Estudi etnofarmacològic de la vall de Chazuta (Amazònia peruana)

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Contribucions científiques derivades d'aquesta tesi

Articles

Sanz-Biset, J., Campos de la Cruz, J., Epiquién Rivera M. A., Cañigueral, S., 2009. A first survey on the medicinal plants of the Chazuta valley (Peruvian Amazon). Journal of Ethnopharmacology. 122, 333-362.

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Aquesta tesi és per a la gent de Chazuta.

ÍNDEX

1

Introducció

1.1. L'etnofarmacologia i la recerca, el desenvolupament i el control de medicaments

Al llarg del temps, la humanitat ha obtingut de la natura els elements essencials per a la seva existència: menjar, medicaments i materials per a la manufactura de roba i refugi. En particular, les plantes superiors han estat la font d'agents medicinals des de temps prehistòrics, i avui encara continuen tenint un paper dominant en l'atenció primària de la salut d'alguns països subdesenvolupats (WHO, 2008).

Al llarg dels segles s'han descobert a la natura substàncies medicinals i tòxiques. La transmissió d'aquest coneixement, principalment de forma oral de generació en generació, també ha estat preservat en textos i matèries mèdiques a partir de l'aparició de l'escriptura. Justament, l'etnofarmacologia s'ocupa d'aquest saber tradicional i es pot definir com "l'estudi científic interdisciplinari dels agents bioactius usats i observats per l'home" (Holmstedt, 1991). Així doncs, l'exploració etnofarmacològica no només es basa en la botànica, la farmacologia, la toxicologia i la química, sinó també en altres disciplines fora de les ciències naturals com l'antropologia. Els estudis etnofarmacològics comprenen des de l'observació i la investigació experimental d'usos tradicionals de plantes, fongs, animals, microorganismes i minerals, fins als efectes farmacològics i les activitats biològiques derivades d'aquests.

Històricament, la majoria dels medicaments s'han generat a partir de productes naturals i dels seus compostos derivats. En molts casos, aquests productes naturals es troben en plantes que la humanitat ha utilitzat amb finalitats medicinals o tòxiques durant segles. Per exemple, l'*Atropa belladona* (atropina), la *Papaver somniferum* (morfina), la *Chondrodendron tomentosum* (tubocurarina) o la *Digitalis lanata* (digoxina), entre moltes altres (Gilani i Atta-ur-Rahmanb, 2005). Tradicionalment, doncs, l'etnofarmacologia ha tingut un paper destacat en el desenvolupament de nous medicaments.

Tot i així, avui dia és estrany basar estratègies comercials de recerca de nous medicaments en l'etnofarmacologia (Cordell i Colvard, 2005). En general, en les últimes dècades la investigació de productes naturals ha anat disminuint gradualment (Carter, 2011). Principalment, això és a causa del fet que la indústria farmacèutica prefereix la recerca de substàncies sintètiques (Li i Vederas, 2009). En l'actualitat, a

través de la combinació de tecnologia robòtica amb avançats processadors de dades, es fan en un breu període de temps tests bioquímics, genètics i farmacològics específics per a centenars de milers de molècules i barreges de molècules (ja siguin provinents de productes naturals o de la química combinatòria). Es tracta de processos de tamisatge d'alt rendiment que permeten identificar ràpidament substàncies actives, anticossos o gens, que són punt de partida per al desenvolupament de fàrmacs. Per diverses raons, l'aplicació d'aquesta tecnologia als productes naturals, comparats amb les substàncies sintètiques, complica i retarda la identificació de nous compostos actius (Frank i Carter, 2005). Per exemple, les substàncies de productes naturals solen presentar estructures complexes amb nombrosos substituents i abundants estereoisòmers (Butler, 2004). Això també dificulta l'etapa de producció industrial de medicaments.

El manteniment d'equips per a la realització d'aquest tipus d'investigació altament tecnificada és costós. Al mateix temps, altres pressions econòmiques actuen fins a la comercialització final d'un nou medicament, moltes de les quals s'han incrementat especialment durant les últimes dècades. Per exemple, l'augment dels requeriments de seguretat, que complica i encareix l'etapa d'assaigs clínics. També, l'aprovació de nous fàrmacs és cada cop més controlada i dirigida per principis de cost-efectivitat, sovint més restrictius. D'altra banda, la indústria ha vist disminuir fortament els seus beneficis per canvis en la regulació de patents i de l'accés a medicaments genèrics (Goodman, 2009). En conseqüència, des dels anys noranta el nombre de nous medicaments comercialitzats ha anat disminuint gradualment any rere any. Així, la indústria es troba cada cop més incentivada a adoptar formes de R+D+I més eficients, és a dir, a desenvolupar compostos actius potencialment més rendibles amb el menor temps possible. Per diferents motius, els productes naturals són residuals dins d'aquest paradigma dominant. Principalment, la indústria farmacèutica obté patents pel descobriment o bé de compostos nous i potents o bé de mecanismes d'acció farmacològics inèdits. Tot i que els agents terapèutics utilitzats en medicina tradicional solen presentar més probabilitat de bioactivitat, molts dels compostos actius aïllats no resulten ser nous i, per tant, tampoc patentables. Sense la comercialització de nous productes protegits per patents, la indústria no pot generar suficients beneficis econòmics per compensar la inversió feta en R+D+I.

Tanmateix, generalment els productes naturals presenten més afinitat per receptors

específics i una activitat biològica més selectiva (Feher i Schmidt, 2003). L'eliminació molecular de centres quirals i la reducció d'àtoms sol produir menys especificitat i una activitat més feble. Així, les molècules derivades de productes naturals tendeixen a presentar més potencial per al desenvolupament de nous medicaments que els compostos sintètics (Newman i Cragg, 2012). Tal com s'ha indicat anteriorment, però, existeixen grans dificultats associades a la investigació de productes naturals. Tot i així, l'avenç de tecnologies com l'enginyeria metabòlica o la biotecnologia pot subministrar en un futur proper noves eines més efectives per al desenvolupament de nous medicaments d'origen natural (Danishefsky, 2010).

En tot cas, el cost total de recerca i comercialització d'un fàrmac nou s'estima entre els 100 i els 900 milions de dòlars americans (Morgan et al., 2011). Aquesta tecnologia, ja prou costosa fins i tot per als països desenvolupats, es fa gairebé inaccessible per a la població de la resta del món, la qual és majoritària. Moltes prediccions apunten a un increment d'aquesta desigualtat en el futur (Patwardhan, 2005). Davant d'aquesta realitat, la medicina tradicional i el desenvolupament de medicaments a partir d'aquesta representen en molts casos una alternativa més sostenible i assequible. Aquest sector també necessita fortes regulacions per assegurar nivells de qualitat, seguretat i eficàcia òptims, així com models de producció capaços de mantenir els costos en situacions d'augment de la demanda.

Tot i que l'estudi de medicaments tradicionals no pretén defensar un retorn a la forma original dels seus usos, alguns elements tradicionals encara poden tenir validesa en un context clínic modern. Per tant, mitjançant la convergència entre coneixement tradicional, medicina moderna i ciència, l'etnofarmacologia pot participar en el desenvolupament d'elements terapèutics tradicionals. Això demostra ser especialment beneficiós per a països del tercer món, els quals depenen més de sistemes de salut tradicionals. Coincidentment, és en aquests països on actualment es fan una part important d'estudis etnofarmacològics (Mashelkar, 2005). Així doncs, l'etnofarmacologia pot participar en la millora de la salut pública en un món global on els recursos són especialment escassos. En aquest apartat és important la participació de governs, universitats i altres organitzacions sense ànim de lucre. A causa de la dificultat de patentar elements de la medicina tradicional, no s'espera que la indústria farmacèutica faci grans contribucions en el camp de l'etnofarmacologia (Verpoorte,

2005).

S'ha de tenir en compte, a més, que tot benefici fruit de la comercialització i conservació dels recursos naturals tradicionals ha de ser compartit pels pobles posseïdors d'aquest coneixement (Soejarto et al., 2005). Per aquesta raó els estudis etnofarmacològics han de ser sensibles al reconeixement dels drets de propietat intel·lectual indígena i moltes vegades necessiten l'adquisició de consentiment informat previ de les comunitats investigades, així com altres negociacions en àmbits diplomàtics, polítics o de llei internacional (Heinrich, 2001).

Per altra banda, un objectiu intrínsec de l'etnofarmacologia és documentar herències culturals, tal com el coneixement que representa la medicina tradicional, especialment quan es troba en situacions vulnerables. De fet, la conservació i el registre del coneixement etnofarmacològic es fan cada cop més urgents en un món on l'extinció de cultures minoritàries avança ràpidament. Aquest és un fet especialment sentit a l'Amazònia peruana, una regió habitada per diversos grups indígenes. Aquests grups són molt vulnerables pel fet de presentar demografies baixes, patir pressions territorials invasores, disposar d'assistències sanitàries en general molt pobres i configurar nivells d'autoorganització insuficients. Des del 1950 fins al 1997 onze grups indígenes de la regió van extingir-se (Brack Egg, 1997). D'altra banda, la conservació i el registre del coneixement etnofarmacològic són també urgents a causa de l'extinció del patrimoni natural. La desforestació d'alguns boscos amazònics comença a ser irreversible.

Finalment, la investigació etnofarmacològica necessita tenir en compte la seva naturalesa interdisciplinària. És important aprofundir en el context cultural, les concepcions tradicionals de la malaltia i la curació, la manera com les plantes medicinals són recol·lectades, processades i formulades, així com la seva identitat (Etkin i Elisabetsky, 2005). Sense disposar d'aquesta informació, pot ser difícil comprendre la funció que es dóna a un ús medicinal concret d'una planta. En un context de medicina tradicional, l'ús o la funció de les plantes medicinals s'explica sovint a partir de comprendre el conjunt íntegre del qual les plantes formen part.

En un context geogràfic global, és possible que només menys del 15% de les espècies

de plantes superiors al món hagin estat subjecte d'anàlisis de bioactivitat (Saklani i Kutty, 2008). Davant de la immensitat de material que encara resta per investigar, la recerca moderna i adequada dirigida per dades etnogràfiques encara pot resultar molt útil per a la selecció de productes naturals i la recerca de medicaments (Cox i Balick, 1994; Heinrich i Gibbons, 2001), però també per al desenvolupament de la mateixa medicina tradicional i la seva possible aplicació en un context clínic modern.

1.2. L'elecció de la vall de Chazuta com a subjecte d'estudi

La principal raó per la qual Chazuta va ser elegida com a subjecte d'aquesta tesi s'explica per l'interès que la regió va suscitar en dues visites fetes els anys 2003 i 2004, abans de l'inici formal d'aquesta tesi. Aleshores es va constatar que, en comparació amb regions veïnes, l'ús de plantes medicinals hi era molt freqüent i estès. A més, els ecosistemes tropicals com el de Chazuta són un tipus de medi especialment interessant per a la recerca i el desenvolupament de medicaments (Soejarto i Farnsworth, 1989). Mendelsohn i Balick (1995) afirmen que fins al moment només ha estat descoberta una vuitena part de tots els medicaments que potencialment poden sorgir dels boscos tropicals. Només a l'Amazònia, s'hi troba aproximadament el 16% de totes les espècies vegetals que hi ha avui a tot el món, i aquesta riquesa augmenta cap a la zona occidental de la regió (Schultes i Raffauf, 1990). A més, els boscos amazònics del Perú es troben entre els ecosistemes amb més riquesa d'espècies de la Terra, ja que diverses àrees peruanes tenen el rècord mundial de nombre d'espècies d'ocells, mamífers, rèptils, papallones o plantes llenyoses (Gentry, 1988).

D'altra banda, la importància etnofarmacològica de Chazuta no només resideix en la riquesa natural del seu ecosistema, sinó també en la seva idiosincràsia cultural. A Chazuta es presenta l'agrupament més dens i nombrós de l'ètnia anomenada *quítxues de San Martín*, també coneguda com a *quítxues de Lamas*. Aquest grup gairebé mai no ha estat estudiat etnofarmacològicament, com tampoc no ho ha estat el seu medi natural, llevat d'algunes exploracions botàniques aïllades. De fet, moltes de les exploracions botàniques i etnofarmacològiques realitzades al Perú han estat molt fragmentades, la qual cosa ha deixat àmplies àrees dels Andes orientals i de la baixa Amazònia encara per explorar degudament (Pennington et al., 2004). Chazuta es pot considerar part d'una d'aquestes àrees poc investigades.

D'altra banda, durant aquelles primeres exploracions realitzades a Chazuta els anys 2003 i 2004, també es va observar que subsistien amb certa presència a la zona unes pràctiques tradicionals molt característiques, com ara la consumició d'extractes de plantes medicinals amb efectes emètics juntament amb restriccions calòriques i altres normes. Aquestes pràctiques, anomenades pels chazutins *dietas* en castellà o *sama* en quítxua, localment es consideraven en gran manera medicinals pels seus efectes depuratius.

En la medicina naturista no és estrany l'ús de pràctiques depuratives per a la "purificació" o "destoxificació" física. Actualment, en medicina el terme *depuratiu* s'utilitza principalment en el tractament clínic d'intoxicacions i al voltant del concepte de *diàlisi*, el mètode que elimina els residus i l'excés d'aigua de la sang en cas d'insuficiència renal. No obstant això, en etnofarmacologia el terme *depuratiu* sovint s'utilitza per a plantes medicinals amb efectes diürètics, purgatius, perspiratoris, colerètics, colagogs o emmenagogs. Aquests efectes han estat reportats a regions de tot el món en diferents períodes històrics (Gurib-Fakim, 2006). La gent de Chazuta atribueix diversos usos medicinals a l'efecte depuratiu, el qual és originat per la ingesta d'extractes vegetals emètics i per la restricció alimentària o calòrica. Les pràctiques depuratives s'utilitzen a Chazuta principalment per al tractament i la prevenció de malalties, encara que també s'empren com a preparació per sortir a caçar o com a pràctiques que formen part del cicle vital de l'home chazutí.

Per diverses raons, a vegades les restriccions sobre l'alimentació augmenten tant que la ingesta de plantes emètiques en aquestes pràctiques va acompanyada de dejuni parcial i algun tipus de reclusió. Aquest tipus de pràctiques, conegudes a Chazuta com a *dietas fuertes* (*dietes estrictes* a partir d'ara), han estat registrades de manera semblant entre altres grups ètnics de l'Amazònia nord-occidental (Cárdenas-Timoteo, 1989; Chaumeil, 1979; Luna, 1986; Reagan, 1983). Aquests estudis no especifiquen les plantes usades i se centren en els usos de naturalesa més magicoreligiosa. En canvi, a Chazuta s'observa la utilització de les dietes principalment per curar malalties o enfortir l'estat de salut. L'àmplia aplicació terapèutica de les dietes estrictes a Chazuta obria la possibilitat d'analitzar aquestes pràctiques més extensament i de fer-ne una descripció més acurada.

A diferents parts del món, el dejuni és i ha estat practicat per la humanitat amb objectius religiosos, d'autodisciplina, polítics o terapèutics. Històricament, les raons per dejunar han implicat aspectes medicinals i espirituals. Moltes religions inclouen el dejuni d'alguna manera o altra (Lützner, 1999). Al començament del segle XX l'interès per aquesta pràctica com a tractament mèdic va revifar a Occident (Kerndt et al., 1982). Avui dia, tot i que minoritàriament, el dejuni encara s'utilitza com a mètode terapèutic, i en diversos sistemes etnomèdics es considera un tractament mèdic vàlid per a trastorns crònics i aguts. Tanmateix, fins ara els efectes terapèutics del dejuni han estat tan sols estudiats per a unes poques indicacions (Michalsen et al., 2005).

Després de les primeres aproximacions a l'etnofarmacologia de Chazuta realitzades els anys 2003 i 2004, es va considerar la possibilitat d'iniciar un estudi formal per aprofundir en el coneixement de l'ús general de plantes medicinals a Chazuta. Incloent a aquest estudi els diferents aspectes de la medicina tradicional de Chazuta associats a l'ús de plantes medicinals, en particular el concepte de *depuració* i la noció de les *dietes estrictes*.

2

Objectius

A partir del que s'ha explicat en els apartats precedents, els objectius de la tesi són els següents:

1. Contribuir al coneixement etnofarmacològic de la vall de Chazuta, mitjançant l'estudi de l'ús medicinal de les plantes.

2. Estudiar el concepte de *dieta* de la medicina tradicional de Chazuta. Particularment, descriure les pràctiques medicinals tradicionals conegudes com a *dietes estrictes* i analitzar la funció que les plantes medicinals tenen en aquestes pràctiques.

3. Estudiar el concepte de *depuració* de la medicina tradicional de Chazuta i analitzar la funció que les plantes medicinals hi poden tenir.

3

Metodologia

3.1. L'àrea d'estudi

El districte de Chazuta està situat en una vall estreta que el riu Huallaga obre al seu pas entre el Cerro Escalera i la Cordillera Azul, al departament de San Martín de l'Amazònia peruana (**figures 1** i **2**).

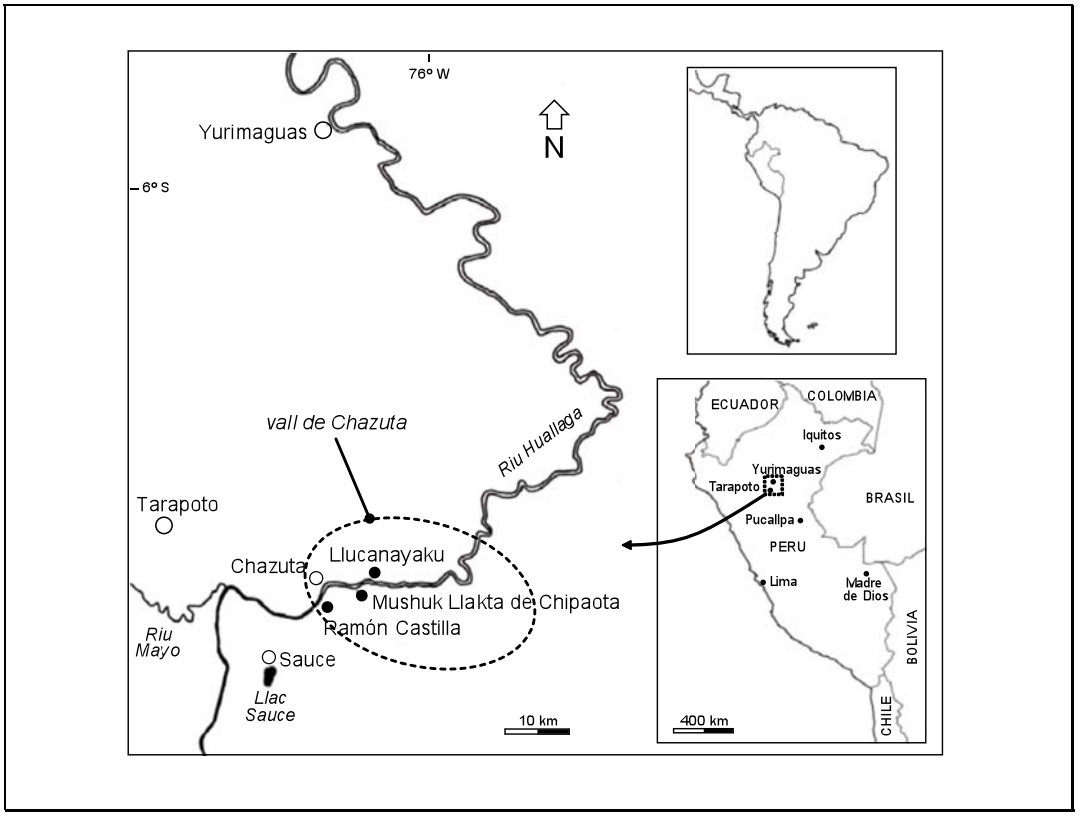

Figura 1. Mapa de la vall de Chazuta i la seva situació al Perú i a l'Amèrica del Sud.

El principal assentament de la vall és el poble anomenat també Chazuta, situat a la riba septentrional a uns 260 metres sobre el nivell del mar (06º36'15'' sud, 76º10'30'' oest) i a 25 quilòmetres al sud-est de la ciutat de Tarapoto (**figura 3**).

Per terra, s'accedeix a la vall de Chazuta per una carretera accidentada. El transport fluvial es restringeix a petites embarcacions que poden sortejar els ràpids que envolten la vall per ambdós extrems (**figura 4**). El clima és tropical i és més humit que en altres parts de San Martín ja que la vall es troba més a prop de la plana amazònica.

El districte té una àrea aproximada de 966 km^2 i una població de gairebé 9.000 habitants (INEI, 2007). La meitat d'aquests individus viuen al poble de Chazuta i l'altra meitat habita en els altres tretze assentaments menors que es troben al districte.

Nou d'ells tenen la categoria legal de *comunidad campesina*, tres de *caserío*, i un altre de *comunidad indígena*. L'últim cens ètnic realitzat pel govern peruà (INEI, 1993) va determinar un 47,4% de població indígena per a tota la vall. Aquesta població indígena sol identificar-se com a *quítxues de San Martín* o *quítxues de Lamas*. Es tracta d'un grup ètnic que habita exclusivament al departament de San Martín i que es considera el tercer grup indígena més nombrós de la selva peruana, amb 22.513 individus (INEI, 1993).

Malgrat que alguns autors consideren aquests quítxues descendents directes d'antigues tribus andines de *chancas* i *pocras* (De Sandoval, 1952; Frisancho i Klayman, 1975), molts altres autors afirmen que aquest grup és el resultat de l'aculturació dels diversos grups que van habitar la regió en temps precolombins, com per exemple *motilones*, *tabalosos*, *lamas*, *amasifuynes*, *cascabosoas*, *jaumuncos*, *payanos*, *suchichis*, *muniches*, *ibitos*, *cholones* i probablement també *chancas* i *pocras* (Brack Egg, 1997; León Bazán, 2003; Puga Capelli, 1989; Scazzocchio, 1979; Weiss, 1949). Barclay (2001) suggereix que Chazuta va ser originalment habitat per indígenes *cascabosoas* (també anomenats *churutinas*) i que la paraula *chazuta* prové d'aquests mots originals.

De totes maneres, a través d'un procés iniciat al principi del colonialisme i per les primeres missions jesuïtes a principis del segle XVI, les diferents tribus que aleshores habitaven a la regió es van mesclar i van formar un grup singular que va adoptar el quítxua ja que aquesta era la llengua franca imposada per les missions.

En l'actualitat, la gran majoria de la població de San Martín és mestissa de forta descendència ameríndia i monolingüe castellana. Aquesta uniformització és en gran part produïda per un fort corrent migratori dominant que arriba a la regió de les valls andines dels voltants i de la costa pacífica més propera, on l'expansió agrícola es fa encara més hostil pel fort creixement demogràfic i per les sequeres periòdiques. Kauffmann-Doig (1990) ha indicat àmpliament l'ancestralitat d'aquest fenomen migratori. Per això, els quítxues de San Martín han esdevingut una minoria ètnica i la seva llengua és el seu principal fet diacrític. El 1993, aquest grup ètnic representava aproximadament el 4% del total de la població del departament (INEI, 1993). Chazuta és el districte on hi havia més individus d'aquesta minoria (4.241 individus: el 19% del total del seu grup) (INEI, 1993).

Figura 2. El riu Huallaga al seu pas pel poble de Chazuta (imatge superior) i pel Cerro Escalera (imatge inferior).

Figura 3. Entrada oest al poble de Chazuta.

Figura 4. Transport fluvial al riu Huallaga al seu pas per la vall de Chazuta.

Durant l'última dècada la població del districte de Chazuta va augmentar en un 29% (ECSC, 2003). També l'àrea destinada a la producció agrícola i ramadera s'ha estès remarcablement. Bager (2005) estima que unes 6.400 hectàrees de la vall van ser desforestades entre el 1989 i el 2001. Així, la situació ecològica és cada cop més crítica. D'altra banda, l'aculturació també progressa ràpidament. L'ús de la llengua quítxua es troba en ràpid retrocés a la vall, on tothom ja entén i parla el castellà. Altres coneixements populars, com la medicina tradicional, també es van deteriorant cada cop més. L'actual situació difereix bastant de la que va trobar el botànic britànic Richard Spruce quan va arribar a Chazuta el 1855: "[...] fins i tot l'alcalde és indi: una persona vella que pot haver estat a l'exèrcit i així haver après castellà. Al poble hi viuen tres cents homes casats i unes 1.500 ànimes aproximadament. Tots ells parlen la llengua inca (quítxua) i només uns pocs saben una mica de castellà" (Spruce, 1908).

Com la resta dels grups indígenes de l'Amazònia peruana, els quítxues de San Martín també representen una minoria ètnica de la regió que habiten. Malgrat tot, almenys Chazuta roman com el principal reservori d'aquest grup, de manera que s'ha convertit en una zona de protecció per a la mateixa ètnia. La forta personalitat de Chazuta en aquest aspecte és capturada a vegades per la famosa dita que sovint s'escolta en pobles veïns: *¡Chazuta tierra de brujos!* Fins fa poc, la vall era particularment coneguda per la bruixeria, un element present en les pràctiques mèdiques tradicionals amazòniques. Aquesta curiosa reputació també es troba registrada a la literatura (Lamb, 1985; Scazzocchio, 1979).

3.2. El sistema de salut de Chazuta

Per a tota la vall només hi havia un metge, un dentista i una infermera, els quals exercien al centre de salut públic de Chazuta. El centre era un edifici antic d'una sola planta, de fusta lleugera i sostre de calamina. Una partera i vuit tècnics sanitaris també treballaven en aquest centre, el qual incloïa una farmàcia i un laboratori d'anàlisis. Els trastorns que es tractaven més freqüentment al centre presentaven etiologies infeccioses (ECSC, 2003) a causa principalment del clima tropical i de la gairebé total mancança de clavegueram als assentaments humans. Fonamentalment, es tractaven desordres dermatològics, urinaris, respiratoris, parasitosis intestinals i diarrea. Menys freqüents eren la tuberculosi, l'hepatitis A infantil, les galteres, la gonorrea i la sífilis.

Els brots de grip eren severs. La malària no era endèmica a la regió però hi havia chazutins que s'infectaven del paràsit quan visitaven les regions veïnes més baixes. Els casos de leishmaniosi eren rars, i havien aparegut algunes infeccions pel virus VIH a la vall. Altres morbiditats freqüents eren malnutrició, càries, altres trastorns dentals, conjuntivitis, traumatismes (especialment greus els accidents per trets de trampes de caça), mossegades de serps verinoses i problemes del període menstrual i del part.

A més del centre de salut, a sis comunitats més de la vall hi havia petites estacions mèdiques, a cadascuna de les quals operava un tècnic de salut i/o llevadora. Al poble de Chazuta un altre tècnic dirigia un negoci privat on eren prescrits, venuts i administrats medicaments molt per sobre del seu preu de mercat (semblaven molt populars les injeccions intramusculars d'antiinflamatoris no esteroïdals). A més, molts dels petits comerços de Chazuta subministraven medicaments bàsics. L'hospital més proper es trobava a la ciutat de Tarapoto. Tot i així, molts chazutins no disposaven de poder adquisitiu no només per pagar una consulta mèdica, sinó tampoc per afrontar els costos de medicaments tan bàsics com un tractament antibiòtic de curta durada. En general, l'ús de clíniques, hospitals i medicaments no era gratuït. Així doncs, la medicina tradicional i les plantes medicinals eren moltes vegades eines terapèutiques més accessibles, les quals encara eren extensament utilitzades.

3.3. La recol·lecció de dades

Les dades presentades en aquesta tesi provenen en primera instància del treball de camp realitzat a la vall de Chazuta de l'octubre del 2004 a l'agost del 2005. Els criteris utilitzats per a la selecció dels informants van ser els següents:

— Es van escollir informants residents en medis més rurals, és a dir, habitants dels tretze poblats disseminats al llarg de la vall, en lloc de població concentrada al poble principal de Chazuta. Aparentment, a les zones més rurals l'accés a l'assistència sanitària era més limitada i per tant l'ús de plantes medicinals podria ser major.

— Es van escollir preferentment informants quitxuoparlants, ja que pertanyien a l'ètnia local i, per tant, més lligada a les tradicions i als coneixements populars del

lloc.

— Es van escollir preferentment individus de més edat, ja que aquests solen ser més bons coneixedors dels costums tradicionals.

En total, es van fer entrevistes semiestructurades a 140 informants adults (60% homes, 40% dones), dels assentaments rurals de Llucanayaku, Mushuk Llakta de Chipaota i Ramón Castilla (**figura 1**). Aquests 140 individus representaven el 6,3% del total d'habitants rurals del districte de Chazuta (INEI, 2005). La gran majoria dels informants eren nadius de la zona o bé individus que hi havien residit gran part de les seves vides. Tot i que moltes vegades va ser difícil determinar l'ètnia d'alguns dels informants entrevistats, el 75% del total van ser considerats quítxues.

Abans d'iniciar les entrevistes, el permís per fer-les es va demanar formalment a les comunitats corresponents a través de reunions públiques amb les autoritats locals. Durant aquests fòrums oberts a tota la comunitat, es va explicar la naturalesa de l'estudi de recerca i es van contestar les preguntes dels assistents (**figura 5**). De cadascuna de les tres localitats estudiades es van obtenir autoritzacions per escrit per a la recol·lecció de dades i la col·lecta de material vegetal (annex 8.1).

Les entrevistes es van fer anant casa per casa. Abans de començar cada entrevista, a cada informant se li va demanar el consentiment de manera formal, incloent-hi l'aprovació per a la publicació de la informació registrada. Depenent del coneixement sobre plantes medicinals que els informants o bé tenien o bé estaven disposats a compartir, les entrevistes duraven des d'alguns minuts fins a hores. Durant dies o fins i tot setmanes senceres es va arribar a conviure amb individus que tenien un coneixement excepcional de plantes medicinals i que al mateix temps es van mostrar disposats a fer sortides de camp per recollir mostres vegetals de les plantes medicinals en qüestió (**figures 6** i **7**). La majoria d'aquests individus eren membres de les famílies quitxuoparlants Chujandama, de Llucanayaku, Ojanama i Tapullima, de Mushuk Llakta de Chipaota, i la família Chujutalli, de la comunitat Ramón Castilla. Les entrevistes es van fer en castellà i es van preparar plecs d'herbari de les plantes recol·lectades. A part dels permisos locals obtinguts, la recol·lecció i exportació de plecs d'herbari va ser autoritzada per l'INRENA (Instituto Nacional de Recursos

Naturales) del Ministeri d'Agricultura del Perú:

— Llicència de recol·lecció 087-2004-INRENA-IFFS-DCB (annex 8.2)
— Llicència d'exportació 005780-AGINRENA (annex 8.3)

Els resultats obtinguts del treball de camp es van confrontar amb la bibliografia, majorment per a les àrees d'etnomedicina, bioactivitats i fitoquímica. La principal base de dades emprada va ser Napralert.

3.4. La identificació taxonòmica

Inicialment, els plecs d'herbari van ser identificats pels botànics peruans José Campos de la Cruz i Mirbel A. Epiquien Rivera i pels botànics de l'herbari USM (Universitat Nacional Major de San Marcos) de Lima Hamilton Beltran i Severo Baldeon Malpartida. Posteriorment, es van enviar plecs i/o fotografies d'herbari als següents especialistes botànics: Pedro Acevedo (US – Smithsonian Institution, EUA), William R. Anderson (MICH – Universitat de Michigan, EUA), Gerardo Aymard C. (PORT – BioCentro-UNELLEZ, Veneçuela), Kerry A. Barringer (BKL – Brooklyn Botanic Garden, EUA), C. C. Berg (L – Universitat de Leiden, Holanda), Paul E. Berry (MICH), Jesús Rodrigo Botina-Papamija (CUVC – Universitat del Valle, Colòmbia), Gemma Bramley (K – Royal Botanic Gardens, Anglaterra), Ricardo Callejas P. (HUA – Universitat d'Antioquia, Colòmbia), Kenneth M. Cameron (WIS – Universitat de Wisconsin, EUA), Xavier Cornejo (GUAY – Universitat de Guayaquil, Equador), Thomas B. Croat (MO – Missouri Botanical Garden, EUA), Nidia Cuello (PORT), Douglas C. Daly (NY – New York Botanical Garden, EUA), Gerrit Davidse (MO), Laurence J. Dorr (US), Stefan Dressler (FR – Senckenberg Forschungsinstitut und Naturmuseum, Alemanya), Uno Eliasson (GB – Universitat de Göteborg, Suècia), Hans-Joachim Esser (M – Botanische Staatssammlung München, Alemanya), José L. Fernández-Alonso (MA – Real Jardín Botánico, Espanya), Christian Feuillet (US), Robin B. Foster (F – Field Museum of Natural History, EUA), C. Frasier (CHRB – Universitat Rutgers, EUA), Paul A. Fryxell (TEX – Universitat de Texas a Austin, EUA), Mats H. Gustafsson (AAU – Universitat d'Aarhus, Dinamarca), Barry E. Hammel (MO), P. Hoffmann (K), Bruce K. Holst (SEL – Marie Selby Botanical Gardens, EUA), Sara B. Hoot (UWM – Universitat de Wisconsin, EUA), John P. Janovec (BRIT – Botanical Research Institute of Texas, EUA), C. C. H. Jonkind

Figura 5. Petició formal d'autorització per a la realització d'investigació a la comunitat de Llucanayaku.

Figura 6. Informant de la família Ojanama amb arrels pelades de *Brunfelsia grandiflora*.

Figura 7. Recol·lecció de parts aèries d'*Inga semialata* amb l'ajut de tisores telescòpiques.

(WAG – Universitat de Wageningen, Holanda), Walter S. Judd (FLAS – Florida Museum of Natural History, EUA), Jacquelyn A. Kallunki (NY), Robert W. Kiger (CM – Carnegie Museum of Natural History, EUA), S. Knapp (BM – The Natural History Museum, Anglaterra), Sven Landrein (K), Leslie R. Landrum (ASU – Universitat Estatal d'Arizona, EUA), Gwilym P. Lewis (K), Ron Liesner (MO), Haroldo C. de Lima (RB – Jardim Botânico do Rio de Janeiro, Brasil), Lúcia G. Lohmann (SPF – Universitat de São Paulo, Brasil), Júlio A. Lombardi (HRCB – Universitat Estatal Paulista, Brasil), P. J. M. Maas (U – Herbarium Utrecht, Holanda), Valéry E. Malécot (INH – Institut Nationale d'Horticulture, França), Alan W. Meerow (FTG – Fairchild Tropical Botanic Garden, EUA), James S. Miller (NY), J. F. Morales (INB – Instituto Nacional de Biodiversidad, Costa Rica), Scott A. Mori (NY), Geoffrey Mwachala (EA – National Museums of Kenya, Kenya), Amanda K. Neill (BRIT), T. D. Pennington (K), G. Prance (K), John F. Pruski (MO), Heimo Rainer (WU – Universitat de Viena, Àustria), Susanne S. Renner (M), Jon Ricketson (MO), N. K. B. Robson (BM), Mark Simmons (CS – Universitat Estatal de Colorado, EUA), James C. Solomon (MO), Brian L. Stannard (K), Charlotte Taylor (MO), Rafael Torres-Colín (MEXU – Universitat Nacional Autònoma de Mèxic, Mèxic), Dieter C. Wasshausen (US) i Hendrik H. Van der Werff (MO).

Plecs d'herbari de gairebé totes les plantes de Chazuta identificades per a aquesta tesi es troben dipositats als herbaris USM (Universitat Nacional Major de San Marcos, Lima, Perú) i BCN (Universitat de Barcelona, Catalunya).

4

Resultats

4.1. Publicació 1

A first survey on the medicinal plants of the Chazuta valley (Peruvian Amazon)

Jaume Sanz-Biset, José Campos de la Cruz, Mirbel A. Epiquién Rivera,
Salvador Cañigueral

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Resum

Actualment, el districte de Chazuta de l'Amazònia peruana constitueix una de les regions amb major presència de quítxues de San Martín (també coneguts com a *quítxues de Lamas*) i de la seva cultura. Aquest grup quítxua, com també la regió de Chazuta mateix, gairebé no han estat estudiats acadèmicament. Amb l'objectiu de contribuir al coneixement etnofarmacològic de la zona, es va fer un estudi de camp sobre l'ús de plantes medicinals a la regió.

La informació es va obtenir a través d'entrevistes de camp fetes al 6,3% de la població adulta rural del districte (140 individus, el 75% dels quals van ser considerats quítxues). En total, es van registrar 945 reports d'usos medicinals pertanyents a 289 espècies diferents de plantes superiors, les quals pertanyen a 202 gèneres i 81 famílies botàniques. Principalment, els remeis vegetals són emprats per al tractament de desordres musculoesquelètics (29,7% de tots els reports d'usos), molèsties gastrointestinals (13,4%) i patologies de la pell (12,9%).

A Chazuta, les plantes medicinals s'utilitzen dins d'un marc de medicina tradicional que confronta la salut i la malaltia des d'una visió integral, on s'han de considerar els usos medicinals de les plantes, la seva combinació amb recomanacions sobre l'estil de vida i la seva participació en rituals i altres pràctiques adreçades al sovint anomenat *món dels esperits*.

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A first survey on the medicinal plants of the Chazuta valley (Peruvian Amazon)

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ABSTRACT

Aim of the study: At present, the Peruvian Amazonian district of Chazuta represents one of the main reservoirs of the San Martin Quechuas (also known as Lamas Quechuas) and their culture. These particular Quechuas, as well as the region of Chazuta, have been seldom studied from an academic point of view. With the objective of contributing to the ethnopharmacological knowledge of the area, a field survey on the use of medicinal plants was performed in the region.
Material and methods: The information was obtained through interviews to the 6.3% of the district rural adult population (140 individuals, 75% of which was considered Quechua).
Results: In total, the study recorded 945 medicinal use-reports of 289 plant species collected in Chazuta, which belong to 202 genera in 81 families of vascular plants. Mainly, plant remedies were employed to treat musculoskeletal disorders (29.7% of all the medicinal use-reports), gastrointestinal complaints (13.4%) and skin conditions (12.9%).
Conclusions: In Chazuta, medicinal plants are used within a context of a traditional medicine that confronts health and illness from an integral vision, in which the medicinal uses of plants, its combination with lifestyle advice, and its participation in the performance of rituals and other practices concerning to what is often named as "the world of spirits" have to be considered.

1. Introduction

Many authors have discussed the importance and potential of medicinal plants as sources of new therapeutic agents (Balandrin et al., 1985; Cordell, 1987, 2000; Hamburger and Hostettmann, 1991; Lewis and Elvin-Lewis, 1995). Knowledge of plant bioactivity has been accumulated by experimentation over centuries by people living in intimate association with their environment. Therefore, ethno-directed research is very useful in drug discovery and development (Cox and Balick, 1994; Heinrich and Gibbons, 2001). However, accelerated acculturation is disintegrating ethnopharmacological information often faster in many areas than the extinction of plant species, which rampant deforestation invariably entails. This problem is particularly serious in the tropical rainforests (Plotkin and Famolare, 1992). Soejarto and Farnsworth (1989) stress the special significance of these tropical areas as sources of new pharmaceutical agents. Mendelsohn and Balick (1995) conclude that only one-eighth of all drugs that can be potentially developed from the rainforests of the world, have been discovered. Only the Amazon has approximately 16% of all the plant species that exist today on the Earth, and this wealth increases towards the west of the region (Schultes and Raffauf, 1990). In addition, the Amazonian forests of Peru are perhaps the most species-rich ecosystems on Earth, with various Peruvian sites holding the world record for number of species of birds, mammals, reptiles, butterflies and for woody plants (Gentry, 1988).

Many of Peruvian botanical as well as ethnopharmacological explorations have been very patchy, with large areas of the eastern Andes and lowland Amazonia not yet properly explored (Pennington et al., 2004). Thus, the aim of this paper is to present and discuss the medicinal plant uses recorded in one of these regions not yet properly investigated: the valley of Chazuta. To our knowledge, this is the first published study of this nature performed in the region.

2. Methodology

2.1. Study site

The Chazuta District is located in a narrow valley that the Huallaga River opens between peaks of over a thousand meters of both *Cerro Escalera* and *Cordillera Azul* mountain ranges in the San Martin Department of the Peruvian Amazon. The main settlement is the town also called Chazuta situated at the left bank of the river, at about 260 m over sea level, 06°36′15″ South, 76°10′30″ West, and

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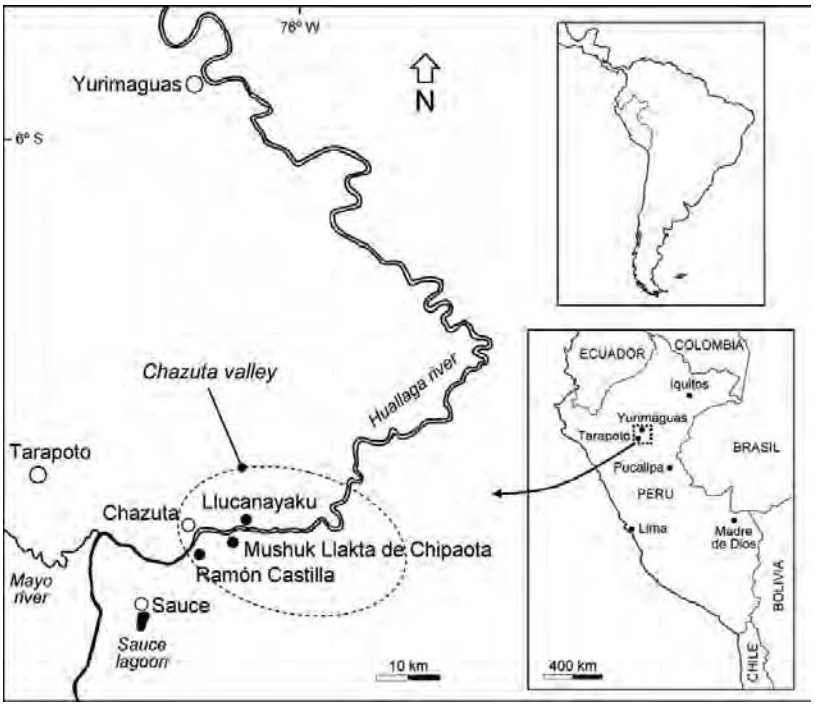

Fig. 1. Map showing the study site of the present research (Chazuta valley) and its situation in Peru and South America.

at 25 km. South-East from Tarapoto city (Fig. 1). Overland, access to the valley is via a bumpy road which can be cut off for short periods of time during the wet season. River transport is restricted to small boats because of the dangerous rapids. Climate is tropical, being more humid than in most parts of San Martin since the valley is close to the lowland Amazon.

The District has an area of 966.38 km^2 and a population of 9.563 people (INEI - Instituto Nacional de Estadística e Informática, 2005). Half of the inhabitants dwell in the town of Chazuta, while the other half lives in the other 13 minor settlements found in the district: 9 of them have a legal status of *Comunidad Campesina* (rural community), 3 are *Caserios* (smaller settlements) and 1 was recently registered as *Comunidad indígena* (indigenous community). The last governmental ethnic census (INEI, 1993) determined that 47.4% of the district population was indigenous.

These so-called indigenous inhabitants belong to the group usually known as San Martin Quechuas or Lamas Quechuas, who exclusively dwell in the San Martin Department of Peru. They are considered the third most numerous indigenous group in the Peruvian rainforest, with 22.513 individuals (INEI, 1993). Although some authors initially considered the San Martin or Lamas Quechuas as the direct descendants of ancient Andean tribes of Chancas and Pocras (De Sandoval, 1952; Frisancho and Klayman, 1975), many other authors state that this group is the result of the acculturation of the many tribes that inhabited the region in pre-Columbian times, such as the Motilones, Tabalosos, Lamas, Amasifuenes, Cascasosas, Juamuncos, Payansos, Suchiches, Muniches, Hibitos, Cholones and probably also Chancas and Pocras (Weiss, 1949; Scazzocchio, 1979; Puga Capelli, 1989; GEF/PNUD/UNOPS, 1997; León Bazán, 2003). Barclay (2001) suggests that Chazuta was originally inhabited by *cascabosoas* Indians (also called *churutinas*), and that the word Chazuta stems from these Indian names. However, through a process initiated by early colonialism and by the first Jesuit missions at the beginning of the XVI century, the onetime tribes of the region merged in a singular group that has adopted the Quechua since this was the lingua franca imposed in the missions.

The present Department of San Martin was the first Amazonian region colonized in Peru. The colony formed the current economic organization; establishing the settlements which today are the bigger towns and cities that articulate a predominant agricultural region. The first villages founded were Moyobamba in 1542 and Lamas in 1656. Tarapoto was established in 1782 and Chazuta in 1808. As mentioned by Maskrey et al. (1991), even in modern times San Martin has been treated as an economic colony, absorbing constant immigrations in order to exploit its territory. The region has gone through a succession of economic cycles or booms based on extractive and predatory activities (rubber, wood, furs), and in monoculture agriculture (barbasco, cotton, coffee). In the seventies, a more intense and modern mercantile system was set up with the arrival of the *carretera marginal* highway. Initially, the government promoted rice and maize monocultures which prompted massive immigrations flooding in San Martin. However, these other unsustainable booms fell in the eighties when the government could not continue with the benefits system. Then, many farmers abandoned the cultivation of food crops and concentrated on coca production which quickly brought mafia, violence and corruption. The revolutionary groups of *Sendero Luminoso* and *MRTA* (*Movimiento Revolucionario Tupac Amaru*) were active in the area and got involved with the drug-traffic. The situation led to a civil war which stroked hardest on the rural areas as Chazuta. At the same time, problems with malnutrition increased as during the coca fever many families stopped cultivating food crops. Today, coca cultivation is said to be nearly extinct.

Hence, the great majority of the present population of San Martin is *mestizo*, which has a strong Amerindian and dimmer European descendant, and is Spanish monolingual. Attracted by the various

economic booms mentioned earlier, these "*mestizos*" come from the close Andean valleys and the near Pacific coastline, both hostile lands for agricultural expansion. Kauffmann-Doig (1990) has indicated the ancestrally of this migratory phenomenon.

Therefore, the San Martin Quechuas have become an ethnic minority, where their Quechua language remains as their main diacritic. Today, they nearly represent the 4% of the whole San Martin Department population (INEI, 1993). Nevertheless, Chazuta is the district where more individuals of this minority are found: 4.241 people, just about the 19% of their entire ethnic group (INEI, 1993). The great majority of the inhabitants, both Quechua and *mestizo*, are peasants with very low income. Often today, individuals of these two ethnic groups live mixed and marry each other. Within this broad social class, racial discrimination is low.

The primary income-generating activities reported in households in Chazuta were agriculture (44.4%), hunting (20.3%) and fishing (19.3%) (Del Campo and Wali, 2007). This agriculture still depends on ancient land management practices, such as burning. However, the traditional agriculture based on diversity and imitation of the forest structure seems to be forgotten after the booms and monocultures experienced in the past (Marquardt, 1998). New projects for sustainable and "ecologic" agriculture lead by non-governmental organizations are being developed now in the District. The changes in demography and production (also to mention introduction of cattle farming and massive tree felling) have meant instability in the relationship between the population and its resources. During the last decade the total District population of Chazuta grew by 29% (Estadísticas del Centro de Salud de Chazuta, 2003). Also, the area of exploited land has extended remarkably reducing at the same time the virgin forest. Bager (2005) states that nearly 6400 ha were deforested from 1989 to 2001 in the valley. Thus, the ecological situation is more serious than ever with deforestation, erosion, stream drying and decrease in numbers of wild animals.

On the other hand, acculturation progresses rapidly. The Quechua language use is decreasing quickly in the valley, while everybody understands and speaks Spanish. This, as the prevalence of other popular knowledge like traditional medicine is deteriorating fast. This situation is quite different to the one that the British botanist Richard Spruce described when he arrived in Chazuta in 1855: "... even the governor is Indian: an old person that might have been a soldier and learnt then Castilian. The town has three hundred married men and 1500 souls approximately. All they speak the Inca language (Quechua) and only very few know some Castilian ..." (Spruce, 1908).

Indigenous groups in the Peruvian Amazon are very vulnerable due to a low demography, invading pressures, poor healthcare and insufficient organization. From 1950 to 1997 eleven indigenous groups became extinct in the region (GEF/PNUD/UNOPS, 1997). However, Chazuta remains one of the main reservoirs for the San Martin Quechuas and their culture.

Since recently, the valley was particularly famous for its sorcerers, a cultural element which plays an important role in their traditional medicine as well as in the use of medicinal plants. This idiosyncrasy is in part captured by a saying often heard in many neighbouring regions: *Chazuta tierra de brujos*! (Chazuta land of sorcerers!), a well-known reputation also found in the literature (Scazzocchio, 1979; Lamb, 1985).

2.2. Health and healing

The only physician, only dentist and only nurse of the district serve in the state health clinic of Chazuta, an old building made of lightweight wood and calamine. One obstetric and other eight sanitary technicians also work in this medical centre, which includes a basic pharmacy and a laboratory where routine blood and parasitological tests are performed as well as diagnosis of malaria, leishmaniosis, tuberculosis, salmonellosis and HIV. The most common diseases reported in this medical centre (Estadísticas del Centro de Salud de Chazuta, 2003) have an infectious aetiology, which is contributed by the tropical climate and the nearly total lack of sewer system in all district settlements. Fundamentally, these ailments are skin, urinary, and respiratory infections, intestinal parasitosis and diarrhoea. Less frequent are tuberculosis, infantile hepatitis A, mumps, gonorrhoea and syphilis. Outbreaks of influenza are severe. Malaria is not endemic in the region but "chazutians" can get infected when visiting the neighbouring lowlands. Although leishmaniosis is rare, individuals who spend days deep inside the forest (normally involved in illegal tree felling) are especially prone to get the disease. Recently, a few cases of HIV appeared in the valley. Other frequent morbidity causes are malnutrition, tooth decay, other dental disorders, conjunctivitis, traumatisms (especially serious the ones caused accidentally by gunfire hunting traps), venomous snake bites, period disorders and labour troubles.

Besides the health clinic, six rural communities in the valley have a first aid post, each being run by a sanitary technician and/or a midwife. In the town of Chazuta another sanitary technician runs a private business where overpriced medicines are prescribed and applied. In addition, many small groceries and shops stock very few basic drugs. The nearest hospital is found in the close city of Tarapoto. However, many "chazutians" cannot even afford the cost of neither medical consultations nor basic medicines such as a course of penicillin. Clinics, hospitals and drugs are not free, hence leaving many ill untreated.

Therefore, traditional medicine and medicinal plants usually represent a much more accessible health system, still being widely employed. Furthermore, this popular medical system is also used against all those culture-bound syndromes and illnesses considered to be caused by the influence of "spirits" and other "supernatural agents". This popular knowledge and practices, not always of Indian origin, have been subjected to several cultural currents, most likely of two kinds: one of strong Andean origin, and another coming from western sources.

2.3. Data collection

The data presented is based on the field work performed in the studied region by one of the authors (JS) from October 2004 to August 2005.

Informants were selected:

(i) Among rural inhabitants, which were those dwelling in the valley's minor settlements, where access to public healthcare is more limited and rely more on the use of medicinal plants than the rest of the valley's population. On the contrary, these other "less rural" inhabitants resided in the main town, which has electricity, the health clinic, secondary school, canteens, market and even a "discotheque".
(ii) Taking in account the ethnicity, preferring quechua informants.
(iii) Taking in account age, preferring the elders.

Moreover, having a representative sample was intended, accounting for not less than a 5% of the adult rural population.

Semi-structured interviews were conducted to 140 adult informants (60% men, 40% women), who lived in the three Chazuta district settlements of Llucanayaku, Mushuk Llakta de Chipaota and Ramón Castilla (Fig. 1). These 140 individuals represented the 6.3% of the total adult rural population of the district (INEI, 2005). Most of the informants were native to the studied region or had spent most of their live there. Even though it was difficult to determine the ethnicity of some individuals due to the wide ethnic heteroge-

neousness mentioned earlier, 75% of all persons interviewed were considered Quechua.

Before interviews were conducted, each community was met in public meetings organised by every local authority from who consent to collect data was received after explaining the nature of the study and answering questions that arose during those forums. Once the investigation was approved and writing authorisation was obtained, interviews were performed moving from house to house. Informed consent, including consent for publication was received from all participants before interviews began. The initial question asked of each individual was whether or not he/she had taken any plant for a medicinal use. Questions focused mainly on the ailments that were treated with plant remedies, and what those plants were. Depending on how much an individual knew or wanted to tell, interviews lasted anywhere from approximately 5 min to hours. Through these conversations, individuals with great plant lore were met. Days or even weeks were spent with persons with good plant knowledge and willingness to take the investigator to areas where plants were collected and point out the species that had been mentioned during the interviews. Mainly, those were members belonging to quechua families known in the valley for being healers, such as the Llucanayaku's Chujandama family, Chipaota's Tapullima and Ojanama families and also the Chujutalli family from Ramon Castilla. Herbarium specimens of plants that were pointed out in the field were collected. The conversations were in Spanish. Besides local consent, permit for the collection and exportation of voucher herbarium specimens was covered by official authorisations issued by the Agricultural Ministry of Peru's INRENA: collection licence 087-2004-INRENA-IFFS-DCB and Exportation permit 005780-AG-INRENA.

2.4. Taxonomic identification

Initially, voucher herbarium specimens were identified by Peruvian botanists José Campos de la Cruz, Mirbel A. Epiquien Rivera and curators of the USM Herbarium of Lima: Hamilton Beltran and Severo Baldeon Malpartida. Later, voucher herbarium specimens where sent to the following specialists: P. Acevedo (US), W.R. Anderson (MICH), C.C. Berg (L), J.R. Botina-Papamija (CUVC), G. Bramley (K), R. Callejas (HUA), T.B. Croat (MO), N. Cuello (PORT), H. Esser (M), C. Feuillet (US), C. Frasier (CHRB), P.A. Fryxell (TEX), B.E. Hammel (MO), B.K. Holst (SEL), S.B. Hoot (UWM), J.A. Kallunki (NY), R.W. Kiger (CM), L. Landrum (ASU), G.P. Lewis (K), R. Liesner (MO), L.G. Lohmann (SPF), J.A. Lombardi (HRCB), P.J.M. Maas (U), V.E. Malécot (INH), J.S. Miller (MO), J.F. Morales (INB), S.A. Mori (NY), T. Pennington (K), J.F. Pruski (MO), S.S. Renner (M), J. Ricketson (MO), J.C. Solomon (MO), B. Stannard (K), C. Taylor (MO), D. Wasshausen (US) and H. van der Werff (MO).

Moreover, identification of a few specimens were confirmed through photographs sent to: K.A. Barringer (BKL), P.E. Berry (MICH), X. Cornejo (GUAY), D.C. Daly (NY), G. Davidse (MO), S. Dressler (FR), U. Eliasson (GB), J.L. Fernández-Alonso (COL), R.B. Foster (F), M.H. Gustafsson (AAU), P. Hoffmann (K), C.C.H. Jonkind (WAG), S. Knapp (BM), S. Landrein (K), H.C. de Lima (RB), A.W. Meerow (FTG), G. Mwachala (EA), A.K. Neill (BRIT), H. Rainer (WU), N.K.B. Robson (BM), M. Simmons (CS) and R. Torres-Colín (MEXU).

Sets of the voucher herbarium specimens have been deposited in the BCN Herbarium of Barcelona (Catalonia), and in the USM Herbarium of Lima (Peru).

3. Results and discussion

3.1. Botanical families and genera of plants used

On the whole, 318 plant species used for medicinal purposes by people living in the Chazuta district were collected and identified. Twenty-nine of these plants were exclusively taken with fasting in specific conditions. This theme is outside the scope of the present paper, but it will be the main topic presented and discussed in a separate article. Thus, excluding those 29 species, the remaining 289 plants are shown in Table 1. These nearly three hundred plants are represented by 81 different families, of which the following have the highest number of species used medicinally: Fabaceae and Moraceae (each with 27 species), Euphorbiaceae (with 13 species), Rubiaceae and Solanaceae (each with 12 species), Apocynaceae and Clusiaceae (each with 11 species), Araceae, Bignoniaceae and Piperaceae (each with 9 species), Asteraceae (8 species) and Verbenaceae (6 species). This mostly agree with another study carried out in Loreto, a similar close ecoregion of Peru, in which Fabaceae, followed by Apocynaceae, Solanaceae and Rubiaceae, registered the highest number of medicinally used plant species (Jovel et al., 1996).

Altogether, 202 genera are represented, the following occurring more often: *Ficus* (16 species), *Piper* and *Solanum* (each with 6 species), *Tabernaemontana* and *Tovomita* (each with 5 species), *Annona*, *Aristolochia*, *Clusia* and *Psychotria* (each with 4 species).

3.2. Plant local nomenclature

All in all, 369 local plant names were recorded for these 289 plants used medicinally. Quechua was present in 59% of these names (27.9% were totally Quechua while the remaining 31.1% contained at least one Quechua word). On the other hand, Spanish was present in 44.1% of all names (12.7% were totally Spanish while 31.4% had at least one Spanish word). Moreover, in 137 names (37.1%) there was at least one word not clearly Spanish nor clearly Quechua, i.e. words which neither we nor informants could explain their meaning. However, many of these words sounded Quechua to us, such as *huacapu*, *pichirina*, *shimikwa*, *winku* or *yanchama*. This shows that languages are mixed even in the same plant name. For example, *pishku isman de hoja menuda* has a Quechua part (*pishku isman*, meaning bird food) and a Spanish part (*hoja menuda*, small leaf). This suggests the progressive loss of Quechua use in plant names.

3.3. Plant type and part used

Of all the plant species used medicinally, 208 species (72%) were woody in nature (a tree, a shrub or a woody vine or liana); while 81 were herbs or herbaceous vines. On the other hand, 206 plant species were collected wild, 73 were cultivated species when gathered, and 10 were collected both wild and cultivated.

The most common plant part used were the leaves, accounting for 112 species (leaves were employed with other parts in 40 of these species). Bark was the second most used part, reported in 101 plants (stem bark was employed in 84 species, root bark in 12 occasions, and mixtures of both stem and root barks were used in 5 plants). Other parts employed more frequently were the aerial part (in 26 plants), latex (25), stem (18), fruit (12), seeds (9) and tuber (in 5 species). In 21 species the whole plant was employed. Above-ground plant parts were highly used, about 83.3% of the time. A combination of above and below-ground parts were employed about the 10.5%, and below-ground parts 6.2% of the time.

The predominant use of leaves and barks is common to the Amazonian region as shown by other surveys (Desmarchelier et al., 1996; Jovel et al., 1996). Conversely, in geographically closer, but ecologically different, regions, such as the near Andes and Pacific coast, woody plant parts are hardly employed (De Feo, 1992; Hammond et al., 1998; Bussmann and Sharon, 2006; De la Cruz et al., 2007).

Table 1
Plants with medicinal uses reported in Chazuta valley (Peruvian Amazon).

Scientific name (botanical family) (C = cultivated and/or W = wild) (Voucher herbarium specimen)	Local name	Part(s) used	Medicinal use-reports N^* = repeated reports	Use or disease treated (N) = use-reports of each use or disease treated) (N^*) = repeated reports, i.e. reports mentioned earlier in this table (N n) = non-medicinal reports	Mode of preparation and administration[a]
Abuta grandifolia (Mart.) Sandwith. (Menispermaceae) (W) (BCN 40122)	Achuni kaspi	Stem and root	4	Rheumatism (2), Aphrodisiac – use interpreted through the Doctrine of Signatures (2)	Macerated in rum[b]
Adenaria floribunda Kunth. (Lythraceae) (W) (BCN 40368)	Puka varilla	Seed	1	Constipation – laxative (1)	Crushed and mixed with warm water
Aegiphila integrifolia (Jacq.) B.D. Jacks. (Verbenaceae) (W) (BCN 40314)	Yurak ukwera	Young stem	3	Eye irritation (3)	Squeezed, the juice obtained is instilled into irritated eyes
Allosanthus trifoliatus Radlk. (Sapindaceae) (W) (BCN 40140)	Acero waska negra	Stem	4	Rheumatism (1) Broken bones (1), Postpartum tonic (1) Health tonic (1)	Decoction Macerated in rum[b] Macerated in rum[b] with *Rourea puberula* and alambre waska (?) bark
Anacardium occidentale L. (Anacardiaceae) (C) (BCN 40323)	Kashu	Fruit	2	Stomach discomfort (1), Antidiarrhoeal (1), Used as food (1n)	Eaten crude
		Seed	8	Intestinal parasites – laxative (2) *Laha* – athlete's foot (2), Calluses (2), Verrucae (2)	Roasted, crushed and mixed with warm water Expressed, the oil obtained is applied on affected skin
		Bark	2	Dysentery (1) Stomach ulcers – internal cicatrizant (1)	Decocted with *Psidium guajava* and ciruelo (?) bark Decoction
Annona cordifolia (Szyszyl.) R.E. Fr. (Annonaceae) (W) (JSB-149)[c]	Anunilla waska	Leaf and bark	1	Diabetes (1)	Decoction
Annona cf. *duckei* Diels (Annonaceae) (W) (JSB-209)[c]	Guayami sacha	Leaf	1	Abscess (1)	Crushed, applied on abscesses
Annona montana Macfad. (Annonaceae) (C) (BCN 40713)	Guanábana, Guana guana	Seed	1	Scabies (1)	Crushed, applied on the affected skin
		Fruit	–	Used as food (1n)	Eaten crude
Annona muricata L. (Annonaceae) (C) (BCN 40714)	Guanábana	Leaf Fruit	2 –	Diuretic (2) Used as food (2n)	Infusion Eaten crude
Aphelandra goodspeedii Standl. et F.A. Bark. (Acanthaceae) (W) (BCN 40222)	Iguana sacha	Aerial part	2	Muscular aches (1), Tonic for children: "to make them playful" – use interpreted through the Doctrine of Signatures (1)	Infusion
Ardisia guyanensis (Aubl.) Mez (Myrsinaceae) (W) (BCN 40225)	Puka chakruna	Leaf	1	Depurative[d] (1)	Decocted with *Banisteriopsis caapi* stems
Aristolochia cf. *fosteri* Barringer (Aristolochiaceae) (C) (BCN 44892)	Yawar panka macho	Leaf	2	Cough – emetic (1), Bronchitis – emetic (1)	Squeezed, the juice obtained is drunk

Table 1 (*Continued*)

Scientific name (botanical family) (C = cultivated and/or W = wild) (Voucher herbarium specimen)	Local name	Part(s) used	Medicinal use-reports *N** = repeated reports	Use or disease treated (*N*) = use-reports of each use or disease treated) (*N**) = repeated reports, i.e. reports mentioned earlier in this table (*N n*) = non-medicinal reports	Mode of preparation and administration[a]
Aristolochia leuconeura Linden (Aristolochiaceae) (C) (BCN 40090)	Yawar panka, Machakuy waska, Wankawi sacha, Omagway waska	Leaf	17	Cough – emetic (4), Bronchitis – emetic (4), Depurative[d] – emetic and laxative (4), Tobacco and cocaine addiction (1)	Squeezed, the juice obtained is drunk
				Cough – emetic (1), Bronchitis – emetic (1)	Mixed and squeezed with *Aristolochia sprucei* leaves, the juice obtained is drunk
				Depurative[d] (1), Tobacco and cocaine addiction (1)	Decocted with *Banisteriopsis caapi* stems and *Psychotria viridis* leaves
Aristolochia pilosa Kunth (Aristolochiaceae) (W) (BCN 40093)	Cielo ayawaska, Puma rinri	Leaf and young stem	2	Cough – emetic (1), Bronchitis – emetic (1)	Squeezed, the juice obtained is drunk
Aristolochia sprucei Mast. (Aristolochiaceae) (W) (BCN 40092)	Cielo ayawaska, Puma rinri	Leaf and young stem	2*	Cough – emetic (1*), Bronchitis – emetic (1*)	Mixed and squeezed with *Aristolochia leuconeura* leaves, the juice obtained is drunk
Asclepias curassavica L. (Asclepiadaceae) (W) (BCN 40333)	Quita wayta	Latex	2	Scabies (1) Cattle wound antiseptic (1)	Applied on the affected skin Applied on cattle wounds
Aspidosperma myristicifolium (Markgr.) Wood. (Apocynaceae) (W) (BCN 40683)	Remo kaspi	Bark	1	Rheumatism (1)	Decoction
Aspidosperma rigidum Rusby (Apocynaceae) (W) (BCN 40686)	Tashkum remo kaspi, Remo kaspi	Bark	2	Rheumatism (2)	Decoction
Asplundia sp. (Cyclanthaceae) (W) (JSB-263)[c]	Cesto támushi	Stem	1	Rheumatism (1) Used to make baskets (1*n*)	Decoction Stems are intertwined
Banisteriopsis caapi (Spruce ex. Griseb.) C.V. Morton. (Malpighiaceae) (C) (BCN 40135)	Ayawaska, Ayawaska negra, Ayawaska amarilla, Purgawaska	Stem	35 + 3*	Depurative[d] – plant mixtures containing *B. caapi* were said to be emetic, sometimes also laxative (13), Body odour modifying agent for hunting and fishing self-preparedness (3), Stomach pains (2), Health tonic (1)	Decocted with *Psychotria viridis* leaves – mixtures of *B. caapi* were said to be taken in specific healing rituals
				Depurative[d] (1*)	Decocted with *Ardisia guyanensis* leaves
				Depurative[d] (1)	Decocted with *Psychotria alba* leaves
				Depurative[d] (1)	Decocted with *Psychotria carthagenensis* leaves
				Depurative[d] (1)	Decocted with *Psychotria ernestii* leaves
				Health tonic (1), Depurative[d] (1)	Decocted with *Psychotria viridis* and *Gonzalagunia cornifolia*
				Health tonic (1), Depurative[d] (1)	Decocted with *Psychotria viridis* and *Petiveria alliacea*
				Health tonic (1), Depurative[d] (1)	Decocted with *Psychotria viridis* and *Pterocarpus rohrii*
				Rheumatism (1), Depurative[d] (1)	Decocted with *Psychotria viridis*, *Mansoa alliacea* and *Piper callosum*

				Rheumatism (1), Depurative[d] (1)	Decocted with *Psychotria viridis*, *P. carthagenensis*, *Cornutia microcalycina*, *Croton draconoides*, *Himatanthus sucuuba*, *Licaria* sp., *Mikania* sp. and *Virola calophylla*
				Lumbago (1), Depurative[d] (1)	Decocted with *Psychotria viridis*, *P. alba*, *Brugmansia suaveolens*, *Calliandra angustifolia*, *Couroupita guianensis*, *Tovomita* aff. *stylosa* and *Zygia longifolia*
				Tobacco and cocaine addiction (1*), Depurative[d] (1*)	Decocted with *Psychotria viridis* and *Aristolochia leuconeura*
				Depurative[d] (1), Employed to divine future events through the visions induced by the plant decoction (1*n*)	Decocted with *Psychotria viridis*, *Rosenbergiodendron longifolium* and *Toxosiphon trifoliatus*
Bauhinia glabra Jacq. (Fabaceae) (W) (BCN 40166)	Chunchulli waska, Escalera waska	Stem and leaf	4	Intestinal pains (2) and discomfort (2) in children – uses interpreted through the Doctrine of Signatures	Decoction
Bauhinia cf. *smilacina* (Schott) Steud. (Fabaceae) (W) (BCN 40157)	Chunchulli waska, Escalera waska	Stem and leaf	2	Intestinal pains (1) and discomfort (1) in children – uses interpreted through the Doctrine of Signatures	Decoction, for drinking and bathing
Bauhinia tarapotensis Benth. (Fabaceae) (W) (BCN 40165)	Machete vaina	Bark	1	Muscular aches (1)	Decoction
		Fruit	1	Hemostatic for umbilicus bleeding in neonates (1)	Roasted, applied on bleeding umbilicus
Bixa orellana L. (Bixaceae) (C) (BCN 40348)	Achiote, Shambo	Leaf	1	Eye infection (1)	Soaked in fresh water for half an hour and squeezed, the gel obtained is instilled into infected eyes
		Seed aril	–	Food condiment (1*n*), Red/orange dye (1*n*)	Added crude to food and also used crude as a dye
Bixa platycarpa Ruiz et Pav. ex G. Don. (Bixaceae) (W) (BCN 40347)	Achiote silvestre, Shambo kaspi	Bark	1	Eye infection (1)	Soaked in fresh water for 10 min and squeezed, the gel obtained is instilled into infected eyes
				Orange dye (1*n*)	The inner bark is squeezed, the liquid obtained is used
Brosimum alicastrum subsp. *bolivarense* (Pittier) C.C. Berg (Moraceae) (C and W) (BCN 40699)	Manchinga	Latex	2	Broken bones (1)	Mixed with warm water
				Rheumatism (1)	Mixed with rum[b]
Browneopsis cf. *cauliflora* (Poepp.) Huber (Fabaceae) (W) (BCN 40242)	Runa kaspi	Bark	1	Rheumatism (1)	Decoction
Brugmansia suaveolens (Humb. et Bonpl. ex Willd.) Berch. et J. Presl (Solanaceae) (C) (BCN 40186)	Toe, Toe de flor blanca	Stem bark	2	Stomach pain (1), Lumbago (1)	Macerated in fresh water for some minutes
		Leaf	2*	Lumbago (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. alba*, *Calliandra angustifolia*, *Couroupita guianensis*, *Tovomita* aff. *stylosa* and *Zygia longifolia*
Brunfelsia grandiflora D. Don. subsp. *grandiflora* (Solanaceae) (C) (BCN 40340)	Chirik sanango	Root bark	26	Rheumatism (11)	Macerated in rum[b] (in 7 reports), Macerated in fresh water (in 4 reports)
				Febrifuge (7), Body odour modifying agent for hunting and fishing self-preparedness (4), Depurative[d] (4)	Macerated in fresh water for some minutes

Table 1 (*Continued*)

Scientific name (botanical family) (C = cultivated and/or W = wild) (Voucher herbarium specimen)	Local name	Part(s) used	Medicinal use-reports *N** = repeated reports	Use or disease treated (*N*) = use-reports of each use or disease treated) (*N**) = repeated reports, i.e. reports mentioned earlier in this table (*N n*) = non-medicinal reports	Mode of preparation and administration[a]
Caesalpinia pulcherrima (L.) Sw. (Fabaceae) (C) (BCN 40158)	Angel sisa	Leaf	1	Headache (1)	Slightly boiled, for drinking and bathing. A poultice is also made with the crushed leaves
Caladium bicolor (Aiton) Vent. (Araceae) (W) (BCN 40188)	Patquinilla blanca	Tuber	1	Leech bite wounds (1)	A poultice is made with the roasted and pounded tuber
Calliandra angustifolia Spruce ex Benth. (Fabaceae) (C) (BCN 40154)	Bobensana	Stem	7+2*	Postpartum tonic (2), Lumbago (1) Rheumatism (1), Broken bones (1) Health tonic (1) Health tonic (1) Lumbago (1*), Depurative[d] (1*)	Decoction Macerated in rum[b] Macerated in rum[b] with *Phthirusa stelis*, *Uncaria tomentosa*, *Zygia longifolia* and caballo sacha (?) Macerated in rum[b] with *Clusia* sp.1, *Maytenus* aff. *macrocarpa*, *Tovomita foldatsii* and *T.* aff. *stylosa* Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. alba*, *Brugmansia suaveolens*, *Couroupita guianensis*, *Tovomita* aff.*stylosa and Zygia longifolia*
Callichlamys latifolia (Rich.) K. Schum. (Bignoniaceae) (W) (JSB-103)[c]	Ñiawi anpina	Tuber	1	Eye irritation (1)	A few drops of the juice obtained from squeezing the tuber are instilled into irritated eyes
Calycophyllum spruceanum (Benth.) Hook. f. ex K. Schum. (Rubiaceae) (C) (BCN 40268)	Capirona	Bark	4	*Arenilla* – acne (2) Vaginal irritation – candidiasis suspected (1) Wound antiseptic (1)	Decoction, used as a face wash Decoction, used as a vaginal douche Decoction, used as a skin wash
Calyptranthes bipennis O. Berg (Myrtaceae) (C) (BCN 40119)	Guayusa macho, Ullku guayusa	Leaf	6	Stimulant: "to awaken as coffee does" (4), Stomach pain (2)	Infusion
Campomanesia speciosa (Diles) Mc Vaugh (Myrtaceae) (W) (BCN 40111)	Palillo	Leaf	4	Flu fever (2), Flu headache (2)	Decoction, for bathing. A poultice is also made with the crushed leaves
Capparis sola J.F. Macbr. (Capparaceae) (W) (BCN 46106)	Nina kaspi, Nina kaspi de hoja ancha	Bark	2	Rheumatism (1) Health tonic (1)	Decoction Macerated in rum[b] with *Petrea* sp., *Zygia longifolia* and alambre waska (?) bark
Carpotroche aff. *longifolia* (Poepp.) Benth. (Flacourtiaceae) (W) (BCN 40258)	Wayra kaspi	Bark	2	*Mal aire*[e] (2)	Decoction, for drinking and bathing
Casearia negrensis Eichler (Flacourtiaceae) (W) (BCN 40086)	Ituchi runtu	Bark and leaf	1	Given to dogs to prepare them for hunting – use interpreted by the Doctrine of Signatures (1)	Decoction, given to dogs to drink it
Casearia sp. (Flacourtiaceae) (W) (BCN 40087)	Chuchuwasha	Bark	2	Rheumatism (1) Aphrodisiac (1)	Decoction Macerated in rum[b]
Ceiba insignis (Kunth) P.E. Gibbs et Semir. (Bombacaceae) (W) (BCN 40349)	Lupuna negra	Root and trunk bark	1	Rheumatism (1)	Decocted or Macerated in fresh water
Ceiba samauma (Mart.) K. Schum (Bombacaceae) (W) (BCN 40350)	Wimba lupuna	Root and trunk bark	1	Rheumatism (1)	Decocted or Macerated in fresh water
Celosia grandifolia Moq. (Amaranthaceae) (W) (BCN 40319)	Pampa mullaka	Leaf	4	Bronchitis (1), Cough (1), Febrifuge (1) Abscess (1)	Infusion Crushed, applied on abscesses

Celtis iguanaea (Jacq.) Sarg. (Ulmaceae) (W) (USM 207158)	Unkano kasha	Root	1	Hepatitis (1)	Decoction
Centropogon cornutus (L.) Druce. (Campanulaceae) (W) (BCN 40353)	Rango	Latex	1	Scabies (1)	Applied on the affected skin
Cestrum microcalyx Francey (Solanaceae) (W) (BCN 40875)	Hierba santa	Leaf	1	Headache (1)	Crushed and rubbed on the head
Cestrum strigilatum Ruiz and Pav. (Solanaceae) (W) (BCN 40874)	Hierba santa	Leaf	1	Headache (1)	Infusion
Chaptalia nutans (L.) Pol. (Asteraceae) (W) (BCN 40336)	Lengua de perro	Leaf	1	Kidney pain (1)	Infusion
Chenopodium ambrosioides L. (Chenopodiaceae) (C) (BCN 40355)	Paico	Leaf and seed	3	Vermifuge for children – weak laxative (3)	Squeezed, the juice obtained is drunk
Chomelia paniculata (Bartl. ex DC.) Steyerm. (Rubiaceae) (W) (BCN 40305)	Tunchi kasha	Bark	1	Digestive (1), Rum flavouring agent (1*n*)	Macerated in rum[b]
Chondrodendron tomentosum Ruiz et Pav. (Menispermaceae) (W) (BCN 40123)	Anpi waska	Leaf	1	Rheumatism (1)	A poultice is made with the crushed leaves
		Stem	–	Arrow poison (1*n*)	Decoction, the paste obtained is applied on arrow tips
Cissus verticillata (L.) Nicolson et C.E. Jarvis (Vitaceae) (W) (BCN 40837)	Ampatu waska	Stem	3	Wound antiseptic (2) Rheumatism (1)	Decoction, used as a wound wash Decoction, for bathing
Clarisia cf. *biflora* Ruiz et Pav. (Moraceae) (W) (JSB-239)[c]	Pampa leche	Latex	1	Scabies (1)	Applied on the affected skin
Clavija elliptica Mez. (Theophrastaceae) (W) (JSB-161)[c]	Gallo poroto	Fruit	1	Scabies (1)	Crushed, applied on the affected skin
Clavija longifolia Ruiz et Pav. (Theophrastaceae) (W) (JSB-565)[c]	Gallo poroto	Fruit	1	Scabies (1)	Crushed, applied on the affected skin
Clavija weberbaueri Mez. (Theophrastaceae) (W) (BCN 40868)	Gallo porotillo	Fruit	1	Scabies (1)	Crushed, applied on the affected skin
Clibadium sp. (Asteraceae) (W) (BCN 40198)	Waka kiwa	Whole plant	1	Vermifuge for children – weak laxative (1)	Decoction
Clusia aff. *lineata* (Benth.) Planch et Triana (Clusiaceae) (W) (BCN 44873)	Came	Bark and stem	1	Rheumatism (1)	Macerated in fresh water
Clusia aff. *palmicida* Rich. ex Planch and Triana (Clusiaceae) (W) (BCN 44874)	Came	Bark	3	Rheumatism (1), Inguinal hernia (1), Broken bones (1)	Decocted or Macerated in fresh water
Clusia sp.1. (Clusiaceae) (W) (JSB-271)[c]	Came	Bark	1*	Health tonic (1*)	Macerated in rum[b] with *Calliandra angustifolia*, *Maytenus* aff. *macrocarpa*, *Tovomita foldatsii* and *T.* aff. *stylosa*
Clusia sp.2. (Clusiaceae) (W) (JSB-24)[c]	Came	Bark and stem	1	Rheumatism (1)	Decoction
Coccoloba sp. (Polygonaceae) (W) (JSB-187)[c]	Ocha baja	Bark	1	Rheumatism (1)	Decoction
Copaifera paupera (Herzog) Dwyer. (Fabaceae) (W) (BCN 40153)	Copaiba	Resin	5	Asthma (1), Bronchitis (1) Antiseptic for wounds (1) and skin ulcers (1) Aching joints (1)	Mixed with warm water Applied on the affected skin Rubbed on skin
Corchorus hirtus L. (Tiliaceae) (W) (BCN 40865)	Alergia sacha, Puka unkuy sacha	Leaf	1	Allergic rash (1)	Infusion is drunk. The crushed leaves are also rubbed on the affected skin.
Cordia kingstoniana J.S. Mill. (Boraginaceae) (W) (JSB-501)[c]	Wapo sacha	Whole plant	1	Against *cutipas*[e] caused by eating *wapo* monkey – interpreted through the Doctrine of Signatures (1)	Slightly boiled, for bathing and also very small doses for drinking. Usually for infants
Cordia sp. (Boraginaceae) (W) (JSB-194)[c]	Bolaina waska	Leaf	1	Gastrointestinal discomfort (1)	Squeezed, the juice obtained is drunk

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Cornutia microcalycina Pav. Ex Moldenke (Verbenaceae) (C and W) (BCN 40316)	Shinkurisacha	Leaf	9 + 2*	Against *cutipas*[e] (6), Rheumatism (2), Health tonic (1) Rheumatism (1*), Depurative[d] (1*)	Slightly boiled, for drinking and bathing Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. carthagenensis*, *Croton draconoides*, *Himatanthus sucuuba*, *Licaria* sp., *Mikania* sp. and *Virola calophylla*
Cortaderia sp. (Poaceae) (W) (BCN 40187)	Cortadera, Zigzag sacha	Aerial part	1	Eye irritation (1)	Slightly boiled, used as an eye wash
Costus guanaiensis var. *macrostrobilus* (K. Schum.) Maas (Zingiberaceae) (W) (JSB-479)[c]	Sacha wiru	Leaf	3	Cough – emetic (1), Febrifuge – emetic (1), Gastrointestinal discomfort – emetic (1)	Infusion
Costus sp. (Zingiberaceae) (W) (JSB-70)[c]	Sacha wiru	Leaf	3	Cough – emetic (1), Febrifuge – emetic (1), Gastrointestinal discomfort – emetic (1)	Infusion mixed with "Andrew's salts" and coconut water
Couroupita guianensis Aubl. (Lecythidaceae) (C) (BCN 40136)	Aya	Fruit pulp	1	Skin infection in dogs (1)	Applied on dogs' skin
	uma	Fruit and flower	1	Health tonic (1)	Squeezed, the juice obtained is drunk
		Bark	1 + 2*	Lumbago (1) Lumbago (1*), Depurative[d] (1*)	Decoction Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. alba*, *Brugmansia suaveolens*, *Calliandra angustifolia*, *Tovomita* aff. *stylosa* and *Zygia longifolia*
Crepidospermum goudotianum (Tul.) Triana et Planch. (Burseraceae) (W) (BCN 40178)	Copal sacha	Resin	3	Wound disinfectant (1) Bruises (1), Muscular aches (1)	Heated and rubbed on wounds Heated and rubbed topically
Crescentia cujete L. (Bignoniaceae) (C) (BCN 40105)	Winku	Fruit pulp	1	Cough – emetic (1)	A small amount is mixed with fresh water
Crinum amabile var. *augustum* (Roxb.) Ker Gawl. (Amaryllidaceae) (C) (JSB-204)[c]	Lirio	Leaf	1	Headache (1)	Warmed in hot water and applied on the forehead
Croton draconoides Müll. Arg. (Euphorbiaceae) (W) (BCN 40216)	Sangre de grado	Bark	8 + 2*	Mouth infection – candidiasis suspected (2)	Decoction, used as a mouthwash
				Vaginal infection – candidiasis suspected (2)	Decoction, used as a vaginal douche
				Back pain (2)	Decoction
				Wound disinfectant (1)	Decoction, used as a wound wash
				Postpartum tonic (1)	Macerated in rum[b] with *Uncaria tomentosa* and honey
				Rheumatism (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. carthagenensis*, *Cornutia microcalycina*, *Himatanthus sucuuba*, *Licaria* sp., *Mikania* sp. and *Virola calophylla*
		Latex	9	Wound cicatrizant (4) and disinfectant (4)	Applied on wounds
				Caja topada – tuberculosis (1)	Three drops mixed with warm water are drunk daily

Croton lechleri Müll. Arg. (Euphorbiaceae) (W) (BCN 40214)	Sangre de grado	Latex	2	Wound cicatrizant (1) and disinfectant (1)	Applied on wounds
Croton tarapotensis Müll. Arg (Euphorbiaceae) (C) (BCN 40261)	Calambre sacha	Aerial part	2	Leg cramps (1), Aphrodisiac (1)	Decoction
Cybistax antisyphilitica (Mart.) Mart. (Bignoniaceae) (C) (BCN 40095)	Jangua	Leaf	1	Used in flourishing/invigorating baths[f] (1) Blue dye (1*n*)	Crushed and macerated in fresh water, for bathing Decoction
Cyphomandra betacea (Cav.) Sendtn. (Solanaceae) (W) (BCN 40177)	Chupu sacha	Leaf	2	Abscess (1) Cough (1)	Crushed, applied on abscesses Squeezed, the juice obtained is mixed with warm water
Desmodium adscendens (Sw.) DC. (Fabaceae) (C) (BCN 40152)	Pata de perro, Amor seco	Leaf	1	Postpartum pains (1)	Slightly boiled
Diclinanona tessmanii Diels (Annonaceae) (W) (JSB-244)[c]	Pamashtu	Bark	3	Antiseptic for wounds (1) and skin ulcers (1) Vaginal infections – candidiasis suspected (1)	Decoction, used as a wound, skin and vaginal wash
Dicranopygium yacu-sisa Harling (Cyclanthaceae) (W) (BCN 40082)	Yaku sisa macho	Aerial root	1	Broken bones (1)	Macerated in rum[b] with *Phthirusa stelis* and *Tovomita* aff. *stylosa*
Dictyoloma peruvianum Planch. (Rutaceae) (C) (BCN 40834)	Waman samana	Aerial part	2	Fungal skin infections (2)	Crushed, a poultice is made
Dieffenbachia cf. *cannifolia* Engl. (Araceae) (W) (BCN 40190)	Patquina	Sap	1	Cattle skin ulcers (1)	Applied on the ulcers
Dracaena sp. (Liliaceae) (W) (JSB-559)[c]	Sangapilla	Seed	–	Taken by men to rise attraction of the opposite sex (1*n*)	Crushed and macerated in fresh water for some minutes
Dracontium spruceanum (Schott) G.H. Zhu. (Araceae) (W) (BCN 40326)	Jergón sacha	Tuber	3	Aphrodisiac (1), Rheumatism (1), Antidote for snakebite poisoning (1)	Crushed, dried, pounded and mixed with water or rum[b]
Drymonia erythroloma (Leeuwenb.) Wiehler (Gesneriaceae) (W) (JSB-57)[c]	Torre sacha	Aerial part	2	Against *cutipas*[e] caused by eating *torre* fish – use interpreted through the Doctrine of Signatures (2)	Decoction, for bathing and also very small doses for drinking. Usually for infants
Duguetia quitarensis Benth. (Annonaceae) (W) (BCN 40716)	Tortuga kaspi	Bark and leaf	1	Rheumatism (1)	Decoction, for drinking and bathing
Entada polyphylla Benth. (Fabaceae) (W) (BCN 40150)	Chirapa sacha, Zicacha	Tuber	1	*Mal de chirapa* – unidentified type of sore skin infection[g] (1)	Crushed, a poultice is made (it soothes the pain and reduces the inflammation)
Epiphyllum phyllanthus (L.) Haw. (Cactaceae) (W) (BCN 40352)	Lagarto sacha	Whole plant	1	Against *cutipas*[e] caused by eating lizard meat – use interpreted through the Doctrine of Signatures (1)	Slightly boiled, for bathing and also very small doses for drinking. Usually for infants
Eryngium foetidum L. (Apiaceae) (C) (BCN 40325)	Sacha culantro	Whole plant	1	Gout (1) Food condiment (1*n*)	Decoction Used crude
Erythrina fusca Lour. (Fabaceae) (C) (BCN 40151)	Eritrina	Leaf	1	Flu headache (1)	Crushed and rubbed on the head
Erythrina cf. *poeppigiana* (Walp.) O.F. Cook (Fabaceae) (W) (BCN 40243)	Ama sisa	Bark	1	Used in flourishing/invigorating baths[f] (1)	Infusion, for bathing
Erythroxylum coca Lam. (Erythroxylaceae) (C) (BCN 40235)	Koka	Leaf	1	Intestinal colics (1)	Infusion
Erythroxylum sp. (Erythroxylaceae) (W) (BCN 40234)	Yaku koka, Yaku bushiklla	Aerial part	1	Rheumatism (1)	Decoction
Eugenia biflora (L.) DC. (Myrtaceae) (W) (BCN 40110)	Yaku bushiklla	Aerial part	2	Rheumatism (2)	Decoction
Euphorbia heterophylla L. (Euphorbiaceae) (W) (BCN 40262)	Yuquilla	Latex	1	Scabies (1)	Applied on the affected skin
Euphorbia tithymaloides L. (Euphorbiaceae) (W) (JSB-191)[c]	Diablo calata	Latex	1	Scabies (1)	Applied on the affected skin
Ficus americana subsp. *guianensis* (Desv. ex Ham.) C.C. Berg (Moraceae) (W) (USM 206345)	Renaquillo	Bark	1	Rheumatism (1)	Decoction

Table 1 (*Continued*)

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Ficus caballina Standl. (Moraceae) (C and W) (BCN 40710)	Wakra renaco	Bark	4	Rheumatism (3), Broken bones (1)	Decoction
		Latex	2	Bruise pain (1), Wound antiseptic (1)	Rubbed on bruises and wounds
Ficus casapiensis (Miq.) Miq. (Moraceae) (W) (BCN 40647)	Yurak renaco, Urku renaco	Bark	3	Rheumatism (3)	Decoction
Ficus eximia Schott (Moraceae) (W) (BCN 40697)	Ojé renaco	Bark	1	Rheumatism (1)	Decoction
Ficus insipida Willd. subsp. *insipida* (Moraceae) (C) (BCN 40707)	Ojé, Ojé de hoja ancha	Latex	45	Vermifuge – laxative (45)	Mixed with warm water
Ficus macbridei Standl. (Moraceae) (W) (BCN 40696)	Ojé renaco, Ojé yanchama	Bark	1	Rheumatism (1)	Decoction
Ficus vs. *maxima* Mill. (Moraceae) (W) (BCN 40639)	Kaspi renaco	Bark	1	Rheumatism (1)	Decoction
Ficus maximoides C.C. Berg. (Moraceae) (C) (BCN 40642)	Ojé, Ojé de hoja pequeña	Latex	2	Vermifuge – laxative (2)	Mixed with warm water
Ficus nymphaeifolia Mill. (Moraceae) (W) (BCN 40638)	Puka renaco	Bark	1	Rheumatism (1)	Decoction
Ficus obtusifolia Kunth (Moraceae) (W) (USM 208763)	Yaku renaco	Bark	1	Rheumatism (1)	Decoction
Ficus vs. *paraensis* (Miq.) Miq. (Moraceae) (W) (BCN 40711)	Wakra renaco	Bark	1	Rheumatism (1)	Decoction
Ficus pertusa L.f. (Moraceae) (W) (BCN 40694)	Pishcu renaco	Bark	1	Rheumatism (1)	Decoction
Ficus tonduzii Standl. (Moraceae) (W) (BCN 40648)	Ojé renaco	Bark	1	Rheumatism (1)	Decoction
Ficus trigona L.f. (Moraceae) (C and W) (BCN 40702)	Millwa renaquillo, Millwa renaco, M.r. macho, M.r. hembra, M.r. de hoja ancha, M.r. de hoja pequeña	Bark	9	Rheumatism (5)	Decoction
				Rheumatism (3)	Macerated in rum[b]
				Rheumatism (1)	Decocted with *Zygia longifolia* bark
		Latex	9	Wound antiseptic (9)	Applied on wounds
Ficus yoponensis Desv. (Moraceae) (C) (BCN 40640)	Ojé renaco, Ojé de hoja delgada, Shakapa ojé	Latex	2	Vermifuge – laxative (2)	Mixed with warm water
Ficus ypsilophlebia Dugand. (Moraceae) (W) (BCN 40580)	Renaco, Yurak renaco, Killu renaco	Bark	2	Rheumatism (2)	Decoction
Fittonia albivenis (Lindl. ex Veitch) Brum. (Acanthaceae) (W) (BCN 40223)	Machakuy mantana	Aerial part	2	Antidiarrhoeal for children (1)	Slightly boiled, for drinking and bathing
				Snakebite wounds (1)	Mixed and crushed with *Tabernaemontana sananho* leaves, a poultice is made
Forsteronia graciloides Woodson (Apocynaceae) (C) (BCN 40684)	Sapo waska	Latex	13	Inguinal hernia (3)	One spoonful is mixed with warm water
				Bruise pain (2), Contusions (2), Aching joints (2)	Heated, a poultice is made
				Broken bones (2), Postpartum tonic (1), *Prolapso* or *caída de ovarios* – uterine prolapse suspected (1)	Mixed with rum[b]
Gallesia integrifolia (Spreng.) Harms. (Phytolaccaceae) (W) (BCN 40894)	Ajoskiro	Root bark	1	Rheumatism (1)	Decocted or Macerated in rum[b]
Genipa americana L. (Rubiaceae) (C) (BCN 40273)	Wito, Jagua	Fruit	1	Aphrodisiac (1)	Macerated in rum[b]
				Black dye (1n)	Dye obtained from squeezed fruits

Geophila cf. *macropoda* (Ruiz et Pav.) DC. (Rubiaceae) (W) (BCN 40274)	Umpala kiwa	Whole plant	1	Tonic for toddlers: "to make them walk" – use interpreted through the Doctrine of Signatures (1)	Slightly boiled, for bathing
Gonzalagunia cornifolia (Kunth) Standl. (Rubiaceae) (W) (BCN 40275)	Pichana sacha, Pichana kaspi, Yaku lucero	Aerial part	2 + 2*	Headache (2) Health tonic (1*), Depurative[d] (1*)	Infusion Decocted with *Banisteriopsis caapi* stems and *Psychotria viridis* leaves
Grias peruviana Miers (Lecythidaceae) (C) (BCN 40137)	Sacha mango, Sacha mango de flor amarilla	Bark	2	Malaria – plant considered more effective against malaria than *Gustavia longifolia* (2)	Decoction
Guarea macrophylla Vahl (Meliaceae) (C) (BCN 45069)	Requia	Bark	2	Depurative[d] – emetic (2)	Decoction
Guatteria sp. (Annonaceae) (W) (JSB-93)[c]	Icoja	Bark and leaf	2	Rheumatism (2)	Decocted or macerated in fresh water for some minutes, for drinking and bathing
Gustavia longifolia Poepp. ex O. Berg (Lecythidaceae) (C) (JSB-38)[c]	Sacha mango, Sacha mango de flor rosada	Bark	1	Malaria – plant considered less effective against malaria than *Grias peruviana* (1)	Decoction
Hebeclinium macrophyllum (L.) DC. (Asteraceae) (W) (BCN 40334)	Pakunka blanca	Leaf	1	Intestinal colics (1)	Infusion
Heliconia acuminata Rich. (Heliconiaceae) (W) (BCN 40361)	Mishki panka	Leaf	1	Body odour modifying agent for hunting and fishing self-preparedness (1)	Slightly boiled, for drinking and bathing
Heliocarpus americanus L. (Tiliaceae) (W) (BCN 40867)	Llawsa kiru	Stem bark	7	Wound antiseptic (2) and cicatrizant (2), To improve the appearance of scars (2) Gastrointestinal discomfort – weak laxative (1)	Crushed, a poultice is made Infusion
Herrania mariae (Mart.) Decne. ex Goudot. (Sterculiaceae) (W) (BCN 40869)	Cacahuillo	Seed	1	Acute cough (1)	Mixed and crushed with *Senna hirsuta* leaves and warm water
Heteropsis flexuosa (Kunth) G.S. Bunting (Araceae) (W) (BCN 40328)	Támushi	Stem and leaf Stem	1 –	Rheumatism (1) Used to make baskets (1*n*)	Decoction Stems are intertwined
Hevea guianensis Aubl. (Euphorbiaceae) (W) (BCN 40260)	Shiringa	Latex	4	Bruises (2) Inguinal hernia (1), Broken bones (1)	Rubbed on bruises Boiled and then mixed with water
Himatanthus sucuuba (Spruce ex Müll. Arg.) Woodson. (Apocynaceae) (C) (BCN 40862)	Bellaco kaspi	Bark	4 + 2*	Vermifuge (2), Depurative[d] (2) Rheumatism (1*), Depurative[d] (1*)	Decoction Boiled with *Banisteriopsis caapi*, *Psychotria viridis*, *P. carthagenensis*, *Cornutia microcalycina*, *Croton draconoides*, *Licaria* sp., *Mikania* sp. and *Virola calophylla*
Hura crepitans L. (Euphorbiaceae) (W) (BCN 40265)	Catahua	Latex	4	Vermifuge (2), Depurative[d] (2)	A small dose of the crude latex is drunk. This remedy is considered very toxic if overdose occurs
Hymenolobium nitidum Benth. (Fabaceae) (W) (BCN 40174)	Marimari	Bark	1	Rheumatism (1)	Decocted or Macerated in fresh water
Hyptis mutabilis (Rich.) Briq. (Lamiaceae) (W) (BCN 40363)	Aya albahaca	Aerial part	4	Headache (2), Vertigo in the elderly (1) Flourishing/invigorating baths for children[f] (1)	The crushed leaves and stems are rubbed on the head Infusion, for bathing
Inga cf. *grandiflora* Wall. (Fabaceae) (C) (BCN 44886)	Guaba	Seed	1	Alcohol addiction (1)	Crushed and mixed with warm water

Table 1 (*Continued*)

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Inga ruiziana G. Don. (Fabaceae) (W) (BCN 44889)	Puka shimbillu, Rojiende	Bark	4	Mouth infection – candidiasis suspected (1) Vaginal infection – candidiasis suspected (1) Antidiarrhoeal (1) Wound disinfectant (1)	Slightly boiled, used as a mouthwash Slightly boiled, used as a vaginal douche Decoction Slightly boiled, used as a wound wash
Inga semialata (Vell.) Mart. (Fabaceae) (C) (BCN 44885)	Urku shimbillu	Bark	1	Inguinal hernia (1)	Decoction
Iriartea deltoidea Ruiz et Pav. (Araceae) (W) (BCN 40330)	Wakra pona	Stilt root	1	Rheumatism (1)	Decocted or Macerated in fresh water
Jacaranda copaia (Aubl.) D. Don. (Bignoniaceae) (C) (BCN 40096)	Waman samana	Bark	1	Lice in poultry (1)	Decoction, for bathing poultry
Jacaranda glabra (A. DC.) Bureau et K. Schum. (Bignoniaceae) (C) (BCN 40097)	Soliman kaspi	Bark	2	Vaginal irritation (1) Health tonic (1)	Slightly boiled, used as a vaginal douche Decoction
		Bark, flower and leaf	1	Wound antiseptic (1)	Roasted and pounded, a poultice is made
Jacaratia digitata (Poepp. et Endl.) Solms. (Caricaceae) (W) (BCN 40354)	Papailla, Shamburu kaspi	Bark	1	Antidiarrhoeal for children (1)	Macerated in fresh water for some minutes
		Leaf	–	Forage for cows (1*n*)	Eaten crude by cows
Jatropha curcas L. (Euphorbiaceae) (C) (BCN 40263)	Piñon blanco	Leaf and seed	4	Depurative[d] – emetic (2) Wound disinfectant (1), Vaginal infection – candida suspected (1)	Squeezed, the juice obtained is drunk Slightly boiled, used as a wound and vaginal wash
		Leaf	2	*Riwi* – shingles suspected (2)	Crushed with other plants and substances (see recipe in *Oxalis lespedezioides*)
Jatropha gossypiifolia L. (Euphorbiaceae) (C) (BCN 40264)	Piñon colorado	Leaf and seed	4	Depurative[d] – emetic (2) Wound disinfectant (1), Vaginal infection – candida suspected (1)	Squeezed, the juice obtained is drunk Slightly boiled, used as a wound and vaginal wash
		Leaf	2*	*Riwi* – shingles suspected (2*)	Crushed with other plants and substances (see recipe in *Oxalis lespedezioides*)
Kalanchoe pinnata (Lam.) Pers. (Crassulaceae) (W) (BCN 40358)	Rakta panka, Aire sacha	Leaf	5	Headache (2) Pain when passing water (1), Depurative[d] if high dose – emetic (1) *Mal aire*[e] (1)	Crushed and rubbed on the forehead Squeezed, the juice obtained is drunk Slightly boiled, for drinking and bathing (for children)
Leandra dichotoma (Pav. Ex D. Don) Cogn. (Melastomataceae) (W) (BCN 40254)	Urku kordoncillu de flor roja	Leaf	4	Wound antiseptic (1) and cicatrizant (1) Vaginal irritation – candidiasis suspected (1) Period pains (1)	Roasted and pounded, applied topically Slightly boiled, used as a vaginal wash Slightly boiled, for steam bathing

Leonotis nepetifolia (L.) R. Br. (Lamiaceae) (W) (BCN 40362)	Aire sacha	Whole plant	1	*Mal aire*[e] (1)	Crushed and macerated in fresh water, for bathing. Small doses are also drunk. Usually for children
Licaria sp. (Lauraceae) (W) (BCN 40116)	Canela	Bark	10+2*	*Susto*[e] (4), *Mal aire*[e] (3), *Daño*[e] (3)	Crushed and rubbed on all the body
				Rheumatism (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. carthagenensis*, *Cornutia microcalycina*, *Croton draconoides*, *Himatanthus sucuuba*, *Mikania* sp. and *Virola calophylla*
Lippia alba (Mill.) N.E. Br. (Verbenaceae) (C) (BCN 40318)	Pampa oregano	Leaf	2	Digestive (1), Carminative (1)	Infusion
Lophostigma schunkei (Acev.-Rodr.) Ace.-Ro. (Sapindaceae) (W) (BCN 40144)	Mashushillu	Whole plant	1	Barrenness (1), Taken by men to rise attraction of the opposite sex (1*n*)	Slightly boiled
Lunania parviflora Spruce ex Benth. (Flacourtiaceae) (W) (BCN 40088)	Ñukñuc panka	Leaf	2	Halitosis (2)	The leaves are chewed
Macfadyena unguis-cati (L.) A.H. Gentry. (Bignoniaceae) (W) (BCN 40098)	Mashushillu enano	Whole plant	1	Barrenness (1), Taken by men to rise attraction of the opposite sex (1*n*)	Slightly boiled
Machaerium isadelphum (E. Mey.) Amshoff. (Fabaceae) (C) (BCN 40149)	Uña de gato	Bark	1	Rheumatism (1)	Decoction
Machaerium sp. (Fabaceae) (W) (BCN 40232)	Mashushillu de hoja ancha	Whole plant	1	Barrenness (1), Taken by men to rise attraction of the opposite sex (1*n*)	Slightly boiled
Maclura tinctoria (L.) Steud. subsp. *tinctoria* (Moraceae) (C) (USM 206353)	Insira	Latex	2	Toothache (1), Gingival pain (1)	Applied on the affected teeth and gums
Malachra alceifolia Jacq. (Malvaceae) (C) (BCN 40900)	Malva	Leaf	13	Gastrointestinal discomfort (4), Febrifuge (2), Diuretic (1), Used against Constipation (1)	Soaked in warm water for some minutes and squeezed, the gel obtained is mixed with warm water and drunk
				Allergic rashes (1)	Soaked in warm water for some minutes and squeezed, the gel obtained is rubbed on the affected skin
				Used in flourishing/invigorating baths[f] (4)	Macerated in fresh water, for bathing
Mansoa alliacea (Lam.) A.H. Gentry. (Bignoniaceae) (C and W) (BCN 40100)	Ajo sacha, Ajo sacha macho, Ajo sacha hembra	Stem and root Bark	58+2*	Rheumatism (41)	Macerated in fresh water for some minutes
				Rheumatism (4)	Macerated in rum[b]
				Rheumatism (1)	Macerated in fresh water for some minutes with *Petiveria alliacea*
				Body odour modifying agent for hunting and fishing self-preparedness: for men (2) and dogs (2), Depurative[d] for men (2) and dogs (2)	Macerated in fresh water for some minutes, drunk by men and dogs
				Health tonic (1), Gastritis (1), Anemia caused by intestinal parasites (1)	Macerated in fresh water for some minutes
				Health tonic (1)	Macerated in fresh water for some minutes with *Piper callosum* leaves
				Rheumatism (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis* and *Piper callosum* leaves
Marcgravia cf. *crenata* Poepp. ex. Wittm. (Marcgraviaceae) (W) (JSB-250)[c]	Támushi	Stem and leaf	1	Rheumatism (1)	Decoction
		Stem	–	Used to make baskets (1*n*)	Stems are intertwined

Table 1 (*Continued*)

Scientific name (botanical family) (C = cultivated and/or W = wild) (Voucher herbarium specimen)	Local name	Part(s) used	Medicinal use-reports *N** = repeated reports	Use or disease treated (*N*) = use-reports of each use or disease treated) (*N**) = repeated reports, i.e. reports mentioned earlier in this table (*N n*) = non-medicinal reports	Mode of preparation and administration[a]
Margaritaria nobilis L. f. (Euphorbiaceae) (W) (USM 207162)	Winku asutina	Bark	1	Abscess (1)	Decoction, used as a wash to disinfect abscesses
		Fruit	1	Pregnancy tonic (1)	Slightly boiled
Maytenus aff. *macrocarpa* (Ruiz et Pav.) Briq. (Celastraceae) (W) (BCN 40217/40218)	Chuchuwasha, Chuchuwasha blanca	Bark	85 + 1*	Rheumatism (49), Aphrodisiac (16), Health tonic (10), Broken bones (2), Rum flavouring agent (34*n*)	Macerated in rum[b]
				Antidiarrhoeal (4), Rheumatism (1), Postpartum tonic (1)	Decoction
				Rheumatism (1)	Macerated in a mixture of wine, honey and arnica (?)
				Postpartum tonic (1)	Macerated in a mixture of wine, rum[b] and honey
				Health tonic (1*)	Macerated in rum[b] with *Calliandra angustifolia*, *Clusia* sp.1, *Tovomita foldatsii* and *T.*aff. *stylosa*
Melothria sp. (Cucurbitaceae) (W) (BCN 40359)	Zapallito	Leaf and stem	1	Febrifuge (1)	Decoction
Miconia paleacea Cogn. (Melastomataceae) (W) (JSB-257)[c]	Pelejo kordoncillu	Leaf	5	Period pain (1)	Slightly boiled, for steam bathing
				Vaginal irritation – candidiasis suspected (1)	Slightly boiled, used as a vaginal douche
				Wound antiseptic (1) and cicatrizant (1)	Roasted and pounded, applied topically
				Flourishing/invigorating baths[f] for children – use interpreted through Doctrine of Signatures (1)	Slightly boiled, for bathing
Mikania sp. (Asteraceae) (C) (JSB-513)[c]	Sinchi toe	Aerial part	2*	Rheumatism (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. carthagenensis*, *Cornutia microcalycina*, *Croton draconoides*, *Himatanthus sucuuba*, *Licaria* sp. and *Virola calophylla*
Mimosa pigra L. (Fabaceae) (C) (BCN 40148)	Pinkakuy, Vergonzosa	Root	2	Contraceptive for women (2)	Decoction
Minquartia guianensis Aubl. (Olacaceae) (W) (BCN 40145)	Huacapú	Bark	5	Depurative[d] – emetic (5)	Decoction (in 3 reports), Macerated in fresh water for some minutes (in 2 reports)
Monstera dubia (Kunth) Engl. et K. Krause. (Araceae) (W) (BCN 40331)	Maki maki	Whole plant	1	Broken bones – use interpreted through the Doctrine of Signatures (1)	Heated in boiling water and applied on parts where a bone has broken
Myroxylon balsamum (L.) Harms. (Fabaceae) (W) (BCN 40146)	Estoraque	Resin	2	Rheumatism (1)	Rubbed on the affected body parts
				Bronchitis (1)	Rubbed on the chest
Nautilocalyx sp. (Gesneriaceae) (W) (BCN 44893)	Machakuy mantana	Whole plant	1	Antidiarrhoeal for children (1)	Slightly boiled, for bathing
Neea aff. *floribunda* Poepp. and Endl. (Nyctaginaceae) (W) (BCN 40229)	Urpay mullaka	Leaf	4	Bronchitis (1), Cough (1), Febrifuge (1)	Infusion
				Abscess (1)	Crushed and applied on abscesses

Neea sp.1. (Nyctaginaceae) (W) (BCN 40241)	Urpay mullaka	Leaf	3	Abscess (3)	Crushed and applied on abscesses
Neea sp.2. (Nyctaginaceae) (W) (USM 207971)	Paujil mullaka	Leaf	1	Abscess (1)	Crushed and applied on abscesses
Ocimum micranthum Willd. (Lamiaceae) (W) (BCN 40365)	Pichana albahaca, Sanisisa albahaca	Aerial part	3	Vertigo in the elderly (3)	Slightly boiled, the steam is inhaled
Ocotea aciphylla (Nees) Mez (Lauraceae) (W) (BCN 40117)	Canela moena	Resin	1	Muscular aches (1)	Rubbed on the affected skin
Otoba parvifolia (Markgr.) A.H. Gentry (Myristicaceae) (W) (BCN 40114)	Cumala roja	Bark	2	Vaginal ulcers – candidiasis suspected (1) Wound antiseptic (1)	Decoction, used as a vaginal douche Decoction, used as a skin wash
Oxalis lespedezioides G. Don. (Oxalidaceae) (W) (BCN 40897)	Riwi sacha, Mani sacha	Aerial part	2 + 2*	*Riwi* – shingles suspected (2) *Riwi* – shingles suspected (2*)	Crushed, a poultice is made and applied on the affected skin Squeezed and mixed with lemon juice, comercial cinnamon, magnesia salt and crushed leaves of both *Jatropha curcas* and *J. gossypiifolia*
Pachystachys puberula Wassh. (Acanthaceae) (W) (BCN 40219)	Cresta de gallo	Leaf	1	Muscular aches (1)	A poultice is made with the crushed leaves
Passiflora alata W. Curtis (Passifloraceae) (W) (BCN 40094)	Tumbo sacha, Puro puro	Leaf	1	Headache (1)	A poultice is made with the crushed leaves
Pavonia fruticosa (Mill.) Fawc. et Rendle. (Malvaceae) (W) (BCN 40898)	Mapa sacha	Leaf and seed Leaf	1 1	Contusions (1) Gastrointestinal discomfort (1)	Crushed, a poultice is made to reduce the pain Infusion
Pavonia sp. (Malvaceae) (W) (BCN 40233)	Mishu chaki	Sap	1	Eye irritation (1)	Instilled into irritated eyes
Peperomia macrostachya (Vahl) A. Dietr. (Piperaceae) (W) (JSB-272)[c]	Ischimi congona	Aerial part	3	Health tonic for children (1), Preventive of *susto*[e] (1) and *mal aire*[e] (1)	Infusion, for drinking and bathing
Peperomia rotundifolia (L.) Kunth (Piperaceae) (W) (BCN 40840)	Garrapata congona	Leaf	6	Flourishing/invigorating baths for children[f] (2), Preventive of *susto*[e] (2) and *mal aire*[e] (2)	Crushed and macerated in fresh water for bathing
Peperomia sp. (Piperaceae) (W) (BCN 46107)	Machakuy llullu	Whole plant	1	Antidiarrhoeal for children (1)	Slightly boiled, for bathing
Perebea guianensis Aubl. (Moraceae) (W) (JSB-227)[c]	Millwa shimikwa	Latex	1	Rheumatism (1)	Mixed with warm water
Petiveria alliacea L. (Phytolaccaceae) (C) (BCN 40892)	Mukura hembra, Mukura macho	Aerial part	7 + 3*	Used in flourishing/invigorating baths[f] (3) Gastrointestinal discomfort (2), Flu fever (1) and Flu headache (1) Rheumatism (1*) Health tonic (1*), Depurative[d] (1*)	Crushed and macerated in fresh water for some minutes Infusion Soaked in fresh water for some minutes with *Mansoa alliacea* Decocted with *Banisteriopsis caapi* and *Psychotria viridis*
		Root	2	Bronchitis (1), Sprains (1)	Decoction
Petrea sp. (Verbenaceae) (W) (BCN 40266)	Acero waska blanca	Stem	3 + 1*	Rheumatism (1) Broken bones (1) Postpartum tonic (1) Health tonic (1*)	Decoction Macerated in rum[b] Macerated in rum[b] with *Rourea puberula* Macerated in rum[b] with *Capparis sola*, *Zygia longifolia* and alambre kaspi (?) barks
Philodendron cf. *deltoideum* Poepp. (Araceae) (W) (JSB-116)[c]	Guisillo	Aerial part	1	Antidote for snakebite poisoning (1)	Slightly boiled, for drinking and bathing

Table 1 (*Continued*)

Scientific name (botanical family) (C = cultivated and/or W = wild) (Voucher herbarium specimen)	Local name	Part(s) used	Medicinal use-reports N^* = repeated reports	Use or disease treated (N) = use-reports of each use or disease treated) (N^*) = repeated reports, i.e. reports mentioned earlier in this table (N n) = non-medicinal reports	Mode of preparation and administration[a]
Phthirusa stelis (L.) Kuijt (Loranthaceae) (C) (BCN 40133)	Suelda con suelda de hoja menuda, Pishku isman de hoja menuda	Stem	13 + 2*	Rheumatism (4), Broken bones (2), Vermifuge (1), Postpartum tonic (4)	Decoction
				Postpartum tonic (1)	Macerated in rum[b]
				Rheumatism (1)	Macerated in rum[b] with *Zygia longifolia*
				Health tonic (1*)	Macerated in rum[b] with *Calliandra angustifolia*, *Uncaria tomentosa*, *Zygia longifolia* and caballo sacha (?) bark
				Broken bones (1*)	Macerated in rum[b] with *Dicranopygium yacu-sisa* and *Tovomita* aff. *stylosa*
Phyllanthus orbiculatus Rich. (Euphorbiaceae) (W) (BCN 40256)	Chancapiedra	Whole plant	1	Renal colics (1)	Slightly boiled
Phyllanthus sp. (Euphorbiaceae) (C) (BCN 44894)	Tirana barbasco	Leaf	3	Skin ulcer disinfectant (1), Skin stains remover (1)	The crushed leaves are applied on skin ulcers and skin stains
				Poultry in lice (1)	Slightly boiled, for bathing poultry
		Stem	–	Fish poison (1*n*)	Pounded
Physalis angulata L. (Solanaceae) (W) (BCN 40877)	Bolsa mullaka	Whole plant	4	Bronchitis (1), Cough (1), Febrifuge (1)	Infusion
				Wound antiseptic (1)	Infusion, employed as a skin wash
		Fruit	–	Used as food (1*n*)	Eaten crude
Phytolacca rivinoides Kunth et C.D. Bou. (Phytolaccaceae) (W) (BCN 40895)	Airampo	Aerial part	2	*Mal de chirapa* – unidentified type of sore skin infection[g] (2)	Infusion drunk. A poultice is also made with the crushed leaves and applied on the affected skin
Pilea microphylla (L.) Liebm. (Urticaceae) (W) (BCN 40864)	Rumi llullu	Aerial part	1	Cough (1)	Leaves and stems are chewed. The aerial part is also decocted and drunk
Piper aduncum L. (Piperaceae) (C) (BCN 40847)	Matico	Leaf	1	Period pains (1)	Slightly boiled, for steam bathing
Piper callosum Ruiz et Pav. (Piperaceae) (C and W) (BCN 40846)	Guayusa macho, Guayusa hembra	Leaf	5 + 3*	Health tonic (1), Rheumatism (1), Body odour modifying agent for hunting and fishing self-preparedness (1), Stimulant: "to awaken as coffee does" (1), Gastrointestinal discomfort (1)	Infusion
				Health tonic (1*)	Macerated in fresh water with *Mansoa alliacea*
				Rheumatism (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis* and *Mansoa alliacea*
Piper heterophyllum Ruiz et Pav. (Piperaceae) (C) (BCN 40841)	Matico	Leaf	6	Period pains (3)	Slightly boiled, for steam bathing
				Vaginal irritation – candidiasis suspected (1)	Slightly boiled, used as a vaginal douche
				Wound antiseptic (1) and cicatrizant (1)	Roasted and pounded, applied topically on wounds

Piper laevigatum Kunth (Piperaceae) (C) (BCN 40843)	Matico	Leaf	2	Wound antiseptic (1) and cicatrizant (1)	Roasted and pounded, applied topically on wounds
Piper reticulatum L. (Piperaceae) (C) (BCN 40842)	Matico negro	Leaf	1	Vaginal irritation – candidiasis suspected (1)	Slightly boiled, used as a vaginal douche
Piper umbellatum L. (Piperaceae) (C) (BCN 40848)	Santa Maria	Leaf	6	Antidiarrhoeal (2), Gastrointestinal discomfort (2), Febrifuge (1), *Riwi* – shingles suspected (1)	Squeezed and mixed with warm water
Pithecellobium mathewsii Benth. (Fabaceae) (C) (BCN 40161)	Algarrobo	Root bark	9	Rheumatism (8) Health tonic (1)	Macerated in rum[b] Macerated in rum[b] with *Uncaria tomentosa* and jengibre (?) root
Plantago major L. (Plantaginaceae) (C) (BCN 40890)	Llantén	Aerial part	4	Cough (1), Bronchitis (1), Febrifuge (1), Gastrointestinal discomfort (1)	Infusion
Polygala acuminata Willd. (Polygalaceae) (W) (BCN 40889)	Karachupa sacha	Aerial part	4	Scabies (2) To treat *cutipas*[e] caused by eating *karachupa* (armadillo) meat – use interpreted through the Doctrine of Signatures (2)	Crushed and applied on the affected skin Slightly boiled, for bathing
Porophyllum ruderale (Jacq.) Cass. (Asteraceae) (W) (JSB-121)[c]	Pakunga negra	Leaf	1	Skin stains remover (1)	The crushed leaves are rubbed on skin stains to eliminate them
Potalia amara Aubl. (Loganiaceae) (W) (BCN 40118)	Curarina	Aerial part	2	Antidote for snakebite poisoning (2)	Decocted or Macerated in fresh water
Poulsenia armata (Miq.) Standl. (Moraceae) (W) (BCN 40578)	Yanchama blanca, Yanchama negra	Latex	12	Postpartum tonic (5), Health tonic (1) Rheumatism (4) Inguinal hernia (1) Wound antiseptic (1)	Mixed with rum[b] Mixed with warm water (in 2 reports), Mixed with honey and wine (in 2 reports) Mixed with warm water Applied on wounds
Pouteria caimito (Ruiz and Pav.) Radlk. (Sapotaceae) (C) (BCN 40880)	Caimito	Bark Fruit	1 –	Vermifuge – laxative (1) Used as food (1*n*)	Decoction Eaten crude
Pouteria sp. (Sapotaceae) (W) (BCN 40240)	Pamashtillu	Latex	1	Infected skin ulcers (1)	Applied on the affected skin
Priva lappulacea (L.) Pers. (Verbenaceae) (W) (BCN 40311)	Bolsa kiwa	Whole plant	1	Hepatitis – emetic (1)	Infusion
Pseudobombax septenatum (Jacq.) Dug. (Bombacaceae) (W) (BCN 40196)	Ponga	Trunk and root bark	1	Rheumatism (1)	Decocted or Macerated in fresh water
Pseudolmedia laevis (Ruiz et Pav.) J.F. Macbr. (Moraceae) (W) (BCN 40570)	Shimikwa	Latex	4	Inguinal hernia (2), Rheumatism (2)	Mixed with warm water
Psidium guajava L. (Myrtaceae) (C) (BCN 40121)	Guayaba	Bark	1 + 1*	Antidiarrhoeal (1) Dysentery (1*)	Decoction Decocted with *Anacardium occidentale* and ciruelo (?) barks
Psittacanthus cucullaris (Lam.) Blume (Loranthaceae) (C) (BCN 40313)	Suelda con suelda, Pishku isman de hoja menuda, Pishku isman de hoja ancha	Stem	9	Postpartum tonic (4), Rheumatism (3), Broken bones (2)	Decoction
Psychotria alba Ruiz et Pav. (Rubiaceae) (W) (BCN 40291)	Chakruna	Leaf	3*	Depurative[d] (1*) Lumbago (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi* stems Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *Brugmansia suaveolens*, *Calliandra angustifolia*, *Couroupita guianensis*, *Tovomita* aff. *stylosa* and *Zygia longifolia*

Table 1 (*Continued*)

Scientific name (botanical family) (C = cultivated and/or W = wild) (Voucher herbarium specimen)	Local name	Part(s) used	Medicinal use-reports *N** = repeated reports	Use or disease treated (*N*) = use-reports of each use or disease treated) (*N**) = repeated reports, i.e. reports mentioned earlier in this table (*N* *n*) = non-medicinal reports	Mode of preparation and administration[a]
Psychotria carthagenensis Jacq. (Rubiaceae) (C and W) (BCN 40292)	Yaku bushiklla, Chakruna	Leaf	3*	Depurative[d] (1*)	Decocted with *Banisteriopsis caapi* stems
				Rheumatism (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *Cornutia microcalycina*, *Croton draconoides*, *Himatanthus sucuuba*, *Licaria* sp., *Mikania* sp. and *Virola calophylla*
Psychotria ernestii K. Krause (Rubiaceae) (W) (BCN 40294)	Chakruna	Leaf	1*	Depurative[d] (1*)	Decocted with *Banisteriopsis caapi* stems
Psychotria viridis Ruiz et Pav. (Rubiaceae) (C) (BCN 40296)	Chakruna, Chakruna negra	Leaf	34*	Depurative[d] (8*), Health tonic (1*)	Decocted with *Banisteriopsis caapi*
				Health tonic (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi* and *Gonzalagunia cornifolia*
				Health tonic (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi* and *Petiveria alliacea*
				Health tonic (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi* and *Pterocarpus rohrii*
				Body odour modifying agent for hunting and fishing self-preparedness (3*), Depurative[d] (3*)	Decocted with *Banisteriopsis caapi* stems
				Stomach pains (2*), Depurative[d] (2*)	Decocted with *Banisteriopsis caapi* stems
				Rheumatism (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi*, *Cornutia microcalycina*, *Croton draconoides*, *Himatanthus sucuuba*, *Licaria* sp., *Mikania* sp., *Psychotria carthagenensis* and *Virola calophylla*
				Rheumatism (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi*, *Mansoa alliacea* and *Piper callosum*
				Lumbago (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi*, *Brugmansia suaveolens*, *Calliandra angustifolia*, *Couroupita guianensis*, *Psychotria alba*, *Tovomita* aff. *stylosa* and *Zygia longifolia*
				Tobacco and cocaine addiction (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi* and *Aristolochia leuconorrea*
				Depurative[d] (1*), Employed to divine future events through the visions induced by the plant decoction (1*n**)	Decocted with *Banisteriopsis caapi*, *Rosenbergiodendron longifolium* and *Toxosiphon trifoliatus*
Pterocarpus rohrii Vahl. (Fabaceae) (C) (BCN 40159)	Yawar kaspi	Bark	1 + 2*	Tuberculosis (1)	Decoction
				Health tonic (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi* stems and *Psychotria viridis* leaves
Pulchranthus adenostachyus (Lindau) V.M. Baum, Reveal and Nowicke (Acanthaceae) (W) (BCN 40221)	Urku kordoncillu	Leaf	4	Period pains (1)	Slightly boiled, for steam bathing
				Vaginal infection (1)	Slightly boiled, used as a vaginal douche
				Wound antiseptic (1) and cicatrizant (1)	Crushed, roasted and pounded; applied on wounds

Qualea wittrockii Malme (Vochysiaceae) (W) (JSB-241)[c]	Azucar kaspi	Fruit	1	Digestive (1), Rum[b] flavouring (1*n*) and aromatizing agent (1*n*)	Macerated in rum[b]
Rauvolfia praecox K. Schum. ex Mark. (Apocynaceae) (W) (BCN 40687)	Siyuca sanango, Motelo sanango	Bark	2	Gastrointestinal parasites – emetic (1), Rheumatism (1)	Macerated in fresh water
Renealmia aromatica (Aubl.) Griseb. (Zingiberaceae) (W) (BCN 40836)	Ñukñuk panka	Leaf	1	Body odour modifying agent for hunting and fishing self-preparedness (1)	Infusion, for drinking and bathing
Rosenbergiodendron longiflorum (Ruiz and Pav.) Fagerl. (Rubiaceae) (W) (BCN 40304)	Lucero sacha	Whole plant	1 + 1*	Eye irritation (1) Depurative[d] (1*), Employed to divine future events through the visions induced by the plant decoction (1*n**)	Infusion, instilled into irritated eyes Decocted with *Banisteriopsis caapi*, *Psychotria viridis* and *Toxosiphon trifoliatus*
Rourea puberula Baker (Connaraceae) (C) (BCN 40691)	Murku waska	Stem	4 + 2*	Broken bones (1), Health tonic (1) Rheumatism (1) Broken bones (1) Health tonic (1*) Postpartum tonic (1*)	Macerated in rum[b] Decoction Macerated in fresh water Macerated in rum[b] with *Allosanthus trifoliatus* and alambre waska (?) bark Macerated in rum[b] with *Petrea sp*
Salacia cordata (Miers) Mennega (Hippocrateaceae) (W) (BCN 40566)	Tambor waska	Bark	2	Rheumatism (1), Broken bones (1)	Decoction
Sambucus peruviana (Kunth) Bolli (Caprifoliaceae) (C) (BCN 40193)	Sauco	Leaf	2	Cough – emetic (2)	Squeezed, the juice obtained is drunk
Sanchezia sanmartinensis Leon. and L.B. Sm. (Acanthaceae) (W) (USM 207948)	Shanshu sacha	Leaf	1	Health tonic (1)	Slightly boiled
Sapium marmierii Huber. (Euphorbiaceae) (W) (BCN 40257)	Caucho	Latex	1	Abscess (1)	Applied on abscesses
Sarcaulus brasiliensis (A. DC.) Eyma. (W) (Sapotaceae) (BCN 40881)	Rupiña	Bark	1	Wound antiseptic (1)	Decoction, used as a wound wash
Sciadotenia toxifera Krukoff and A.C. Sm. (Menispermaceae) (W) (BCN 40124)	Abuta	Stem	4	Abdominal colics (1), Dysentery (1), Rheumatism (1), Abortifacient (1)	Decocted or Macerated in rum[b]
Scoparia dulcis L. (Scrophulariaceae) (W) (BCN 40878)	Ñukñuk pichana	Leaf	5	Febrifuge (2), Gastrointestinal discomfort (2) Mouth ulcers (1)	Squeezed, the juice obtained is drunk Squeezed, the juice obtained is applied on ulcers
Senna hirsuta (L.) H.S. Irwin and Barneby (Fabaceae) (C) (BCN 40176)	Millwa retama	Leaf	1 + 1*	Measles (1) Acute cough (1*)	Slightly boiled Mixed and crushed with *Herrania mariae* seeds and warm wate
Senna obtusifolia (L.) H.S. Irwin and Barneby. (Fabaceae) (C) (BCN 40164)	Retama	Aerial part	3	Antitussive for children (2), Measles (1)	Slightly boiled
Senna reticulata (Willd.) H.S. Irwin and Barneby. (Fabaceae) (C) (BCN 40175)	Retama	Aerial part	2	Measles (1), Antitussive for children (1)	Slightly boiled
Senna ruiziana (G. Don) H.S. Irwin and Barneby (Fabaceae) (W) (JSB-65)[c]	Porotillu	Fruit Bark	1 1	Scabies (1) Intestinal parasites – laxative (1)	Crushed, a poultice is made Slightly boiled
Sida setosa Mart. ex Colla (Malvaceae) (C) (BCN 44891)	Sinchi pichana	Leaf	1	Hair growth stimulant (1)	Crushed leaves are applied on bald scalps
Siparuna bifida (Poepp. et Endl.) A. DC. (Monimiaceae) (C) (BCN 40253)	Isula mikuna	Leaf	2	Headache (2)	Squeezed, the juice obtained is drunk and rubbed on the head
Siparuna aff. *guianensis* Aubl. (Monimiaceae) (W) (JSB-67)[c]	Asna panka	Leaf	1	Headache (1)	With the crushed leaves a poultice is made and applied on the forehead

Table 1 (*Continued*)

Scientific name (botanical family) (C = cultivated and/or W = wild) (Voucher herbarium specimen)	Local name	Part(s) used	Medicinal use-reports *N** = repeated reports	Use or disease treated (*N*) = use-reports of each use or disease treated) (*N**) = repeated reports, i.e. reports mentioned earlier in this table (*N n*) = non-medicinal reports	Mode of preparation and administration[a]
Smilax longifolia Rich. (Smilacaceae) (W) (BCN 40850)	Zarza, Zarzaparrilla	Root	10	Postpartum tonic (3), Rheumatism (2), Health tonic (1), Bronchitis (1), Cough (1), Tumors (1) and Vacapucho – some sort of abscess (1)	Decoction
Smilax sp. (Smilacaceae) (W) (JSB-143)[c]	Cuiro sacha	Leaf and root	1	Eye irritation (1)	Decoction, a few drops are instilled into irritated eyes
Solanum caricaefolium Rusby (Solanaceae) (W) (BCN 40873)	Ayak mullaka	Leaf	1	Abscess (1)	Crushed, applied on abscesses
Solanum grandiflorum Ruiz et Pav. (Solanaceae) (W) (BCN 40871)	Siyuca wito	Fruit	1	Skin infection (1)	Squeezed, the juice obtained is applied on the affected skin
Solanum huallagense Bitter. (Solanaceae) (W) (BCN 40870)	Chupu sacha, Chupu mullaka	Leaf	1	Abscess (1)	Crushed, applied on abscesses
Solanum mite Ruiz et Pav. (Solanaceae) (W) (BCN 40182)	Chirapa sacha, Toe mullaka	Aerial part	4	*Mal de chirapa* – unidentified type of sore skin infection[g] (3)	Crushed and applied on affected skin – it soothes the pain and the inflammation
				Abscess (1)	Crushed, applied on abscesses
		Leaf	3	Cough (1), Bronchitis (1), Febrifuge (1)	Infusion
Solanum monadelphum Van Heurck et Müll. Arg. (Solanaceae) (W) (JSB-259)[c]	Lobo toe, Yaku toe	Whole plant	1	Wound antiseptic (1)	Crushed, a poultice is made and applied on wounds
Spondias mombin L. (Anacardiaceae) (C) (BCN 40320)	Ubos, Ubus	Bark	1	Antidote for snakebite poisoning (1)	Decocted with cedro (?) bark
Stenospermation amomifolium (Poepp.) Schott (Araceae) (W) (BCN 40189)	Llanbu achupilla	Young stem	1	Eye irritation (1)	Squeezed, a few drops of the juice obtained are instilled into irritated eyes
Sterculia sp. (Sterculiaceae) (W) (BCN 40239)	Sapuena	Bark	1	Rheumatism (1)	Decoction
Strychnos toxifera R.H. Schomb. ex Benth. (Loganiaceae) (W) (JSB-275)[c]	Rumu suifa	Root	1	Health tonic (1)	Decocted or Macerated in fresh water
Swartzia arborescens (Aubl.) Pittier (Fabaceae) (W) (BCN 40173)	Nina kaspi, Nina kaspi de hoja menuda	Bark	2	Rheumatism (2)	Decoction
Swartzia brachyrachis Harms. (Fabaceae) (W) (BCN 40171)	Mashushillu negro	Leaf	1	Barrenness (1), Taken by men to rise attraction of the opposite sex (1*n*)	Slightly boiled
Swartzia simplex (Sw.) Spreng. (Fabaceae) (W) (BCN 40172)	Nina kaspi, Nina kaspi de hoja mediana	Bark	1	Rheumatism (1)	Decoction
Tabernaemontana cymosa Jacq. (Apocynaceae) (C) (BCN 40856)	Cocha sanango, Cocha sanango de flor naranja	Root bark	1	Rheumatism (1)	Macerated in fresh water for some minutes
Tabernaemontana pandacaqui Lam. (Apocynaceae) (C) (BCN 44876)	Uchu sanango ornamental	Root bark	1	Rheumatism (1)	Macerated in fresh water for some minutes
Tabernaemontana sananho Ruiz and Pav. (Apocynaceae) (C and W) (BCN 40859)	Uchu sanango	Leaf	1*	Snakebite wounds (1*)	Mixed and crushed with *Fittonia albivenis* stems and leaves, a poultice is made
Tabernaemontana undulata Vahl (Apocynaceae) (C and W) (BCN 40725)	Ushpawasha sanango, Ayac sanango	Root bark	1	Antidote for snakebite poisoning (1)	Boiled or Macerated in fresh water
Tabernaemontana vanheurckii Müll. Arg. (Apocynaceae) (C) (BCN 40855)	Cocha sanango de flor blanca, Siyuca sanango	Root bark	1	Rheumatism (1)	Macerated in fresh water for some minutes
Tagetes erecta L. (Asteraceae) (C) (BCN 40335)	Rosa sisa	Aerial part	2	Febrifuge (1), Headache (1)	Crushed and rubbed on the forehead

Talinum paniculatum (Jacq.) Gaertn. (Portulacaceae) (W) (BCN 40882)	Kuchi llullu	Leaf	4	Skin burns (3), Rheumatism (1)	A poultice is made with the crushed leaves
Thevetia peruviana (Pers.) K. Schum. (Apocynaceae) (C) (BCN 40851)	Shakapa	Latex	1	Cattle skin infections caused by parasites (1)	Applied on cattle skin
Tournefortia cuspidata Kunth. (Boraginaceae) (W) (BCN 40179)	Choshna sacha	Aerial part	1	To treat *cutipas*[e] caused by eating *choshna* monkey meat – use interpreted through the Doctrine of Signatures (1)	Slightly boiled, for bathing and also very small doses for drinking. Usually for infants
Tovomita brasiliensis (Mart.) Walp. (Clusiaceae) (W) (BCN 45070)	Bachuja, Chullachaki kaspi, Chullachaki kaspi macho	Bark	1	Rheumatism (1)	Decocted or Macerated in fresh water
Tovomita carinata Eyma (Clusiaceae) (W) (BCN 44877)	Killuwiki hembra	Bark	1	Rheumatism (1)	Decoction
Tovomita foldatsii Cuello (Clusiaceae) (W) (BCN 44883)	Killuwiki, Killuwiki de hoja ancha	Bark	2 + 1*	Rheumatism (2) Health tonic (1*)	Decoction Macerated in rum[b] with *Calliandra angustifolia*, *Clusia* sp.1, *Maytenus* aff. *macrocarpa* and *Tovomita* aff. *stylosa*
Tovomita cf. *longifolia* (Rich.) Hochr. (Clusiaceae) (W) (BCN 44878)	Killuwiki macho	Bark	1	Rheumatism (1)	Decoction
Tovomita aff. *stylosa* Hemsl. (Clusiaceae) (W) (BCN 44882)	Bachuja, Chullachaki kaspi, Chullachaki kaspi hembra	Bark	3 + 4*	Rheumatism (2) Broken bones (1) Broken bones (1*) Health tonic (1*) Lumbago (1*), Depurative[d] (1*)	Decocted (in 1 report), Macerated in rum[b] (in 1 report) Decoction Macerated in rum[b] with *Dicranopygium yacu-sisa* and *Phthirusa stelis* Macerated in rum with *Calliandra angustifolia*, *Clusia* sp.1, *Maytenus* aff. *macrocarpa* and *Tovomita foldatsii* Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. alba*, *Brugmansia suaveolens*, *Calliandra angustifolia*, *Couroupita guianensis* and *Zygia longifolia*
Toxosiphon trifoliatus (Pilg.) Kallunki (Rutaceae) (W) (JSB-145)	Lucero sisa, Lucero sacha	Whole plant	1 + 1*	Health tonic (1) Depurative[d] (1*), Employed to divine future events through the visions induced by the plant decoction (1*n*)	Slightly boiled Decocted with *Banisteriopsis caapi*, *Psychotria viridis* and *Rosenbergiodendron longiflorum*
Tradescantia zanonia (L.) Sw. (Commelinaceae) (W) (BCN 40356)	Pampa llullu	Aerial part	1	Cough (1)	Slightly boiled and drunk, or just chewed
Trema micrantha (L.) Blume. (Ulmaceae) (W) (JSB-160)[c]	Atadiho	Leaf	1	Gastrointestinal discomfort in pregnancy – weak laxative (1)	Infusion
Triplaris americana L. (Polygonaceae) (W) (BCN 40887)	Tangarana	Stem	9	Health tonic (4), Aphrodisiac (4) Malaria (1)	Macerated in rum[b] Decoction
Trophis racemosa (L.) Urb. (Moraceae) (W) (BCN 40576)	Manchingillo	Latex	1	Bruise pain (1)	A poultice is made with the heated latex
Tynanthus polyanthus (Bur.) Sandwith (Bignoniaceae) (W) (BCN 40104)	Clavo waska	Bark	4	Rheumatism (2), Aphrodisiac (2), Rum[b] aromatizing and flavouring agent (2*n*)	Macerated in rum[b]
Tynanthus villosus A.H. Gentry (Bignoniaceae) (W) (BCN 40103)	Clavo waska	Bark	4	Rheumatism (2), Aphrodisiac (2), Rum[b] aromatizing and flavouring agent (2*n*)	Macerated in rum[b]
Uncaria guianensis (Aubl.) J.F. Gmel. (Rubiaceae) (W) (BCN 40306)	Uña de gato, Uña de gato blanca	Bark	3	Intestinal colics (1), Health tonic (1) Antidiarrhoeal (1),	Macerated in rum[b] Decocted

Table 1 (*Continued*)

Scientific name (botanical family) (C = cultivated and/or W = wild) (Voucher herbarium specimen)	Local name	Part(s) used	Medicinal use-reports *N** = repeated reports	Use or disease treated (*N*) = use-reports of each use or disease treated) (*N**) = repeated reports, i.e. reports mentioned earlier in this table (*N n*) = non-medicinal reports	Mode of preparation and administration[a]
Uncaria tomentosa (Willd. Ex Roem. et Schult.) DC. (Rubiaceae) (W) (BCN 40308)	Uña de gato, Uña de gato colorada	Bark	8 + 3*	Postpartum tonic (3) Antidiarrhoeal (2), Intestinal colics (2), Liver pain (1) Postpartum tonic (1*) Health tonic (1*) Health tonic (1*)	Macerated in rum[b] Decocted Macerated in rum[b] with *Croton draconoides* and honey Macerated in rum[b] with *Pithecellobium mathewsii* and jengibre (?) root Macerated in rum[b] with *Calliandra angustifolia*, *Phthirusa stelis*, *Zygia longifolia* and caballo sacha (?) bark
Unonopsis sp. (Annonaceae) (W) (JSB-33)[c] (BCN 40720/40719/40718/40717)	Icoja, Icoja negra	Bark and leaf	5	Rheumatism (5)	Decocted or Macerated in fresh water, for drinking and bathing
Urera baccifera (L.) Gaudich. ex Wedd. (Urticaceae) (W) (BCN 40238)	Ishanka waska	Leaf	2	Rheumatism (1) Hemostatic (1)	A bunch of leaves is gently and repeatedly hit against rheumatic body parts Slightly boiled
Urera laciniata Goudot ex Wedd. (Urticaceae) (W) (BCN 40863)	Allku ishanka	Leaf	2	Rheumatism (1) Hemostatic (1)	A bunch of leaves is gently and repeatedly hit against rheumatic body parts Slightly boiled
Urera sp. (Urticaceae) (W) (BCN 40237)	Crespo ishanka	Leaf	1	Rheumatism (1)	A bunch of leaves is gently and repeatedly hit against rheumatic body parts
Verbena litoralis Kunth. (Verbenaceae) (W) (BCN 40312)	Verbena	Leaf	2	Cough (1), Malaria (1)	Crushed and mixed with warm water
Vernonia patens Kunth. (Asteraceae) (W) (BCN 40338)	Ukwera, Sanisisa ukwera	Young stem	2	Eye irritation (2)	Squeezed, a few drops of the juice obtained are instilled into irritated eyes
Vigna peduncularis (Kunth) Fawc. et Rendle. (Fabaceae) (W) (JSB-155)[c]	Porotillu	Whole plant	2	Infected skin ulcers (1), Leprosy (1)	Decoction, used as a body wash
Virola calophylla (Spruce) Warb. (Myristicaceae) (W) (BCN 40115)	Cumala roja	Bark	2 + 2*	Vaginal irritation – candidiasis suspected (1) Wound antiseptic (1) Rheumatism (1*), Depurative[d] (1*)	Decoction, used as a vaginal douche Decoction, used as a skin wash Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. carthagenensis*, *Cornutia microcalycina*, *Croton draconoides*, *Himatanthus sucuuba*, *Licaria* sp. and *Mikania* sp.
Virola flexuosa A.C. Sm. (Myristicaceae) (W) (BCN 40113)	Cumala blanca	Bark	2	Vaginal irritation – candidiasis suspected (1), Wound antiseptic (1)	Decoction, used as a vaginal douche or as a wound wash
Vismia macrophylla Kunth (Clusiaceae) (W) (USM 207180)	Pichirina, Urku pichirina	Bark and leaf Latex	1 1	*Mundialito* – scabies (1) Scabies (1)	Crushed, a poultice is made Applied on the affected skin
Vismia aff. *sandwithii* Ewan (Clusiaceae) (W) (JSB-183)[c]	Pichirina	Fruit	1 –	Hepatitis (1) Dye (1*n*)	Decoction The fruit is squeezed and the dye obtained in a liquid form

Witheringia solanacea L'Hér. (Solanaceae) (W) (BCN 40876)	Ayak panka	Leaf	2	Scabies (1), "Fungal skin infections" (1)	Crushed, applied on the affected skin
Wulffia baccata (L.) Kuntze (Asteraceae) (W) (BCN 40337)	Sacha albahaca	Whole plant	2	Used in flourishing/invigorating baths[f] (1)	Slightly boiled, for bathing
				Wound antiseptic (1)	Slightly boiled, used as body wash for wounds
Xanthosoma sp. (Araceae) (W) (BCN 40228)	Patquinilla	Tuber	1	Leech bite wounds (1)	With the roasted and crushed tuber a poultice is made and applied on wounds caused by leech bites
Xiphidium caeruleum Aubl (Haemodoraceae) (W) (BCN 40360)	Lengua de lagarto	Leaf	1	Gastrointestinal discomfort in children (1)	Slightly boiled
Xylopia cuspidata Diels. (Annonaceae) (W) (BCN 40715)	Tortuga kaspi	Bark and leaf	1	Rheumatism (1)	Slightly boiled
Zanthoxylum ekmanii (Urb.) Alain. (Rutaceae) (W) (BCN 40833)	Walaha	Leaf	2	Flu fever (1), Flu headache (1)	Decoction
Zygia longifolia (Humb. and Bonpl. ex Willd.) Britton and Rose (Fabaceae) (W) (BCN 44887)	Yaku shimbillu, Untai shimbillu, Shimbillu	Bark	2 + 6*	Postpartum tonic (1)	Macerated in rum[b]
				Broken bones (1)	Decoction
				Rheumatism (1*)	Decocted with *Ficus trigona*
				Rheumatism (1*)	Macerated in rum[b] with *Phthirusa stelis*
				Health tonic (1*)	Macerated in rum[b] with *Capparis sola*, *Petrea* sp. and alambre kaspi (?) bark
				Health tonic (1*)	Macerated in rum[b] with *Calliandra angustifolia*, *Phthirusa stelis*, *Uncaria tomentosa* and caballo sacha (?) bark
				Lumbago (1*), Depurative[d] (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. alba*, *Brugmansia suaveolens*, *Calliandra angustifolia*, *Couroupita guianensis* and *Tovomita* aff. *stylosa*

[a] Unless otherwise stated the mode of administration is oral and taken by humans.

[b] Here, rum refers to the locally made alcoholic brew prepared from sugar cane by fermentation and distillation.

[c] BCN and USM codes unavailable. Instead, the collection number, i.e. Jsb-xxx, is provided. If needed, a duplicate must be found in USM (Lima), where these specimens were yet to enter.

[d] Depurative remedies were said to "cleanse body and soul" mainly trough a marked laxative and/or emetic effect. In Chazuta these remedies are called *purgantes*, a term which informants also applied to laxatives and emetics that were considered to cleanse only on a physical level. To differentiate these two distinct plant effects recorded in the field, this paper uses the term "depurative" when refering to the remedies that were said to cause the "integral" cleansing mentioned first.

[e] Mal aire, Cutipa, Susto, Daño: Culture-bound syndromes (see Section 3.6.8).

[f] In the *Baños de florecimiento* or Flourishing baths, the selected plant part is macerated for some minutes in water and then used in baths as a tonic to invigorate body tone and "strengthen the *espiritu*" (soul).

[g] *Mal de chirapa* was a disease that could not be identified. This ailment was described as a very irritant and sore skin infection that erupts around the waist and chest usually in very hot and humid weather (see Section 3.6.3 on skin disorders).

3.4. Herbal preparations and mode of administration

According to Schultes and Raffauf (1990), throughtout the Northwestern Amazon, the commonest method of using medicinal plants is by ingestion of a tea, either a decoction or infusion, warm or cold. This was also confirmed in Chazuta valley, where, on the whole, 395 different herbal preparations were reported and nearly 65% of them entailed some sort of aqueous extraction, in which the selected plant parts were decocted (in 122 of these preparations), slightly boiled (45), prepared as infusions (29), mixed with warm water (18), and macerated (36) or mixed in fresh water (2).

Another 9% of the reported preparations involved some sort of alcoholic extraction: plant parts were macerated in rum (in 28 preparations), mixed with rum (4), mixed or macerated in wine (2) and macerated in a mixture of wine and rum (1). Here rum refers to the locally made alcoholic brew prepared from sugar cane by fermentation and distillation.

The remaining 26% of herbal preparations were made of crude plant parts, e.g. latex applied on wounds, fresh leaves crushed and rubbed on the forehead, or sap instilled into eyes. In one eight of these preparations heat was applied to plant parts, e.g. resins were warmed and rubbed on limbs, or roasted and pounded tubers were applied topically.

On the other hand, 63.5% of all the herbal preparations reported were taken orally, 31% were used topically, 5.3% were used both orally and topically, and the 0.2% was inhaled. The topical preparations were applied on the skin (90 preparations), employed for bathing (33), used for vaginal application (15), instilled into the eyes (9), used as wound washes (8), administered by steam bathing (6), and just one was employed as an eye wash.

In addition, many times informants used the expression *dietar plantas* ("to diet plants") instead of "taking or applying plant remedies". In that context, "to diet plants" meant the administration of herbal remedies with regulation of food ingestion and human activity, i.e. prescribing *dieta* norms, such as rest and the avoidance of alcohol, pork meat, condiments, spicy and sweet food ingredients consumption. In particular cases, *dieta* rules became so strict that implied to fast in social seclusion. As mentioned earlier, this theme will be the main topic presented and discussed in a separate article.

3.5. Plants most often reported

It was found that 25 plant species were mentioned more than 7 times for having a medicinal use. Table 2 shows these species. *Maytenus* aff. *macrocarpa* (known as *chuchuwasha*) was by far the plant most times employed. The bark of species of the genus *Maytenus* of the northwestern Amazonia are highly reputed as medicinal (Schultes and Raffauf, 1990). The barks of these trees have an important commercial value. They are sold for their medicinal and flavouring properties in many Amazonian markets. In Chazuta, *M*. aff. *macrocarpa* was said to be extinguishing fast. The same was stated for the so-called *canela* trees (*Licaria* sp.).

The plant species that were mentioned to have more different medicinal uses were *Croton draconoides*, *Petiveria alliacea*, *Mansoa alliacea* and *Anacardium occidentale*. All of them are well-known medicinal plants in Latin America and some of them are widely used in the region (Gupta, 1995; Lorenzi and Abreu-Matos, 2002; Roth and Lindorf, 2002).

3.6. Medicinal uses

Altogether, 945 medicinal use-reports were recorded for the 289 plants presented in this paper. Most reports (98.8%) concerned human medicine, whereas very few (1.2%) were linked to veterinary uses. Non-medicinal uses reported for these plants were: as rum flavouring and aromatizing agents (in 5 species), dyes (5), food (in 5 plants, their fruits), to make baskets (3), as food condiments (2), cattle forage (1), and to prepare arrow (1) and fish (1) poisons. Furthermore, a mixture of 4 species (*Banisteriopsis caapi*, *Psychotria viridis*, *Rosenbergiodendron longifolium* and *Toxosiphon trifoliatus*) was taken in a ritual to divine future events. And 5 plants were used on their own by men to rise attraction of the opposite sex (even though one of these species, *Dracaena* sp., was only reported for this use, it has been also included in Table 1).

Table 2
Plants cited more than seven times for having a medicinal use in Chazuta (Peruvian Amazon).

Scientific name	Medicinal uses or diseases treated	Medicinal use-reports
Maytenus aff. *macrocarpa*	6	86
Mansoa alliacea	8	60
Ficus insipida	1	45
Banisteriopsis caapi	7	38
Psychotria viridis	7	34
Brunfelsia grandiflora	4	26
Croton draconoides	9	19
Ficus trigona	2	18
Aristolochia leuconeura	5	17
Phthirusa stelis	5	15
Forsteronia graciloides	7	13
Malachra alceifolia	6	13
Anacardium occidentale	8	12
Licaria sp.	5	12
Petiveria alliacea	9	12
Poulsenia armata	5	12
Cornutia microcalycina	4	11
Uncaria tomentosa	5	11
Smilax longifolia	7	10
Calliandra angustifolia	6	9
Pithecellobium mathewsii	2	9
Psittacanthus cucullaris	3	9
Triplaris americana	3	9
Piper callosum	6	8
Zygia longifolia	6	8

Returning to the medicinal uses, they have been grouped in 26 categories which are shown in Table 3 and are discussed in the following subsections. As it can be seen in Table 3, in Chazuta, plant remedies were mainly employed to treat musculoskeletal disorders (29.7% of all the medicinal use-reports), gastrointestinal complaints (13.4%) and skin conditions (12.9%). Musculoskeletal and gastrointestinal disorders are the categories of medicinal uses that have been also found among the most significant in other surveys performed in close Peruvian regions, including ecologically similar (Jovel et al., 1996) and different (Hammond et al., 1998; Bussmann and Sharon, 2006; De la Cruz et al., 2007) areas. Plant uses for skin complains were also reported to be common in Suni Miraño, Loreto (Jovel et al., 1996) and Callejón de Huaylas, Ancash (Hammond et al., 1998). Plants are also frequently reported against respiratory disorders by Jovel et al. (1996), Bussmann and Sharon (2006) and Hammond et al. (1998): but in our survey this category accounts only for a 4.8% of all plant use-reports.

Finally, Bussmann and Sharon (2006) found the use in magical/ritual ailments as the most frequent in a survey performed in Northern Peru where data were mostly collected in local markets of Trujillo and Chiclayo (both large cities of the Peruvian coast). In Chazuta, culture-bound syndromes only account for 3.6% of the plant uses reported.

3.6.1. Musculoskeletal disorders

These were the type of ailments most times (281) treated with plants. Most likely, the region's climate and rural lifestyle make these disorders especially prevalent in the area, the majority of which were recorded as unspecified rheumatism (232 use-reports). Five plants made more than half of all the antirheumatic use-

Table 3
Frequency of ailments treated with plants and number of species employed against these disorders in Chazuta (Peruvian Amazon). Altogether, 945 medicinal use-reports were recorded for 289 plants.

Use or diseases treated	Species used	% of total medicinal use-reports
Musculoskeletal disorders	107	29.7%
Gastrointestinal complaints	47	13.4%
Skin disorders	71	12.9%
Tonics	39	9.3%
Depuratives	30	5.4%
Respiratory disorders	29	4.8%
Reproductive conditions	21	4.8%
Culture-bound syndromes	12	3.6%
Fever / Malaria	20	3.3%
Headache	15	2.1%
Genital conditions	16	1.8%
Eye disorders	10	1.4%
Body odour modifiers for hunting and fishing self-preparedness	7	1.3%
Veterinary uses	8	1.2%
Inguinal hernias	6	0.9%
Oral and dental disorders	5	0.8%
Venomous snake bites	6	0.7%
Urinary disorders	5	0.6%
Liver conditions	4	0.4%
Vertigo	2	0.4%
Drug addiction	4	0.3%
Measles	3	0.3%
Haemostatics	3	0.3%
Diabetes	1	0.1%
Tumours	1	0.1%
Hair growth stimulant	1	0.1%

reports: *Maytenus* aff. *macrocarpa* (with 51 reports), *Mansoa alliacea* (47), *Brunfelsia grandiflora* (11), *Ficus trigona* (9) and *Pithecellobium mathewsii* (8). The other musculoskeletal ailments treated with plants were broken bones (22 reports), bruises and contusions (10), muscular aches (5), lumbago (4), aching joints (3), back pain (2), leg cramps (1), gout (1) and sprains (1). Sometimes, informants described rheumatic or joint pain as being "cold" or "hot". These "cold" disorders were normally triggered by coldness and exposure to water, e.g. being soaked by rain or having spent all night fishing. Against these ailments, a plant remedy deemed as "cold" was recommended to use, such as *Brunfelsia grandiflora* (the plant can induce chills when is ingested). On the contrary, "hot" joint pains were considered to be caused by an excess of activity, against which a plant reckoned "warm" was suggested to employ, such as *Capparis sola* (its bark is rubefacient). What observed in Chazuta is different of the widely extended rule in Latin America in which cold remedies are used for the treatment of hot illnesses and vice versa (Barragán-Solís, 2006; Waldstein and Adams, 2006).

3.6.2. Gastrointestinal complaints

On the whole, 64 use-reports applied in the treatment of gastrointestinal worms and parasites. *Ficus insipida* alone was used 45 times against these particular ailments. With less frequency plants were employed against gastrointestinal discomfort (24 use-reports), diarrhoea or dysentery (18), gastrointestinal pains or colics (14), as a digestive (3), for constipation (2), as a carminative (1) and against stomach ulcers (1).

Some episodes of diarrhoea or gastrointestinal discomfort were described again as cold or hot. As well as mentioned earlier, a "cold" diarrhoea was thought to be caused after having experienced coldness and being exposed to water, e.g. having been bathing in the river too long. Against this sort of disorders a plant remedy reckoned "cold" was recommended to use, such as *Malachra alceifolia*. Conversely, "hot" diarrhoeas were considered to be originated by food intoxication or severe hot weather. In these cases, a plant regarded "warm" was suggested to employ, such as *Anacardium occidentale*.

3.6.3. Skin disorders

Nearly 46% (56) of all skin disorders reported (122) were against wounds, where plant remedies were used as local antiseptics and/or cicatrizants. Other skin complaints treated with plants were: scabies (with 15 use-reports), abscesses (14), *chirapa* disease (6), fungal infections (5), shingles (5), skin ulcers (5), scars and skin stains (4), burns (3), allergic rashes (2), acne (2), calluses (2), verrucae (2), and leprosy (1). *Chirapa* disease could not be identified. This ailment was described as a very irritant and sore skin infection that erupts around the waist and chest usually in very hot and humid weather, like when the sun shines just after a heavy rain in a summer afternoon. When the sun shines like that, reflected on the remaining clouds, the solar light forms a circle in the sky which in Quechua is known as *chirapa* or *yurak chirapa* (*yurak* signifies white in Quechua). Another similar atmospheric phenomena, rainbows, are known as *puka chirapa* (*puka* means red or coloured in Quechua).

3.6.4. Tonics

In Chazuta plants were taken very often to invigorate health. All in all, 88 reports corresponded to tonics in this survey. Nearly two thirds of these reports (53) accounted just as general health tonics, 14 of which consisted of *baños de florecimiento* (flourishing or invigorating baths). These baths are performed with water where the selected plant parts have been macerated for some minutes. Informants mentioned how such therapies did not imply just a "physical" invigorating effect since they also strengthened the *espíritu* (soul in English).

The other tonics reported were postpartum tonics (29 reports), stimulants "to awaken as coffee does" (5) and one tonic used in pregnancy (1).

3.6.5. Depuratives

In 51 use-reports, plant remedies were said to "cleanse body and soul" mainly through a marked laxative and/or emetic effect. In Chazuta, these remedies are called *purgantes*, a term which informants also applied to laxatives and emetics that were considered to cleanse only on a physical level. To differentiate these two distinct plant effects recorded in the field, this paper uses the term "depurative" when referring to the remedies that were said to cause the "integral" cleansing mentioned first. Moreover, 12 of these depurative herbal preparations were also employed as: health tonics (in 4 herbal preparations), body odour modifying agents for hunting and fishing preparedness for men (3) and dogs (1), vermifuges (2), against rheumatism (2), drug addiction (2), cough and bronchitis (1), febrifuge (1), lumbago (1), pain when passing water (1) and stomach pain (1). Nearly half of all the depuratives use-reports (25 out of 51) corresponded to ayahuasca mixtures (decoction of *Banisteriopsis caapi* stem with other plant/s).

3.6.6. Respiratory disorders

Cough was the most common respiratory complaint treated with plants (with 26 use-reports), while bronchitis was the second most frequent (16). Plant remedies were employed against tuberculosis in 2 reports, and against asthma in one report. All in all, 45.2% of the times that a plant was used against either cough or bronchitis, the remedy was emetic and the disease considered to be expelled by vomiting.

3.6.7. Reproductive conditions

This type of ailments was the seventh most frequently reported in the survey due, in part, to the great use of plant remedies as aphrodisiacs. Indeed, 30 of the 45 uses on reproductive disorders

were said to arouse sexual desire. Altogether, 9 plants were reported as aphrodisiacs, *Maytenus* aff. *macrocarpa* being the specie most recorded for this use (in 16 reports). More sporadically, plant remedies were employed to treat period pains (7 reports), barrenness (4), as contraceptives for women (2), abortifacient (1), and against postpartum pains (1).

3.6.8. Culture-bound syndromes

Plants were used against four main types of culture-bound syndromes: *cutipas*, *mal aires*, *sustos* and *daños*.

Cutipas – a Quechua term that means to give in, to exchange, to swap – are based on the belief that animals, plants, spirits, objects, activities and other phenomena, can transmit to a person their characteristics, which are often considered the cause of a wide array of ailments. Informants reported *cutipas* in two distinct settings.

The first is observed in the initial days of a baby's life. Then, many food and certain activities that the parents of the newborn might ingest or perform are considered potentially harmful for the infant's health. For example, it is thought that the baby back bends if the father carries heavy weights, and that the newborn becomes intoxicated if the mother touches toxic plants. As indicated by Reagan (1983), parent activities remain hazards for the infant until the umbilical cord falls. The diagnosis and treatment of these "newborn *cutipas"* are determined through a logic ruled by the Doctrine of Signatures. For example, if the newborn cries too much at night, it is suspected that the parents might have eaten meat of the nocturne *choshna* monkey (note the coincidence between the monkey's habit and the baby cry, both nocturnes). Thus, against this specific *cutipa* the plant *Tournefortia cuspidata* is used since both plant and *choshna* monkey are said to have a similar pubescence.

In another example, if an infant suffers diarrhoea and severe haemorrhoids, it is thought that the parents might have eaten *torre* fish (Fig. 2), since the "phlegmy" meat and black stains of the animal are considered harmful elements that can be transmitted to newborns. Here, the decoction of *Dryomonia erythroloma* (Fig. 2) is used for bathing children affected by this disease since the vivid red flowers of the plant resemble anuses affected by haemorrhoids.

The second scenario where *cutipas* are mainly observed is when the "*dieta* rules" prescribed with the ingestion of plant remedies (see Section 3.4 on herbal preparations and mode of administration), are exceeded.

Altogether, 13 use-reports accounted against *cutipas*. The specie *Cornutia microcalycina* being the most employed (6 times). This plant was used against unspecific "*dieta cutipas*", while the other species reported were employed for specific "newborn *cutipas*": besides the examples mentioned earlier, other three plants were recorded to be used against *cutipas* originated by the ingestion of *wapo* monkey (*Cordia kingstoniana*), lizard (*Epiphyllum phyllanthus*) and armadillo (*Polygala acuminata*).

Besides this type of culture-bound syndrome, the Doctrine of Signatures ruled the medicinal uses of many other plants. In some species the Doctrine was present very clearly such as in *Abuta grandifolia*, *Aphelandra maculata*, *Bauhinia glabra*, *B.* cf. *smilacina*, *Casearia negrensis*, *Geophila* cf. *macropoda* and *Miconia paleacea*. But in many other plants the Doctrine had a dimmer presence (e.g. shrubs that were "strongly rooted" were taken to "strengthen" the body).

Widespread throughout Latin America, *mal aire* ("malevolent wind"), *susto* ("sudden fright" or *manchari* in Quechua) and *robo del alma* ("steal of the soul") were culturally important medical problems also in Chazuta. All them usually affecting children and being associated with a broad collection of symptoms that did not fit specific diagnosis. In *susto*, evil spirits were thought to cause illness by stealing souls through frightening, thus originating symptoms which tend to affect the nervous system, e.g. hysteria, panic, sleeplessness, lethargy or depression. With a similar aetiology and symptomatology as *sustos*, in disorders known as *robo del alma* the soul was said to be stolen again but the frightening experience did not happen.

On the other hand, *mal aires* were considered to be originated by winds that carry evil spirits as well as unpleasant hotness or odours. Impacts with these airs were believed to alter the normal function, thus causing symptoms such as fever, vomits and diarrhoea.

In another way, *daño* or *brujeria* (witchcraft) were those diseases originated by the penetration of harmful objects inside the body of the victim by sorcery. Actually, many "apparent" disorders such as rheumatism were attributed to witchcraft. Also, some *sustos* and *mal aires* were said to be caused by sorcery. Therefore, there was not a specific symptomatology for *daño*. However, an abrupt and inconstant pulse was thought to indicate illnesses caused by witchcraft.

Within this medical conception where exogenous pathogens caused illness by penetration, the utilization of depuratives, purgatives and emetics play an even major role.

However, invoking "the supernatural" was another important health resource too. This entered into the domain of *vegetalistas*, a

Fig. 2. *Torre* fish (left) and *Dryomonia erythroloma* (right): cause and remedy of a newborn *cutipa* (see Section 3.6.8 on culture-bound syndromes).

Fig. 3. Treating *susto* (see Section 3.6.8 on culture-bound syndromes)—note a piece of *canela* (*Licaria* sp.) bark on the man's right ear.

type of traditional healers nearly extinct today, who employ specific therapeutic techniques such as "sucking" (extracting) objects introduced by *daño*, chanting to call upon spirits to return souls stolen by *susto* (Fig. 3), or restoring the balance when suffering *mal aires* or *cutipas*. *Vegetalistas* used to perform these cures within simple rituals where tobacco and the plant locally known as *canela* (*Licaria* sp.) were the main species used (the first being smoked and the fume blown around the patient, and the bark of the second being crushed and rubbed on the ill). Furthermore, other 5 plants were reported to be used to treat *mal aires* and *sustos*.

These traditional healers also chant to invoke what they say are the spirits of the plants contained in the herbal remedies, hence making the remedies "more medicinal" they state. This can be observed while preparing plant remedies, and before, while or after their administration.

In some cases and within a ritual context, the therapeutic process involved the *vegetalista*, or rarely the patient too, entering in an ecstatic state which sometimes was induced by the ingestion of entheogenic *ayawaska* plant mixtures (different decoctions of *Banisteriopsis caapi* stem with other plant/s). The performance of *ayawaska* rituals applied for 8 distinct medicinal applications and 38 medicinal use-reports.

Besides *vegetalistas*, general population also tried to establish contact with "the world of spirits" when ill, e.g. by praying, fulfilling sexual abstinence or accomplishing other taboos in order to seek the help of the spirits.

3.6.9. Other uses

Twelve plants were used as febrifuges, other 10 species against headache (one of them against flu headache) and 4 plants against both fever and headache (of flu origin in 3 plants of this last four). Against malaria, four species were used: *Grias peruviana*, *Gustavia longifolia*, *Triplaris americana* and *Verbena litoralis*.

All in all, 15 plants were used against vaginal irritation, infection or ulceration. Most cases were probably related to candidiasis infection. In another genital disorder, *Forsteronia graciloides* was employed to treat *prolapso* or *caida de ovarios* ("fallen ovaries"), a women's ailment said to originate when carrying heavy weights. Probably, it refers to a uterine prolapse.

On the whole, 13 use-reports applied for eye disorders. Eleven were against eye irritations, and two against eye infections.

Another popular plant use was that directed to modify body odour for hunting and fishing self-preparedness. Informants stated how important it was to smell less human and more as a "plant" as possible so animals could not notice them when in the forest or rivers. In short treatments where herbal preparations were used just once, aromatic plants such as *Heliconia acuminata*, *Piper callosum* or *Renealmia aromatica* were employed. In addition, longer treatments used depurative remedies and the prescription of strict *dietas* to reduce human odour. This last type of practices were said to produce also an invigorating effect which helped in the preparedness for hunting and fishing.

The same sorts of treatments were used for dogs. Of the 11 veterinary use-reports, 5 consisted in depurative remedies for dogs, 3 of which were employed to modify their odour so to prepare them for hunting. In these cases the animals were leased and forced to take the plants, which were aqueous extractions administered with the help of a funnel. Other veterinary use-reports were: one again for dogs (against skin infections), 3 were employed on cattle skin ailments (wound antiseptic, against skin ulcers and to treat a parasitic skin infection), and 2 reports were recorded against lice in poultry.

A prevalent ailment among "chazutian" men was the disorder known as *bajada de testos* (descendent testicles), which refers to inguinal hernias usually caused when carrying heavy weights. This condition was said to be the male version of the "fallen ovaries" mentioned earlier. When the protrusion may occur, one of the testicles is said to get very inflamed and descent due to its abnormal volume and weight. Six plants were used against these hernias.

Eight reports against oral and dental disorders were recorded in the survey (in which 5 plants were used). Three of these reports being mouth infections that resembled to be of fungal cause, 2 halitosis, and gingival pain, mouth ulcers and toothache, one each.

Two types of plant remedies were employed against venomous snake bites. The first one included plants used as antidotes (5 plants reporting 6 uses), and the second were those employed to cure snake bite wounds (2 plants reporting just one use).

Against urinary disorders 5 different plants were used: two as diuretics, two for kidney pain, and one against pain when passing water.

Altogether, four plants were used against liver conditions: *Celtis iguanaea*, *Priva lappulacea* and *Vismia* aff. *sandwithii* to treat hepatitis, and *Uncaria tomentosa* against liver pain.

Although present eradication of coca cultivation is producing a consequent decrease of cocaine addiction rates, cocaine addiction remains as an important health problem in the region. Two depurative plant remedies were reported against both cocaine and tobacco addiction in the survey. One was obtained from *Aristolochia leuconeura*, and the other remedy consisted of an *ayawaska* mixture containing the previous *A. leuconeura*, plus both *Banisteriopsis caapi* and *Psychotria viridis*. On the other hand, the crushed seeds of *Inga* cf. *grandiflora* were mixed with warm water and drunk against alcohol addiction, a more widely occurring disorder in the region than the former one.

4. Conclusions

The present paper has shown data corresponding to 289 medicinal plant species collected in the Peruvian Amazonian valley of Chazuta; a region that represents one of the main reservoirs of the San Martin Quechuas (also known as Lamas Quechuas) and their culture.

Among the plants collected, Fabaceae, Moraceae and Ficus were the botanical families and genera most represented. The plant parts most times used were the leaves and barks, and herbal preparations that entailed some sort of aqueous extraction were the most common. Altogether, 945 medicinal use-reports were obtained from these nearly three hundred species. The plants that were cited more times for having a medicinal use were *Maytenus* aff. *macro-*

carpa, *Mansoa alliacea* and *Ficus insipida*. And the plant species that were mentioned to have more different medicinal uses were *Croton draconoides*, *Petiveria alliacea*, *Mansoa alliacea* and *Anacardium occidentale*.

Mainly, plant remedies were employed to treat musculoskeletal disorders (29.7% of all the medicinal use-reports), gastrointestinal complaints (13.4%) and skin conditions (12.9%). In addition, many medicinal plants were used for their intended general and unspecific effects, e.g. tonics and depuratives. It is remarkable that in 14% of all the medicinal use-reports recorded, plant remedies-induced emesis and/or laxation (58 times as laxatives/purgatives, 51 as depuratives and 24 as emetics). Certainly, plant remedies were widely employed to prevent and restore health throughout what informants considered a cleansing effect. Lastly, plant uses for respiratory disorders accounted only for 4.8% of the reports.

Furthermore, it was observed how herbal remedies were employed in conjunction with lifestyle advice: regulating activities and food consumption.

Moreover, health and illness were faced through a third aspect, which consisted in performing rituals and other practices concerning "the supernatural", in which the use of plants reached the psychological and religious sphere. Hence, the effect of some remedies and practices where mentioned to go beyond a physical level, reaching, as they said, the *espíritu* (soul).

In conclusion, in the Chazuta valley, medicinal plants are used within a context of a traditional medicine that confronts health and illness from an integral vision, in which three elements have to be considered: the medicinal uses of plants (mainly for musculoskeletal, gastrointestinal and skin conditions), its combination with lifestyle advice, and its participation in the performance of rituals and other practices concerning to what is often named as "the world of spirits".

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4.2. Publicació 2

Plant use in the medicinal practices known as "strict diets" in Chazuta valley (Peruvian Amazon)

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Resum

Les dietes estrictes de Chazuta són pràctiques medicinals tradicionals que consisteixen a consumir remeis vegetals en quasi dejuni i amb algun tipus de reclusió social. L'objectiu d'aquest treball és descriure les dietes estrictes de Chazuta, com també analitzar les possibles funcions de les plantes medicinals utilitzades en aquestes pràctiques.

La informació es va obtenir a través d'entrevistes de camp fetes al 6,3% de la població adulta rural del districte (140 individus, el 75% dels quals van ser considerats quítxues). En total, es van registrar 122 dietes estrictes, en les quals es van utilitzar 106 espècies vegetals diferents. Les dietes estrictes presenten una estructura i un ús de plantes característics. Els principals efectes reportats de les dietes estrictes van ser antiinflamatori, antiinfectiu, alteració de la funció cerebral i depuratiu.

Les dietes estrictes són pràctiques medicinals tradicionals ben estructurades, amb un significat simbòlic en el cicle vital de l'home chazutí. Les plantes utilitzades en les dietes estrictes podrien contribuir als principals efectes a través d'accions antiinflamatòries, antiinfectives, de psicoactivitat i d'altres activitats depuratives relacionades. La correlació entre dades bibliogràfiques d'activitats de les plantes més utilitzades i els efectes reportats per les corresponents dietes (en les quals la planta en qüestió va ser usada) són el 36% per a activitat antiinflamatòria, el 29% per a activitat antimicrobiana, el 18% per a psicoactivitat i el 5% per a activitats depuratives relacionades. Els percentatges augmenten al 77%, 64%, 73% i 32%, respectivament, quan es consideren dades bibliogràfiques de taxons propers.

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Plant use in the medicinal practices known as "strict diets" in Chazuta valley (Peruvian Amazon)

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ABSTRACT

Aim of the study: Strict diets are traditional medicinal practices where plant remedies are consumed with nearly fasting and with some sort of social seclusion. The aim of this work was to describe these practices of Chazuta and the use of plants within, as well as to analyse the possible functions of the last.
Material and methods: The information was obtained through interviews to the 6.3% of the district rural adult population (140 individuals, 75% of which was considered Quechua).
Results: In total, 122 strict diets were recorded and 106 different plant species were reported to be used. Strict diets present a characteristic structure and plant use. The main effects reported in strict diets were antinflammatory, antiinfective, brain function alteration and depuration.
Conclusions: Strict diets are well structured traditional medicinal practices, also with a symbolic significance in the life cycle of chazutian men. Plants used in strict diets can contribute to the main effects through antinflammation, antiinfective actions, psychoactivity and depurative related activities. The correlation between literature evidence of activity of most used plants and effects reported for the correspondent diet (i.e. in which the plant was used) are 36% for antinflammatory activity, 29% for antimicrobial activity, 18% for psychoactivity and 5% for depurative related activities. The percentages go to 77%, 64%, 73% and 32%, respectively, when literature evidences on related taxa are also considered.

1. Introduction

In a previous paper, we presented a first survey on the use of medicinal plants in the Peruvian Amazonian valley of Chazuta (Sanz-Biset et al., 2009). There, we reported the subsistence in Chazuta of traditional practices where plant remedies producing marked emesis or laxation are consumed with nearly fasting and with some sort of social seclusion during a period of time that usually lasts from two to eight weeks. These practices are known as strict diets in Chazuta (*dietas estrictas* or *dietas fuertes* in Spanish, or *sama* in Quechua).

In early visits of one of the authors (JS) to Chazuta region (2003 and 2004), we observed that strict diets are mainly used whether to restore or invigorate human health, for hunting and fishing preparedness, and are also part of a ritualistic way of life and healing, mainly among men. In any case, strict diets seem to operate an intense experience that in Chazuta is considered medicinal because: (a) always produce depurative effects, (b) usually originate other physiological or pharmacological effects that are considered to strengthen health or to be useful against musculoskeletal or infectious ailments, and (c) sometimes induce holotropic states of consciousness, i.e. states that are oriented toward feelings of wholeness. We also observed that strict diets appeared to maintain a general structure. The elements that presented some variability are length, level of seclusion and herbal preparations taken. The present work is aimed, in part, to describe these practices of Chazuta and confirm or not these early observations.

These practices take place in a context of a traditional medicine that usually sets food restrictions and other norms with the general use of plant remedies (Sanz-Biset et al., 2009). This is what in Chazuta stands for *dieta* and gives meaning to the expression *dietar plantas*, which one can easily hear there. The popular believe is that unlike "medicines from pharmacies", plant remedies need certain and careful time to work. In general, plant remedies are taken daily during a period of time in which will be recommended to rest, to moderate sexual activity, as well as cut off heavy food, alcohol, and the use of perfumes or the exposure to other strong odours. Compliance with these restrictions is considered fundamental if healing wants to be obtained from plant remedies. Recurrently is stressed

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how: *en la dieta está la curación*, i.e. that healing is found in the diet itself (rather than only in the plants). The elements avoided by diets are considered with the potential to inactivate the effects of plant remedies (*cortar la dieta*, i.e. to cut the diet), to cause harm by interacting with plant medicines (*cruzar la dieta*, *tener cutipa*, i.e. to cross the diet, to experience bad reactions), or both.

In many traditional medical systems of other regions of the Peruvian Amazon is usual to find dietary and other restrictions with plant use. Also, in these other regions is usual to find practices like the strict diets of Chazuta, in which diet restrictions increase to a point where plant remedies are consumed with nearly fasting and with some sort of seclusion. These strict diet like practices have been found and described among various ethnic groups of north-western Amazonia, such as the Aguaruna (Guallart, 1989), Chayahuitas (Reagan, 1983), Cholones (Poeppig, 1835), Iquitos' mestizos (Luna, 1986), Lamas Quechua (Scazzocchio, 1979), Matsigenka (Baer, 1979), Napo Quechua (Iglesias-Palacios, 1989), Secoya (Payaguaje, 1994), Shipibo (Cárdenas-Timoteo, 1989), Shuar (Fericgla, 1994), Ufaína (Hildebrand, 1983) and Yagua (Chaumeil, 1979). However, these studies use to mention very little about the medicinal uses of such practices and are mainly focused on their ritualistic use.

Moreover, in different parts of the world fasting has been practised by humankind for religious purposes, own discipline, political intentions and as a mean of restoring health. Historically, the reasons to fast have involved both medicinal and religious or spiritual issues. Many religions have a component of fasting entailed (Lützner, 1999). In the beginning of the XX century the interest in fasting as a medical treatment revived in Europe and in the U.S.A. (Kerndt et al., 1982). Nowadays, fasting is still used as a therapeutic method. Fasting as a medical treatment is claimed to be a valuable therapeutic method for chronic and acute diseases in most ethnomedical systems. However, the effects of therapeutic fasting have been studied only for a few indications (Michalsen et al., 2005).

Indeed, some strict diets in Chazuta also have a ritualistic component. Certainly, some strict diets in Chazuta are part of a ritualistic way of men's life. Periodically, men used to fulfil strict diets in order to be prepared and to strengthen their body so to be a proper *chacarero* (farmer), *montaraz* (hunter) or *mitayero* (worker). All these terms partially compile what used to be the man ideal of the region, i.e. a capable, strong and healthy individual able to sustain his family and clan who since recently mainly depended upon the food harvested from orchards, the animals hunted in the jungle and fished in rivers, as well as upon the maintenance of a certain social balance (Salas-Fasabi, 2001; Weiss, 1949).

In our previous journeys to Chazuta, we also observed that, normally, the first strict diet takes place in adolescence. This usually marks the passage to adulthood for young boys. After completion of what usually is the first strict diet of men, a proper ability to hunt as well as the strength required for an adult is expected to be obtained. Afterwards, adult men will perform other strict diets during life in order to keep health, against illnesses or for hunting and fishing preparedness (in part due to the depuration experienced in this kind of stricter diets where most of the corporal odour is lost, hence making human presence unnoticeable for wild animals which then become easier whether to hunt or fish). Even dogs are forced to complete strict diets prior to hunting expeditions or just to tonic them to make them better hunters. They are leashed, imposed to fast, and forced to drink plant remedies, which are administered with the help of a funnel.

In addition, we saw that other juvenile period in which strict diets were common was months before youngsters went to serve in the army, which was compulsory in the past. To complete the military service was seen as a great challenge for adolescents. There, they needed to resist great hunger, coldness, and outbrave beatings and similar abuses. Thus, youngsters completed strict diets as a preparation, in part to resist these maltreatments. In addition, strict diets were also frequent when returning from the army so to recuperate an optimal physical and mental state.

Another ambit where strict diets become rites of passage occurs, much more rarely, in the sphere of *vegetalistas*, a kind of medicine men common in the region. Many *vegetalistas* become healers following a similar pattern: an ill man undergoes a strict diet in order to find cure. In the ascetic conditions of fasting and seclusion, the spirits of the plants ingested with the herbal preparations not only cure but also teach how to heal. During these initiations, this knowledge is said to be transmitted within mystical experiences through: (a) dreams in which apprenticeship is received and, (b) chants (known as *ikaros*) that are said to come from these plant spirits and which the dieter will hear spontaneously coming from the forest. Afterwards, in their healing sessions and rituals, *vegetalistas* chant these *ikaros* they learnt to invoke spirits, sometimes while having an ecstatic experience which is not always produced by the ingestion of plants. Therefore the term *vegetalista* (from the Spanish word *vegetal* which means "plant") indicates not only the use of plants in their practice but also the origin of their knowledge since the spirits of certain plants are considered the truly teachers of them (Luna, 1984a, 1984b, 1986).

However, in Chazuta, even when strict diets show an important ritualistic component, the main motivation for their practice seems to be for medicinal purposes: the young men need to strengthen their body and the future *vegetalistas* look for cure. This pragmatism drew our attention: it was observed how during the wet season strict diets used to be widely practised, mainly to prevent and restore health. Interviewing locals, many times the same sentences were repeated. That with strict diets there was an increase in work performance, enhancement of physical endurance (*hacerse más bizarro*) capability to carry heavier weights, better resistance of colder conditions, feeling more awake, loss of laziness (*dejar de ser arragán*), higher difficultness to become ill, alleviation of rheumatic pains, cure of illnesses, the loss of corporal odour, optimization of sexual function as well as gaining the curious faculty of rising attraction of the opposite sex.

On the contrary, spirits where hardly mentioned. But indeed, some informants said to have had some odd experiences. Maybe few heard chants but many other perceived simpler sounds or noises. Intense dreams were frequent, as well as the encounter with different animals (often venomous snakes) which were believed to be transformations of plant spirits. All these different kinds of experiences are seen as good signs when occur. It is thought that when plant spirits start to appear like this, they are just testing the courage of the dieter. It is considered that if one wants the remedy and the diet to produce the desired effect, it is necessary to not be intimidated by the strange noises, resist the intensity of the chants heard and avoid disturbing any animal that might be encountered (i.e., to prevent scaring plant spirits in order to allow them to "stay" and cure).

Besides *vegetalistas*, only few people seem to experience non ordinary states of consciousness of a mystical nature during strict diets. When they occur, these kinds of experiences are considered the origin of healing and as mentioned earlier, they may also become initiations into the domain of *vegetalistas*. Following the interpretation of Grof (1998), this kind of experiences fall into the category of holotropic states of consciousness.

Holotropic literally is "oriented toward wholeness" from the Greek *holos* = whole, and *trepein* = moving toward. In holotropic states, consciousness is changed qualitatively in a very fundamental way, but is not grossly impaired. In addition, the content of holotropic experiences is often spiritual or mystical. Holotropic states of consciousness have many different forms and occur under a variety of circumstances. Primitive cultures have developed mind-altering techniques combining chanting, breathing,

drumming, rhythmic dancing, fasting, social and sensory isolation, extreme physical pain, and others. These have been used in shamanic procedures, healing ceremonies and rites of passage, and many cultures have used psychedelic plants for these purposes (Eliade, 2001).

The therapeutic use of holotropic states of consciousness is considered a recent development in Western psychotherapy (Grof, 1995). Paradoxically, it is also one of the oldest forms of healing and can be traced back to the dawn of human history.

2. Aim of the study

Strict diets in Chazuta show three main elements that define these special practices: the use of plants, fasting and social seclusion. These types of practices, which are not rare to find among other indigenous cultures, represent complex topics of study that require a multidisciplinary approach. From an ethnopharmacological point of view, this paper is mainly focused in one of the three major elements that define strict diets, i.e. the use of plants. As far as we know, previously published studies on strict diet like practices lack on reporting accurate determination of the plants used. Moreover, in these earlier works, the investigation of strict diet like practices was usually restricted to the study of shamanism. The wide field of applications found in Chazuta for these practices opens the possibility for a wider analysis and an accurate description of them.

The aim of this work was to describe these practices of Chazuta and the use of plants within, as well as to analyse the possible functions of the last.

3. Materials and methods

The Chazuta district is located in a narrow valley that the Huallaga River opens in its pass through the easterly part of the San Martin Department of Peru. At present, Chazuta represents one of the main reservoirs of the San Martin Quechuas (also known as Lamas Quechuas) and their culture. They are considered the third most numerous indigenous group alive in the Peruvian rainforest. The information was obtained through semi-structured interviews to the 6.3% of the district rural adult population (140 individuals, 60% men, 40% women, 75% of which was considered Quechua). The data presented in this paper is based in a wider fieldwork performed in the studied region from October 2004 to August 2005. In a previous work about the medicinal plants of Chazuta (Sanz-Biset et al., 2009), precise information was already given on the study site, its ethnicity, the demography, its socio cultural context, the historical background, the present medical system of Chazuta, how the selection of informants was done for the study, the type of interviews used, how plants were collected and how local consent for the investigation in Chazuta was obtained. Moreover, permit for the collection and exportation of voucher herbarium specimens was covered by official authorisations issued by the Agricultural Ministry of Peru's INRENA: Collection licence 087-2004-INRENA-IFFS-DCB and Exportation permit 005780-AG-INRENA.

Initially, voucher herbarium specimens were identified by Peruvian botanists José Campos de la Cruz, Mirbel A. Epiquien Rivera and curators of the USM Herbarium of Lima: Hamilton Beltran and Severo Baldeon Malpartida. Later, voucher herbarium specimens where sent to the following specialists: P. Acevedo (US), W.R. Anderson (MICH), C.C. Berg (L), J.R. Botina-Papamija (CUVC), G. Bramley (K), R. Callejas (HUA), N. Cuello (PORT), H. Esser (M), C. Frasier (CHRB), P.A. Fryxell (TEX), B.E. Hammel (MO), B.K. Holst (SEL), J.A. Kallunki (NY), R.W. Kiger (CM), L.G. Lohmann (SPF), J.A. Lombardi (HRCB), L. Landrum (ASU), G.P. Lewis (K), R. Liesner (MO), P.J.M. Maas (U), J.F. Morales (INB), T. Pennington (K), G. Prance (K), J. Ricketson (MO), B. Stannard (K), C. Taylor (MO) and D. Wasshausen (US). Moreover, identification of a few specimens were confirmed through photographs sent to: G. Aymard (PORT), K.M. Cameron (NY), X. Cornejo (GUAY), J. Dorr (US), S. Dressler (FR), L. Fernández-Alonso (COL), R.B. Foster (F), M.H. Gustafsson (AAU), again J.P. Janovec (BRIT), C.C.H. Jonkind (WAG), S. Knapp (BM), W.S. Judd (FLAS), H.C. de Lima (RB), H. Rainer (WU) and M. Simmons (CS).

Sets of the voucher herbarium specimens have been deposited in the BCN Herbarium of Barcelona (Catalonia), and in the USM Herbarium of Lima (Peru).

Results were confronted to the existing literature, mainly in the fields of ethnomedicine, bioactivity and phytochemistry. Napralert was the main database used.

4. Results and discussion

In this section results are shown and discussed in the following sequence. First, quantitative results obtained in recording strict diets in Chazuta valley, their chronological structure, characteristics of fasting and seclusion found in these practices, the plants used, with the special case of Bachuja mixtures, their local nomenclature, the plant types and parts used, as well as the herbal preparations, modes of administration and medicinal uses are reported. Then, the function of plants in strict diets is analysed and discussed in view of ethnomedical, phytochemical and bioactivity literature data found for the plant species most reported in strict diets.

4.1. Strict diets reported

Altogether, 122 strict diets were reported in the survey. Of the 140 individuals interviewed, 42 (30%) had performed strict diets; 38 were men and 4 were women. Of these 42 persons, 37 were born in the valley, 3 in other San Martin Department's Districts, and 2 were born in other parts of Peru. Overall, 52% of all men born in Chazuta that were interviewed had taken plant remedies with secluded fasting (Table 1).

Moreover, 83% (35) of all individuals that have followed strict diets were considered Quechua. Only 7 non-considered Quechua individuals had taken plants with secluded fasting: 1 was born in Chazuta, 5 had been living in the valley for more than 20 years and another one for more than 10 years.

4.2. Chronological structure of strict diets

Even though strict diets reported in the survey showed different characteristics, (e.g. length, indication, plants used, and level of restriction), most of these diets showed great similarity and had in

Table 1
Frequency of strict diet performance by origin and genre of the informants of Chazuta valley (Peruvian Amazon).

	No. of individuals interviewed	Have performed strict diets	Have not performed strict diets
Born in the Chazuta district	111 (63 men and 48 women)	37 (33 men and 4 women)	74 (30 men and 44 women)
Born in the San Martin Department but in Chazuta district	10 (7 men and 3 women)	3 (3 men)	7 (4 men and 3 women)
Born in Peru but in the San Martin Department	19 (15 men and 4 women)	2 (2 men)	17 (13 men and 4 women)
Total	140 (85 men and 55 women)	42 (30%) (38 men and 4 women)	98 (70%) (47 men and 51 women)

Stage	I	II	III	IV
Relative temporal length	t	t	t	3t
Seclusion	Yes		No	
Salt limitation and fasting	Yes		No	
Ingestion of plant remedies	Yes	No		
Level of restrictions	High		Medium	Low

Fig. 1. Chronological structure and general characteristics of strict diets performed in Chazuta valley (Peruvian Amazon). Concerning the length of stages, *t* can be a few days up to one month, exceptionally it can be several months.

common a proportional structure in time which can be divided in 4 chronological stages, as shown in Fig. 1.

In stage I, the dieter rests in the secluded site under a high level of restrictions: herbal preparations, water and very few plantains are likely to be the only things ingested. Once the consumption of plant remedies is over, dieters usually carry on nearly fasting in seclusion for the same time it took to ingest herbal preparations before; this period, still with seclusion and fasting but without plant remedies, corresponds to the second stage. In some strict diets this second phase does not exist, and the third stage comes just after the first one. Then, the seclusion ends just after the consumption of plant remedies. Usually, the secluded fasting period (i.e. stage I + stage II) lasts from one week up to two months.

Stage III starts when the seclusion ends and salt is permitted to ingest again. To mark this passage in which these two major diet norms are ceased, a short ritual is sometimes performed. Then, the carer chants and blows tobacco smoke on the first salted meal that the still secluded dieter is about to eat. This is known as *cortar la dieta con sal* (to cut the diet with salt – here, "to cut" does not have the negative meaning mentioned earlier, here represents a proper way to call to an end this diet's initial period). The chants that were observed in these rituals use to call upon plant spirits for their help in giving health to the dieter, and protecting him/her from possible elements likely to originate adverse effects. These rituals are performed more often when the carer is a *vegetalista* traditional healer. Even though dieters leave the seclusion state when the first salted meal is eaten, many still stay in semi seclusion for some days after. Although many restrictions are still present in this third phase, the consumption of white meat (e.g. hens, armadillo), non greasy meat (e.g. *picuro*, a type of agouti), eggs and manioc is often permitted.

Each of these three stages last usually the same. However, the fourth and last stage is the longest one. If each of the first three stages lasted one month, the fourth period can go on easily for another three months. In this last phase dieters come back to their normal daily life but still have some restrictions to accomplish, such as sexual abstinence, ingestion of red and greasy meat as well as the consumption of alcohol. Due to the difficultness of not transgressing the norms when the taboos are so close (in this period many return to the settlements and some might make short visits to the neighbouring cities), it is considered very easy to waste (cut or cross) the whole diet in this final period. And consequently, to lose any positive outcome that might have been gained with the performance of the strict diet.

4.3. The food regime in strict diets

At the initial stages (I and II) of a strict diet, other than water and plant extracts or decoctions, only a very few unripe plantains and very rarely also some fish, are ingested daily. Like in many tropical regions, plantains are the staple food in Chazuta. They are the main thing – sometimes the only – eaten for breakfast, lunch and dinner. But when consumed in strict diets, the smaller and thinner plantains are selected. Then, the unripe fruits are boiled (*inguiri* in Quechua) or roasted (*karanti* in Quechua) and taken solid or as a purée. Fish is more common to be included in these special regimes during the dry season, since is then when fish is more available in the region. Only a few species are suitable to consume in strict diets, such as *boquichico* and *racta cara* (since are forbidden any animals with horns, claws, sharp spines, especially harsh or black stained skin or scales, or particularly pronounced teeth). Fish must be caught with a fishing cast net, and never with the help of hooks, poisons or dynamite. Again, the smaller ones are preferred and just a few are ingested daily.

Besides all these restrictions, the use of tobacco is sometimes allowed in the form of smoking the dried plant leaves in a pipe or the locally known *mapachos* (cigarettes made just of tobacco leaves soaked in liquor, dried, grounded and rolled in thick paper).

The restriction of the salt intake seems to be a major one. It is only found when secluded fasting is prescribed and vice versa. Due to its scarcity in the Amazon, salt used to be one of the most valued items in the area until very recently, when marine salt became widely available. Interestingly, one of the biggest salt mines of the Peruvian Amazon is found in the Chazuta valley settlement of Callanayaku. Callanayaku was an important salt trade centre in pre-Columbian times, but nowadays the mine is underused. However, locals still prefer that type of salt for the preservation of meat and fish and they still use it (Fig. 2). Thus, what observed in Chazuta would agree with the salt taboos studied by Kroeber (1941) among North American indigenous and by Wörrle (1996) among Latin American Indians. These authors coincide that generally, an object must be easy to obtain and be highly desired before the existence of a strong motivation to forbid it.

With the restriction on salt intake together with the nearly fasting regime, diuretic activity is enhanced and body fluids are highly eliminated. Moreover, the depurative process must be raised by the ingestion of potassium from plantains. Both the herbal preparations ingested (with marked emetic and laxative effects) and the diet themselves, are referred as *purgas* (purges in English) due to their inherent depurative effect.

4.4. The seclusion in strict diets

To perform the seclusion, the dieter (i.e. who does the diet) usually stays far from settlements, nearly within the forest, in a *chacra* (orchard) which usually belongs to his/her own/family. In Chazuta as well as in other San Martin Quechua areas, each household usually owns a piece of land (normally a few hectares), known as *chacra* (orchard), where cultivation is practised and forest resources exploited. There, a house that serves as a secondary or field residence is found since the main home is usually situated in one of the main settlements. Due to the increase in demography, new orchards are placed farer every time from the communities, usually being a few hours walk away. It is in these distant and isolated settings that the sometimes necessary social seclusion for strict diets is found.

Normally, a carer accompanies the dieter, who usually is a family member of the later or exceptionally a *vegetalista* traditional healer.

Fig. 2. Grounding salt of the Callanayacu mine, used to preserve fish caught in the Chazuta valley.

If the second is the case, diets can be performed in the orchard of the healer and some sort of economic deal is accorded for the curing services (e.g. some hens, one pig, few days of work or just some money). The carer is responsible to bring water, plant remedies, and the few plantains. Furthermore, the carer has to follow some sort of less strict diet which is indicated necessary for the success of the patient's diet. They both can be in restricted contact with people as long as the diet rules are not broken. Mostly, the houses found in the orchards might be good enough for both. However, sometimes the seclusion prescribed is so severe, that obliges the dieter to stay even more isolated. Then, small huts (Fig. 3) are used instead. In these huts human activity is nearly unnoticeable. In this kind of restrictive setting, is when the carer is the only person that the dieter sees.

Absolute rest is habitually prescribed to the dieter who will spend most of the time inside the house or hut, lying in a hammock or a bed made of bamboo stems. Generally, bathing is not permitted either. The dieter only leaves the hut for basic needs: a few meters from there two holes are dug in the ground, one is used to throw the vomits induced by the ingestion of plant remedies, and the other is for faeces. Here sexual abstinence is of major importance. Informants declare that is with the transgression of this rule that the worst adverse reactions can happen, such as madness, or some sort of acute edema in other occasions, and that very rarely but possibly, this can lead to death.

4.5. Plants used in strict diets

On the whole, 318 plant species used for medicinal purposes by people living in the Chazuta district were collected and identified

Fig. 3. Hut-type where the fasting stages of the strict diets with severer seclusion are usually completed.

(Sanz-Biset et al., 2009). One hundred and six of these plants were taken in strict diets, 29 of which exclusively in these diets.

Of these 106 plant species, 39 are listed in Table 2. The remaining 67 species are only used in a special type of herbal mixtures known as *bachuja* mixtures. These mixtures can also include five of the plants already listed in Table 2. These 72 plants reported to be used in *bachuja* mixtures are listed in Table 3.

These 106 species are represented by 43 different families of vascular plants, of which the following have the highest number of species: Clusiaceae (16 species), Moraceae (15), Fabaceae (9), Rubiaceae (7), Apocynaceae and Solanaceae (4 each). Altogether, 75 genera are represented, the following occurring more often: *Ficus* (13 species), *Clusia* (9), *Tovomita* (5), *Ceiba*, *Dicranopygium*, *Inga*, *Psychotria*, *Strychnos*, *Swartzia* and *Tabernaemontana* (2 each).

The plants most times used with strict diets were *Tovomita* aff. *stylosa* (34 reports), *Tovomita foldatsii* (29), *Calliandra angustifolia* (21), *Brunfelsia grandiflora* (14), *Maytenus* aff. *macrocarpa* (15), *Zygia longifolia* (13), *Petrea* sp. (12), *Allosanthus trifoliolatus* (12), *Mansoa alliacea* (11), *Clusia* aff. lineata, *Dicranopygium* aff. *lugonis*, *D. yacusisa* and *Tabernaemontana sananho* (10 reports each), *Ficus trigona* and *Rourea puberula* (7 reports each).

For the plants with more than 2 use reports in strict diets, Fig. 4 shows a comparison of the number of reports found in the present work with those reported previously by Sanz-Biset et al. (2009) for medical uses outside strict diets in Chazuta, and also with those citations found in the ethnomedical literature. Some plants are frequently used in and outside strict diets in Chazuta, and show many citations in the ethnomedical literature, such as *Brunfelsia grandiflora*, *Maytenus macrocarpa*, *Tabernaemontana sananho*, *Mansoa alliacea*, *Calliandra angustifolia* and *Tabernaemontana undulata*. Nevertheless, the two plant species most frequently used in strict diets (*Tovomita* aff. *stylosa* and *T. foldatsii*), as many others listed in Fig. 4, have not been found previously mentioned outside Chazuta in the ethnomedical literature.

4.6. The Bachuja mixtures

The plant remedy known by informants as either *bachuja* or *mezcla de palos* was the most reported (35 times) in the survey for being taken in strict diets. It consists of distinct mixtures of different number of plants which are listed in Table 3. This herbal preparation is considered by informants as the panacea of Chazuta.

The term *bachuja* is also used to name the plant that is almost always present in the mixture (i.e. *Tovomita* aff. *stylosa* in 34 of the 35 reports, and *Tovomita brasiliensis* in the remaining report).

Table 2
Plants taken in strict diets in Chazuta valley (Peruvian Amazon).

Scientific name[a] (C=Cultivated and/or W=wild) (Voucher herbarium specimen)	Local name	Part used	Use reports	Use or disease[b] treated (*N*)=(no. of reports)	Mode of preparation and administration[c]
Agarista albiflora (B. Fedtsch. & Basil.) Judd (Ericaceae) (W) (BCN 40181)	Tupashairi	Leaf	5	Hfp for dogs (4)	Decocted and given orally to dogs. Also, male dogs are castrated to make them better hunters; the wound is stitched and covered with a poultice made with the roasted leaves, which the animal licks
				Hfp for dogs (1)	Into the decoction *Capsicum annuum* fruits are added; it is given orally to dogs
Annona ambotay Aubl. (Annonaceae) (W) (BCN 44890)	Opefico	Stem	6	Hfp for dogs (5)	Slightly boiled with the whole plant of *Justicia pectoralis* and given orally to dogs. Also, male dogs are castrated to make them better hunters; the wound is stitched and covered with a poultice made with the roasted stem of *A. ambotay* and the roasted whole plant of *J. pectoralis*, which the animal licks
				Hfp for dogs (1)	The decoction is mixed with *Capsicum annuum* fruits and given orally to dogs
Aspidosperma rigidum Rusby (Apocynaceae) (W) (BCN 40686)	Tashkum remo kaspi, Remo kaspi	Bark	2	Ht (1)	Decocted with the root bark of *Tabernaemontana undulata*
				Ht (1)	Decocted with *Tovomita aff. stylosa* and other plants to prepare one of the popular Bachuja mixtures (see Table 3)
Banisteriopsis caapi (Spruce ex Griseb.) C. V. Morton. (Malpighiaceae) (C) (BCN 40135)	Ayawaska negra, A. amarilla, Purgawaska	Stem	1	Pulmonary disease (1)	Decocted with *Psychotria viridis* leaves
Brosimum alicastrum subsp. *bolivarense* (Pittier) C.C. Berg (Moraceae) (C&W) (BCN 40699)	Manchinga	Latex	3	Rh (3)	One spoonful of the latex is mixed with warm water
Browneopsis cf. *cauliflora* (Poepp.) Huber (Fabaceae) (W) (BCN 40242)	Runa kaspi	Bark	1	Vt (1)	Decoction
Brunfelsia grandiflora D.Don. subsp. *grandiflora* (Solanaceae) (C) (BCN 40340)	Chirik sanango	Root bark	14	Rh (12), Ht (1), Ih (1)	Macerated in fresh water
Callaeum antifebrile (Griseb.) D. M. Johnson (Malpighiaceae) (C&W) (BCN 40246)	Shillinto blanco, Shillinto negro	Stem	5	Ab (1), Uta (1), Chronic sinusitis (1), Tumors (1), AIDS (1)	The crushed stem, (sometimes previously roasted), is macerated in fresh water. Normally, a single dose is given
Calyptranthes bipennis O. Berg (Myrtaceae) (C) (BCN 40119)	Guayusa macho Ullku guayusa	Leaf	1	Ht (1)	Infusion
Capsicum annuum L. (Solanaceae) (C) (BCN 40184)	Pukunuchu	Fruit	4	Hfp for dogs (1)	Mixed with the infusion of *Justicia pectoralis* whole plant; it is given orally to dogs
				Hfp for dogs (1)	Mixed with the decoction of *Leonia glycycarpa* bark and leaves; it is given orally to dogs
				Hfp for dogs (1)	Mixed with the decoction of *Agarista albiflora* leaves; it is given orally to dogs
				Hfp for dogs (1)	Mixed with the decoction of *Annona ambotay* stem; it is given orally to dogs
Ceiba insignis (Kunth) P.E. Gibbs & Semir.(Bombacaceae)(W)(BCN 40349)	Lupuna negra	Trunk and root bark	1	Vt (1)	Decocted or macerated in fresh water

Ceiba samauma (Mart.) K. Schum (Bombacaceae) (W) (BCN 40350)	Wimba lupuna	Trunk and root bark	1	Vt (1)	Decocted or macerated in fresh water
Coccoloba sp. (Polygonaceae) (W) (JSB-187)[d]	Ocha baja	Bark	1	Vt (1)	Decoction
Couepia chrysocalyx (Poepp.) Benth. ex Hook. f. (Chrysobalanaceae) (W) (BCN 44897)	Parinari	Bark	1	Tumors (1)	Decocted with Remijia megistocaula, Smilax longifolia and Trichilia maynasiana (moreover, the fruit is eaten)
Esenbeckia amazonica Kaastra (Rutaceae) (W) (BCN 40831)	Munichi sacha	Leaf	2	Ht (2)	Decoction
Ficus trigona L.f. (Moraceae) (C&W) (BCN 40702)	Millwa renaquillo, Millwa renaco, M.r. macho, M.r. hembra, M.r. de hoja ancha, M.r. de hoja pequeña	Bark	7	Ht (1)	Decoction
				Ht (2), Rh (1), Uta (1)	Decocted with *Tovomita aff. stylosa* and other plants to prepare some of the popular Bachuja mixtures (see Table 3)
				Ht (1), Rh (1)	Macerated in fresh water with *Tovomita aff. stylosa* and other plants to prepare some of the popular Bachuja mixtures (see Table 3)
Gallesia integrifolia (Spreng.) Harms. (Phytolaccaceae) (W) (BCN 40894)	Ajoskiro	Root bark	1	Vt (1)	Decoction
Heliconia acuminata Rich. (Heliconiaceae) (W) (BCN 40361)	Mishki panka	Leaf	1	Hfp (1)	Infusion, for drinking and bathing
Hymenolobium nitidum Benth. (Fabaceae) (W) (BCN 40174)	Marimari	Bark	1	Vt (1)	Decocted or macerated in fresh water
Iriartea deltoidea Ruiz & Pav. (Araceae) (W) (BCN 40330)	Wakra pona	Stilt root	1	Vt (1)	Decocted or macerated in fresh water
Justicia pectoralis Jacq. (Acanthaceae) (W) (BCN 40689)	Crespo	Whole plant	6	Hfp for dogs (5)	Slightly boiled with the stem of *Annona ambotay* and given orally to dogs. Also, male dogs are castrated to make them better hunters; the wound is stitched and covered with a poultice made with the roasted stem of *A. ambotay* and the roasted whole plant of *J. pectoralis*, which the animal licks
				Hfp for dogs (1)	Into the infusion *Capsicum annuum* fruits are added; it is given orally to dogs
Leonia glycycarpa Ruiz & Pav. (Violaceae) (W) (BCN 40839)	Ituchi runtu	Bark and leaf	1	Hfp for dogs (Doctrine of Signatures) (1)	Into the decoction *Capsicum annuum* fruits are added; it is given orally to dogs
Mansoa alliacea (Lam.) A.H. Gentry. (Bignoniaceae) (C&W) (BCN 40100)	Ajo sacha macho/hembra	Stem and root bark	11	Rh (8), Ht (1)	Macerated in fresh water
				Hfp for dogs (2)	Macerated in fresh water; it is given orally to dogs
Maytenus aff. *macrocarpa* (Ruiz & Pav.) Briq. (Celastraceae) (W) (BCN 40217/40218)	Chuchuwasha Chuchuwasha Blanca	Bark	15	Ih (1), Bb (1)	Decoction
				Ht (3), Rh (1), Bb (1), Uta (1)	Decocted with *Tovomita aff. stylosa* and other plants to prepare some of the popular Bachuja mixtures (see Table 3)
				Rh (4), Ht (2), Ih (1)	Macerated in fresh water with *Tovomita aff. stylosa* and other plants to prepare some of the popular Bachuja mixtures (see Table 3)
Phthirusa stelis (L.) Kuijt (Loranthaceae) (C) (BCN 40133)	Suelda con suelda de hoja menuda, Pishku isman de hoja menuda	Stem	2	Ih (1)	Decoction
				Rh (1)	Macerated in fresh water with *Tovomita aff. stylosa* and other plants to prepare one of the popular Bachuja mixture (see Table 3)

Table 2 (*Continued*)

Scientific name[a] (C=Cultivated and/or W=wild) (Voucher herbarium specimen)	Local name	Part used	Use reports	Use or disease[b] treated (*N*)=(no. of reports)	Mode of preparation and administration[c]
Physalis angulata L. (Solanaceae) (W) (BCN 40877)	Bolsa mullaka	Whole plant	1	Malaria (1)	Infusion
Piper callosum Ruiz & Pav. (Piperaceae) (C&W) (BCN 40846)	Guayusa macho Guayusa hembra	Leaf	2	Ht (2)	Infusion
Poulsenia armata (Miq.) Standl. (Moraceae) (W) (BCN 40578)	Yanchama blanca Yanchama negra	Latex	1	Rh (1)	A few spoonfuls are mixed with warm water
Pseudobombax septenatum (Jacq.) Dugand (Bombacaceae) (W) (BCN 40196)	Ponga	Trunk and root bark	1	Vt (1)	Boiled or macerated in fresh water
Psychotria viridis Ruiz & Pav. (Rubiaceae) (C) (BCN 40296)	Chakruna Chakruna negra	Leaf	1	Pulmonary disease (1)	Decocted with crushed stems of *Banisteriopsis caapi*
Remijia megistocaula K. Krause (Rubiaceae) (W) (BCN 40270)	Capirona Blanca	Bark	1	Tumors (1)	Decocted with Couepia chrysocalyx, Smilax longifolia and Trichilia maynasiana
Renealmia aromatica (Aubl.) Griseb. (Zingiberaceae) (W) (BCN 40836)	Ñukñuk panka	Leaf	1	Hfp (1)	Infusion, for drinking and bathing
Smilax longifolia Rich. (Smilacaceae) (W) (BCN 40850)	Zarza Zarzaparrilla	Root	1	Tumors (1)	Decocted with Couepia chrysocalyx, Remijia megistocaula and Trichilia maynasiana
Sterculia sp. (Sterculiaceae) (W) (BCN 40239)	Sapuena	Bark	1	Vt (1)	Decoction
Strychnos ramentifera Ducke (Loganiaceae) (W) (USM 206354)	Suifa, Waska chuchuwasha	Stem	2	Malaria (1) Ih (1)	Decoction Macerated in fresh water with *Tovomita aff. stylosa* and other plants to prepare one of the popular Bachuja mixtures (see Table 3)
Strychnos solimoesana Krukoff (Loganiaceae) (W) (USM 206381)	Suifa, Waska chuchuwasha	Stem	1	Rh (1)	Decoction
Tabernaemontana sananho Ruiz & Pav. (Apocynaceae) (C&W) (BCN40859)	Uchu sanango	Root bark	10	Ht (5), Rh (3), Ih (1), Intestinal parasites (1)	Macerated in fresh water
Tabernaemontana undulata Vahl (Apocynaceae) (C&W) (BCN 40725)	Ushpawasha sanango, Ayac sanango	Root bark	5	Rh(2), Ht(1), Malaria (1) Ht (1)	Decocted or macerated in fresh water Decocted with the bark of *Aspidosperma rigidum*
Trichilia maynasiana C. DC. (Meliaceae) (W) (BCN 44884)	Shatunillu	Bark	1	Tumors (1)	Decocted with Couepia chrysocalyx, Remijia megistocaula and Smilax longifolia

[a] In addition, Tobacco and Camalonga plants were mentioned to be used with fasting but no voucher specimens could be collected. Tobacco leaves are allowed to smoke during strict diets. Camalonga was used once in a secluded fast to heal an abscess; this last report does not count as a result in this paper. Giove (2002) identifies one specimen called camalonga as *Strychnos* sp. Moreover, *Cornutia microcalycina* Pav. ex Moldenke (Verbenaceae; C&W; BCN 40316; local name: shinkurisacha; plant part used: leaves) is employed to treat "diet cutipas", i.e. bad reactions originated when the norms that regulate activities and food ingestion during *dietas* are exceeded (mode of preparation and administration: boiled, for bathing and also taken orally) (Sanz-Biset et al., 2009).

[b] **Ab**, Abscess; **Bb**, Broken bones; **Hfp**, For hunting and fishing preparedness; **Ht**, Health tonic; **Ih**, Inguinal hernia; **Rh**, Rheumatism; **Uta**, probably refers to leishmaniasis; **Vt**, *Vegetalista* traditional healers use the plant/s to obtain special powers.

[c] Unless otherwise stated the *mode of administration* is oral and taken by humans.

[d] BCN and USM codes unavailable. Instead, the collection number, i.e. *Jsb-xxx*, is provided. If needed, a duplicate must be found in USM (Lima), where these specimens were yet to enter.

Table 3
Plants taken in strict diets being part of *Bachuja* mixtures in Chazuta valley (Peruvian Amazon).

Scientific name[a] (Family) (C, cultivated and/or W, wild) (Voucher herbarium specimen)	Local name	Part used	Use-reports	Use or disease[b] treated (reports)	Mode of preparation[c] (D, decoction) (M, maceration in fresh water)
Allosanthus trifoliolatus Radlk. (Sapindaceae) (W) (BCN 40140)	Acero waska negra	Stem	12	Ht (3), Rh (3), Uta (1) Ht (4), Ih (1)	D M
Ardisia huallagae Mez. (Myrsinaceae) (W) (BCN 40226)	Yaku bushiklla	Whole plant	2	Ht (1), *Flor blanca* (some sort of urine infection) (1)	M
Aspidosperma rigidum Rusby (Apocynaceae) (W) (BCN 40686)	Tashkum remo kaspi, Remo kaspi	Bark	1	Ht (1)	D
Asplundia sp. (Cyclanthaceae) (W) (JSB-263) [d]	Cesto tamushi	Stem	1	Rh (1)	D
Calliandra angustifolia Spruce ex Benth. (Fabaceae) (C) (BCN 40154)	Bobensana	Stem	21	Ht (8), Rh (1), Bb (3) Ht (4), Rh (3), Vp (1) Rh (1)	D M M (with *Tovomita brasiliensis* and other plants)
Capparis sola J.F. Macbr. (Capparaceae) (W) (BCN 46106)	Nina kaspi Nina kaspi de hoja ancha	Bark	1	Ht (1)	M
Carpotroche aff. *longifolia* (Poepp.) Benth. (Flacourtiaceae) (W) (BCN 40258)	Wayra kaspi	Bark	1	Bb (1)	D
Casearia sp. (Flacourtiaceae) (W) (BCN 40087)	Chuchuwasha	Bark	1	Ht (1)	M
Chomelia paniculata (Bartl. ex DC.) Steyerm. (Rubiaceae) (W) (BCN 40305)	Tunchi kasha	Bark	1	Rh (1)	D
Chrysochlamys ulei Engl. (Clusiaceae) (W) (BCN 40227)	Yaku killuwiki	Bark	1	Ht (1)	D
Clusia aff. *flavida* (Benth.) Pipoly (Clusiaceae) (W) (BCN 45073)	Renaco shashkina	Stem	2	Rh(1), Uta(1)	D
Clusia aff. *lineata* (Benth.) Planch and Triana (Clusiaceae) (W) (BCN 44873)	Came, Came renaco	Bark and stem	10	Ht(4), Rh(1), Bb(1) Ht (2), Rh(1), Vp(1)	D M
Clusia aff. *loretensis* Engl. (Clusiaceae) (W) (BCN 44872)	Came	Bark and stem	4	Ht (2), Bb (1) Ih (1)	D M
Clusia aff. *palmicid*a Rich. ex Planch and Triana (Clusiaceae) (W) (BCN 44874)	Came	Bark	1	Rh (1)	M (with *Tovomita brasiliensis* and other plants)
Clusia sp.1. (Clusiaceae) (W) (JSB-271) [d]	Came	Bark	1	Rh(1)	D
Clusia sp.2. (Clusiaceae) (W) (JSB-24) [d]	Came	Bark and stem	2	Ht(2)	D
Clusia sp.3. (Clusiaceae) (W) (USM 207186)	Renaco waska	Bark and stem	2	Ht (1) Ht (1)	D M
Clusia sp.4. (Clusiaceae) (W) (JSB-261)	Came	Bark and stem	2	Ht (1), Rh (1)	M
Clusia sp.5. (Clusiaceae) (W) (JSB-469)	Waska renaco	Bark and stem	1	Ht(1)	D
Condaminea corymbosa (Ruiz & Pav.) DC. (Rubiaceae) (W) (BCN 40271)	Tajetan	Stem	1	Ht (1)	D
Copaifera paupera (Herzog) Dwyer. (Fabaceae) (W) (BCN 40153)	Copaiba	Resin	1	Rh (1)	D
Coussarea brevicaulis K. Krause (Rubiaceae) (W) (BCN 40310)	Lobo sanango	Whole plant	1	Ht (1)	M
Dicranopygium aff. *lugonis* Harling (Cyclanthaceae) (W) (BCN 40083)	Yaku sisa hembra	Aerial root	10	Ht (3), Bb (1), Uta (1) Ht (3), Rh (2)	D M
Dicranopygium yacu-sisa Harling (Cyclanthaceae) (W) (BCN 40082)	Yaku sisa macho	Aerial root	10	Ht (3), Bb (1), Uta (1) Ht (3), Rh (2)	D M
Doliocarpus aff. *dentatus* (Aubl.) Standl. (Dilleniaceae) (W) (BCN 40192)	Paujil chaki, Wika chaki	Stem	1	Ht (1)	D
Erythroxylum sp. (Erythroxylaceae) (W) (BCN 40234)	Yaku koka, Yaku bushiklla	Whole plant	1	Rh (1)	M (with *Tovomita brasiliensis* and other plants)
Eugenia biflora (L.) DC. (Myrtaceae) (W) (BCN 40110)	Yaku bushiklla	Whole plant	2	Ht (1), Bb (1)	D
Ficus americana subsp. *guianensis* (Desv. ex Ham.) C.C. Berg (Moraceae) (W) (USM 206345)	Renaquillo	Bark	1	Ht (1)	M
Ficus caballina Standl. (Moraceae) (C&W) (BCN 40710)	Wakra renaco	Bark	3	Ht (1) Rh (1), Ih (1)	D M

Table 3 (*Continued*)

Scientific name[a] (Family) (C, cultivated and/or W, wild) (Voucher herbarium specimen)	Local name	Part used	Use-reports	Use or disease[b] treated (reports)	Mode of preparation[c] (D, decoction) (M, maceration in fresh water)
Ficus casapiensis (Miq.) Miq. (Moraceae) (W) (BCN 40647)	Yurak renaco, Urku renaco	Bark	2	Ht (1), *Flor blanca* (some sort of urine infection) (1)	M
Ficus eximia Schott (Moraceae) (W) (BCN 40697)	Ojé renaco, Yurak renaco	Bark	1	Ht (1)	D
Ficus macbridei Standl. (Moraceae) (W) (BCN 40696)	Ojé renaco, Ojé yanchama	Bark	1	Ht (1)	D
Ficus vs. *maxima* Mill. (Moraceae) (W) (BCN 40639)	Kaspi renaco	Bark	1	Ht (1)	D
Ficus nymphaeifolia Mill. (Moraceae) (W) (BCN 40638)	Puka renaco	Bark	1	Rh (1)	M (with *Tovomita brasiliensis* and other plants)
Ficus obtusifolia Kunth. (Moraceae) (W) (BCN 208763)	Yaku renaco	Bark	1	Ht (1)	M
Ficus vs. *paraensis* (Miq.) Miq. (Moraceae) (W) (BCN 40711)	Wakra renaco	Bark	1	Rh (1)	M (with *Tovomita brasiliensis* and other plants)
Ficus pertusa L.f. (Moraceae) (W) (BCN 40694)	Pishcu renaco	Bark	1	Ht (1)	M
Ficus tonduzii Standl. (Moraceae) (W) (BCN 40648)	Ojé renaco	Bark	1	Ht (1)	D
Ficus trigona L.f. (Moraceae) (C&W) (BCN 40702)	Millwa renaquillo, Millwa renaco, M.r. macho, M.r. hembra, M.r. de hoja ancha, M.r. de hoja pequeña	Bark	6	Ht (2), Rh (1), Uta (1) Ht (1), Rh (1)	D M
Ficus ypsilophlebia Dugand. (Moraceae) (W) (BCN 40580)	Renaco, Yurak renaco, Killu renaco	Bark	2	Ht (1) Rh (1)	M M (with *Tovomita brasiliensis* and other plants)
Forsteronia graciloides Woodson (Apocynaceae) (C) (BCN 40684)	Sapo waska	Bark	1	Bb (1)	D
Garcinia madruno (Kunth) Hammel (Clusiaceae) (W) (JSB-139) [d]	Charichuelo	Bark	1	Ht (1)	D
Heteropsis flexuosa (Kunth) G.S. Bunting (Araceae) (W) (BCN 40328)	Tamushi	Stem and leaf	1	Ht (1)	M
Hevea guianensis Aubl. (Euphorbiaceae) (W) (BCN 40260)	Shiringa	Latex	1	Rh (1)	D
Hippotis tubiflora Spruce ex K. Schum. (Rubiaceae) (W) (BCN 40277)	Yaku witillu	Stem	1	Ht (1)	D
Inga ruiziana G. Don. (Fabaceae) (W) (BCN 44889)	Puka shimbillu, Rojiende	Bark	1	Ht (1)	M
Inga semialata (Vell.) Mart. (Fabaceae) (C) (BCN 44885)	Urku shimbillu	Bark	1	Ht (1)	D
Marcgravia cf. *crenata* Poepp. ex. Wittm. (Marcgraviaceae) (W) (JSB-250) [d]	Tamushi	Stem	1	Ht (1)	D
Matelea rivularis Woodson (Asclepiadaceae) (W) (BCN 40332)	Bushiklla	Whole plant	1	Rh (1)	M
Maxillaria sp. (Orchidaceae) (W) (JSB-159)[d]	Zapatito	Whole plant	1	Ht (1)	D
Maytenus aff. *macrocarpa* (Ruiz & Pav.) Briq. (Celastraceae) (W) (BCN 40217/40218)	Chuchuwasha, Chuchuwasha blanca	Bark	13	Ht (3), Rh (1), Bb (1), Uta (1) Rh (4), Ht (2), Ih (1)	D M
Petrea sp. (Verbenaceae) (W) (BCN 40266)	Acero waska blanca	Stem	12	Ht (3), Rh (3), Uta (1) Ht (4), Ih (1)	D M
Phthirusa stelis (L.) Kuijt (Loranthaceae) (C) (BCN 40133)	Suelda con suelda de hoja menuda, Pishku isman de hoja menuda	Stem	1	Rh (1)	M
Psittacanthus cucullaris (Lam.) Blume (Loranthaceae) (C) (BCN 40313)	Suelda con suelda, Pishku isman de hoja menuda P. i. de h. ancha	Stem	1	Bb (1)	D
Psychotria carthagenensis Jacq. (Rubiaceae) (W) (BCN 40292)	Yaku bushiklla, Chakruna	Whole plant	1	Ht (1)	D
Rinorea viridifolia Rusby (Violaceae) (W) (BCN 46108)	Yurak varilla	Stem	1	Ht (1)	D
Rourea puberula Baker (Connaraceae) (C) (BCN 40691)	Murku waska	Stem	7	Ht (1), Bb (1), Uta (1) Rh (1), Bb(1), Vp (1), *Flor blanca* (some sort of urine infection) (1)	D M

Ruellia proxima Lindau (Acanthaceae) (W) (BCN 40220)	Yaku bushiklla	Stem	3	Ht (1), Bb (1) Bb (1)	D M
Salacia cordata (Miers) Mennega (Celastraceae) (W) (BCN 40566)	Tambor waska	Bark	4	Uta (1) Rh (2), Bb (1)	D M
Sida setosa Mart. ex Colla (Malvaceae) (C) (BCN 44891)	Sinchi pichana	Whole plant	1	Ht (1)	M
Solanum monadelphum Van Heurck & Müll. Arg. (Solanaceae) (W) (JSB-259) [d]	Lobo toe, Yaku toe	Whole plant	1	Ht (1)	D
Strychnos ramentifera Duke (Loganiaceae) (W) (USM 206354)	Suifa, Waska chuchuwasha	Stem	1	Ih (1)	M
Swartzia arborescens (Aubl.) Pittier (Fabaceae) (W) (BCN 40173)	Nina kaspi, N. k. de hoja menuda	Bark	1	Ht (1)	D
Swartzia simplex (Sw.) Spreng. (Fabaceae) (W) (BCN 40172)	Nina kaspi, N. k. de hoja mediana	Bark	1	Rh (1)	D
Tovomita brasiliensis (Mart.) Walp. (Clusiaceae) (W) (BCN 45070)	Bachuja, Chullachaki kaspi, C. k. macho	Bark	1	Rh (1)	M (with Calliandra angustifolia, Clusia aff. palmicida, Erythroxylum sp., Ficus nymphaeifolia, F. vs. paraensis, F. ypsilophlebia, Tovomita cf. longifolia and Zygia longifolia)
Tovomita carinata Eyma (Clusiaceae) (W) (BCN 44877)	Killuwiki hembra	Bark	1	Ht (1)	M
Tovomita foldatsii Cuello (Clusiaceae) (W) (BCN 44883)	Killuwiki, K. de hoja ancha	Bark	29	Ht(9), Rh(2), Bb(3), Uta(1) Ht(5), Rh(4), Bb(2),Ih(1), Vp(1), *Flor blanca* (some sort of urine infection) (1)	D M
Tovomita cf. *longifolia* (Rich.) Hochr. (Clusiaceae) (W) (BCN 44878)	Killuwiki macho	Bark	1	Rh (1)	M (with *Tovomita brasiliensis* and other plants)
Tovomita aff. *stylosa* Hemsl. (Clusiaceae) (W)(BCN 44882)	Bachuja, Chullachaki kaspi, C. k. hembra	Bark	34	Ht (10), Rh (3), Bb (3), Ab (1), Uta (1), Ht (7), Rh (4), Bb (2), Ih (1), Vp (1), Against *Flor blanca* (some sort of urine infection) (1)	D (with other plants) M (with other plants)
Toxosiphon trifoliatus (Pilg.) Kallunki (Rutaceae) (W) (JSB-145) [d]	Lucero sisa, Lucero sacha	Whole plant	1	Ht (1)	D
Unonopsis sp. (Annonaceae) (W) (BCN 40720)	Icoja Icoja negra	Bark and leaf	1	Bb (1)	D
Zygia longifolia (Humb. & Bonpl. ex Willd.) Britton & Rose (Fabaceae) (W) (BCN 44887)	Yaku shimbillu Untai shimbillu Shimbillu	Bark	13	Ht (2), Bb (3) Ht (2), Rh (2), Bb (2), Ih (1) Rh (1)	D M M (with *Tovomita brasiliensis* and other plants)

[a] In addition, the following plants were reported once but no specimen could be collected: *Nudillo*, *Palo de flor*, *Penca*, *Bombonaje*, *Shupaicasha*, *Trillija*, *Wicungo*, *Supai shimbillu*, *Puma sacha*, *Guayna sacha*, *Alambre kaspi* and *Pan de arbol* (this last one was reported twice).

[b] **Ab**, Abscess; **Bb**, Broken bones; **Ht**, Health tonic; **Ih**, Inguinal hernia; **Rh**, Rheumatism; **Uta**, probably refers to leishmaniasis; **Vp**, Vaginal pains.

[c] Unless otherwise stated the plant part is whether boiled (B) or macerated (M) in fresh water with *Tovomita* aff. *stylosa* and other plants. The mode of administration is oral and taken by humans.

[d] BCN and USM codes unavailable. Instead, the collection number, i.e. *Jsb-xxx*, is provided. If needed, a duplicate must be found in USM (Lima), where these specimens were yet to enter.

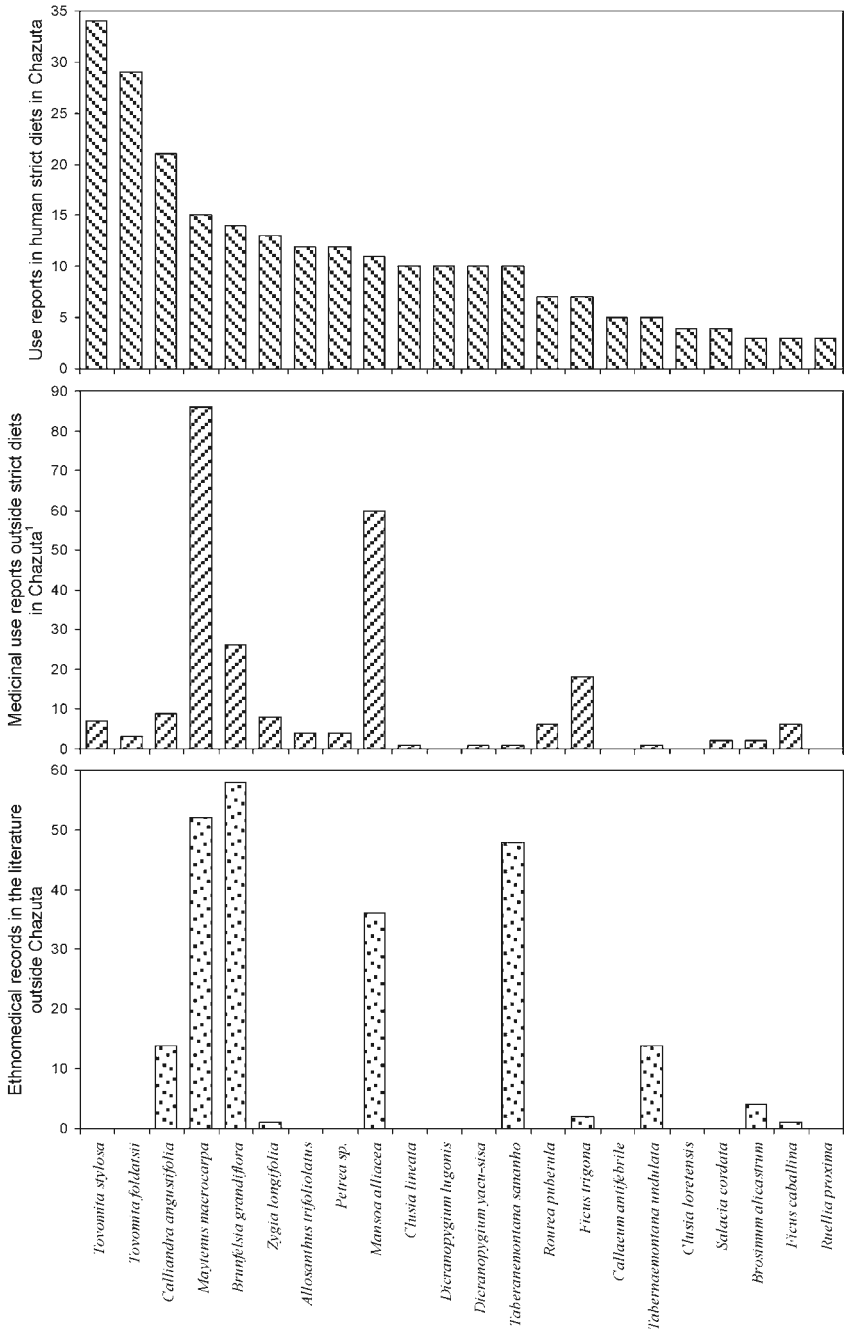

Fig. 4. Comparison of the number of use reports in human strict diets in Chazuta of the 22 most used plants with literature use reports of these plants, as medicinal, inside Chazuta (data from Sanz-Biset et al., 2009) and the number of literature ethnomedical records outside Chazuta (obtained mainly from Napralert and also from other specific bibliography on the ethnobotany of the Peruvian Amazon).

These two plant species are also known as *chullachaki kaspis*. The Quechua term *kaspi* signifies woody bush or tree in English, and *chullachaki* can be translated as "uneven foot". With the term *chullachaki* is named what is considered the most popular spirit of the forest, known to nearly everyone in the Amazon. It refers to a sort of anthropomorphic male elf with one foot human shaped, and the other of animal form which makes him to walk lame. This creature is considered the protector dweller of the forest who possesses supernatural powers often mischievousness to humans. The two *Tovomita* spp. named *bachuja* have one stilt root which informants

declared that it resembled the *chullachaki* lame foot. Therefore, it is said that the *chullachaki* spirit is found inside these *Tovomita* spp. plants or *kaspis*, as well as in the remedies made of these plants.

Although the other three *Tovomita* spp. collected in the survey had multiple stilt roots instead of one, they were not considered to hold that force and were known under a different vernacular name, i.e. *killuwiki* (i.e., "yellow resin" in English).

The composition of the different *bachuja* mixtures reported in the survey was the most heterogeneous of all the plant mixtures recorded in Chazuta. The minimum number of species recorded in the preparation of one *bachuja* mixture was four, the maximum estimated by informants was sixty.

Besides the *Tovomita* spp. mentioned before, the core of the *bachuja* mixtures is formed by specific plants which give to the brews a precise symbolic meaning. Hence, the plants named *yaku shimbillu*, *yaku sisa*, *yaku bushiklla* (*yaku* means water in Quechua) and *bobensana*, grow along streams and are usually added to the *bachuja* brew. Informants state that these plants resist strong currents throughout heavy rainstorms during the wet season. This special endurance quality is considered to be given by special water spirits which are also considered as the spirits of these plants. Thus, the two main symbolic worlds of the San Martin Quechua's jungle are found in this unique plant mixture: the water world (rivers, lakes, oxbows) by these "aquatic" species, and the forest by *chullachaki kaspi* plants.

A few other plant species are less frequently, but quite regularly, included in *bachuja* mixtures. Nearly all of them are woody bushes, lianas or trees, and are considered to have strong barks and robust trunks. The plants known as *renaco* or *came* (*Clusia* spp and *Ficus* spp.) usually are strangler trees or hemiepiphytic woody plants which informants see that "stick to others very tight". *Chuchuwashas* (*Maytenus* spp.) have a special thick and hard bark. *Killuwikis* (*Tovomita* spp.) present various robust stilt roots. And the woody lianas *acero waska*, *murku waska* and *tambor waska* are also considered to have the hardest stems. This is why the *bachuja* mixtures are also called *mezcla de palos* (i.e., mixture made of woody shrubs and trees). This apparent "toughness and strength" seen by informants is thought to be passed to the medicinal properties of the remedies made of these plants.

4.7. Local nomenclature of plants

All in all, 128 local plant names were recorded for these 106 plants used in strict diets: 70 names (54.7%) were formed by two words (e.g. *uchu sanango*), 37 (29%) by one word (e.g. *opefico*), 13 (10.1%) by three words (e.g. *yaku sisa macho*) and 8 names (6.2%) by more than 3 words (e.g. *nina kaspi de hoja ancha*, prepositions do not count).

Quechua was present in 69% of these names (23.5% were totally Quechua while the remaining 45.5% contained at least one Quechua word). On the other hand, Spanish was present in 44.5% of all names (6.2% were totally Spanish while 38.3% had at least one Spanish word). Moreover, in 54 names (42.2%) there was at least one word not clearly Spanish nor clearly Quechua, i.e. words which neither we nor informants could explain their meaning. However, many of these words sounded Quechua to us, such as *munichi*, *shillinto*, *tamushi* or *tupashairi*.

4.8. Plant type and part used

Of all the plant species used in strict diets, 96 species (91%) were woody in nature (a tree, a shrub or a woody vine or liana); while 10 were herbs or herbaceous vines. On the other hand, 85 plant species were collected wild, 12 were cultivated species when gathered, and 9 were collected both wild and cultivated.

The most common plant part used was the bark, accounting for 58 species (stem bark was employed in 50 species, root bark in 4 plants, and mixtures of both stem and root barks were used in 4 species). Stem was the second most used part, reported in 26 plants. Other parts employed were the leaf (in 10 plants), root (4), latex (3), fruit (1) and resin (1). In 12 species the whole plant was employed.

Above-ground plant parts were highly used, about 85% of the time. A combination of above- and below-ground parts was employed about the 11%, and below-ground parts 4% of the time.

4.9. Herbal preparations and mode of administration in strict diets

On the whole, 88 different herbal preparations taken in strict diets were reported. Nearly all of them (86) entailed some sort of aqueous extraction, in which the selected plant parts were decocted (in 47 of these preparations), slightly boiled (1), prepared as infusions (5), mixed with warm water (2), and macerated in fresh water (31). The remaining 2 herbal preparations were poultices made of roasted plant parts.

On the other hand, 95.5% of all these herbal preparations were taken orally (86.6% by humans, 7.6% were given to dogs and 1.3% were both taken by humans and given to dogs), 2.3% were used by humans both orally and topically (for bathing), and another 2.2% were used for dogs topically (as a poultice).

4.10. Uses of strict diets

Of the 122 strict diets reported, 107 were performed by humans and 15 by dogs. Table 4 shows the medicinal uses reported more than twice in the 107 strict diets reported for human use. Altogether, of these 107 strict diets, the 68.3% was used against illnesses, and the 31.7% was employed as tonics.

The majority of the secluded fasts performed to restore health were against musculoskeletal disorders such as unspecified rheumatism (38 strict diets reported) and broken bones (6), which are very common ailments in such a rural and humid region. In 5 reports, informants employed strict diets against what they know as *bajada de testos* ("descendent testicles" in English), which refers to inguinal hernias. When the protrusion may occur, one of the testicles is said to get very inflamed and descent due to its abnormal volume and weight. This seems to be a prevalent ailment among "chazutian" men, usually caused when carrying heavy weights. Most of the orchards are far from the settlements, which means most of the food they eat and the wood they burn has to be brought across great distances usually up and downhill. Horses are scarce, so most everything is carried on people's back such as entire plantain bunches or huge manioc sacks, even children are always carrying something.

Malaria was treated with strict diets by informants three times in total. The disease is not endemic in the region but "chazutians" can get infected when visiting the neighbouring lowlands. Strict diets were also used by informants against: abscesses, intestinal parasites, a pulmonary disease likely of infectious aetiology, and a possible urine infection. Diseases of an infectious cause are the most common reported in the medical centre of Chazuta (Estadísticas del Centro de Salud de Chazuta, 2003). This is contributed by the tropical climate and the nearly total lack of sewer system in all district settlements. Although leishmaniasis is rare, two strict diets were performed against two cases known as *uta*, which probably refers to this disease. Individuals who spend days deep inside the forest (normally involved in illegal tree felling) are especially prone to leishmania infection.

All the secluded fasts completed by female informants (6 strict diets by 4 women) were aimed to restore health.

Table 4
Medicinal uses reported more than twice in the 93 strict diets performed by the informants of Chazuta valley (Peruvian Amazon).

Medicinal uses (*Medicinal uses as mentioned by informants*)	Reports	% of total	Average age (years) when strict diets were performed	Average length of the secluded fasting period (days) (Stages I and II)
Rheumatism (*Reumatismo*)	38	40.8	29	24
Tonic (*Prepararse y fortalecer el cuerpo*)	34	36.5	19	17
Broken bones (*Quebradura de huesos*)	6	6.4	21	60
Inguinal hernia (*Bajada de testos*)	5	5.3	30	30
Malaria (*Malaria*)	3	3.2	16	30

Moreover, 34 strict diets were performed by informants, being them healthy, to invigorate their health: 5 were performed after returning from the military service, 2 before attending the army and 1 after having the appendix removed in hospital. Of these 34 strict diets, 21 were conducted at an age younger than 20 years and represented a rite of passage to adulthood.

In strict diets performed by dogs, it was observed that the herbal preparations used are usually the same as the ones employed by humans. However, three plants (i.e. *Agarista albiflora*, *Annona ambotay* and *Leonia glycycarpa*) were very popular as dog remedies but non human use was recorded for them. In one case, it was cited that "to diet" *Mansoa alliacea* specially helped with the hunt of *sajino* (a sort of peccary).

Finally, 9 strict diets reported were performed by *vegetalistas* that even though intended to invigorate themselves, the main intention was to obtain special powers of plant spirits. This kind of use is often related with the ingestion of brews made of huge trees known as *palos altos* ("high trees" in English). Observe the Doctrine of Signatures in between "high trees", "high spirits" and "high powers". The plants employed were: *Browneopsis* cf. *cauliflora*, *Ceiba insignis*, *C. samauma*, *Coccoloba* sp., *Gallesia integrifolia*, *Hymenolobium nitidum*, *Iriartea deltoides*, *Pseudobombax septenatum* and *Sterculia* sp. Informants considered these plants medicinal but "dangerous to ingest" due to the high possibility of suffering heavy adverse reactions when dieting them.

4.11. Function of plants in strict diets

These results suggest that plants employed in strict diets could be relevant in the origin of the following pharmacological effects described in these practices: depuration, brain function alteration, antinflammatory and antiinfective. In order to evaluate this hypothesis, the available literature was consulted regarding these bioactivities for the plant species with more than two medicinal reports in strict diets performed by humans, i.e. 22 different species in total.

Most of the selected plants (16 species) have been reported in ethnomedicine as useful against inflammation (Fig. 4). However, only two of these plants have been biologically tested for antinflammatory activity. On the contrary, few of the selected plants (6 species) have been reported as antiinfectives in ethnomedicine, and just three have been biologically tested against microbia. On a lesser extent, psychoactivity and depuration have been also reported (in 4 species each). In addition, just 8 of the 22 selected plant species have been chemically studied.

This shows how understudied are many of the plants used in strict diets in Chazuta. The ethnomedical literature is scarce and only a few chemical and biological studies exist for these species. In order to understand best the function of plants in strict diets, we expanded the literature search by considering data from related taxons.

None of the selected plants of the *Clusiaceae* family have ever been chemically studied or biologically tested. Neither *Tovomita stylosa* nor *Tovomita foldatsii* nor *Clusia lineata* nor *Clusia loretensis*. Clusiaceae are phytochemically characterized by the content of xanthones and their biosynthetically related benzophenones.

Several compounds isolated from *Tovomita* species have demonstrated antimicrobial activity, such as xanthones, benzophenones and betulinic acid (Pecchio et al., 2006; Zhang et al., 2002).

On the other hand, compounds isolated from *Clusia* species have shown antimicrobial activity (isoprenylated benzophenones), and potent analgesic and anti-HIV activities (biflavonoids) (Bittar et al., 2000; Gustafson et al., 1992; Lokvam et al., 2000; Porto et al., 2000).

Xanthones from the Clusiaceae family have presented antiinflammatory, antimicrobial and both CNS stimulant and depressant activities (Bennett and Lee, 1989). Also, natural occurring benzophenones, and isoprenylated benzophenones isolated from *Clusia* species in particular, have proven antimicrobial activity (Finnegan et al., 1973; Pecchio et al., 2006; Schultz et al., 2002).

The two legumes, *Calliandra angustifolia* and *Zygia longifolia*, belong to the Ingeae tribe. Species of this tribe do not produce alkaloids, they are characterized instead by the synthesis of non-protein amino acids which are pipecolic acid and their derivatives.

Even though *Zygia* is a botanical genus of about 100 species, none of them have ever been biologically tested or chemically studied.

On the other hand, *C. angustifolia* has shown inhibitory activity on COX-1, but was not able to inhibit an induced ear edema in rat (Dunstan et al., 1997). Furthermore, pipecolic acid and 12 different pipecolic acid derivatives have been isolated from *C. angustifolia* (Romeo, 1984; Romeo et al., 1983). Pipecolic acid and 5-hydroxy pipecolic acid (both isolated in *C. angustifolia*) have shown spasmogenic activity due to serotonin (5-HT) antagonism (Bejar et al., 1995).

In addition, extracts and flavonoids isolated from other *Calliandra* species have demonstrated antimicrobial activity (Adewunmi and Marquis, 1983; Aguwa and Lawal, 1988; Awachie and Ugwu, 1997; Chiappeta and De Mello, 1984; Encarnacion and Garcia, 1991; Encarnacion et al., 1994), and an extract from *Calliandra portoricensis* showed CNS depressant activity (Adesina, 1982).

The *Celastraceae* family has been widely studied. The presence of dihydro-β-agarofuran sesquiterpenes is characteristic of the family, as well as other terpenoids (diterpenes, cardenolides, pentacyclic triterpenes of dammarane, friedelane, lupane and oleanane types), alkaloids of different types, anthocyanidins, tannins (proanthocyanidins) and other phenolic compounds.

Compounds isolated from *Maytenus macrocarpa* (Celastraceae) have proven antimicrobial activity (canophyllol and orthosphenic acid, both friedelane triterpenoids, and maytenfolic acid, an oleanane triterpene) (Ali et al., 1999; Mitaine-Offer et al., 2002; Orabi et al., 2001; Zheng et al., 1989), anti-HIV activity (maytenfolic acid, orthosphenic acid) (Piacente et al., 2006) and leishmanicidal activity (1α,6β,8β,15-tetraacetoxy-9α-benzoyloxy-4β-hydroxy-β-dihydroagarofuran) (Chavez et al., 1999).

Friedelane triterpenoids have shown antinflammatory, analgesic (Chaturvedi et al., 1974; Duwiejua et al., 1999; Nakamura et al., 1997), antibacterial and antifungal activities (Jain and Singh, 1999; Singh and Dubey, 2001) and anti-HIV activity (Kuo and Yang-Kio, 1997).

M. macrocarpa contains dammarane triterpenes (Chavez et al., 1997). This class of compounds has shown, in general, antinflammatory, analgesic (Akihisa et al., 1997; Ozaki et al., 2000; Rouf et al.,

2001; Yasukawa et al., 2000) antimicrobial (Gonzalez et al., 1996), and antiviral activities (Inada et al., 1993; Kaij-A-Kamb et al., 1992; Madureira et al., 2003; Zhang et al., 2003).

Furthermore, dihydro-β-agarofuran sesquiterpenes isolated from other plants have shown antimycobacterial and leishmanicidal activities (Chen et al., 2008; Perez-Victoria et al., 1999; Wu et al., 2001).

In addition, some CNS bioactive compounds have been found in Celastraceae, such as phenylalkylamines (stimulants) and some CNS depressant alkaloids (Brüning and Wagner, 1978).

Salacia cordata (Celastraceae) has been chemically studied once. Pentacyclic lupane triterpenoids of lup-20(29)-en type have been isolated from the plant (Tinto et al., 1992). One of them (i.e. pyracrenic acid) has shown antinflammatory activity (Otsuka et al., 1981a). Lup-20(29)-en triterpenoids from other plants, have shown antimicrobial activity (Kuroyanagi et al., 1985; Mustafa et al., 2000; Woldemichael et al., 2004).

Brunfelsia grandiflora (Solanaceae) has been chemically studied in depth (Castioni, 1996), and two alkaloids were isolated: hopamidine (=brunfelsamidine) and 2-pyrrolidinone (a biosynthetic precursor of the first). Scopoletin has been also isolated in *B. grandiflora*. Both hopamidine and scopoletin have shown convulsant activity (Lloyd et al., 1985). The volatile fraction of *B. grandiflora* presented methyl salicylate in high proportion (61%), as well as other salicylate compounds. This richness in salicylates could explain the utilization of the plant as an antinflammatory remedy. In another study, Fuchino et al. (2008) isolated a furostan type saponin from *B. grandiflora* that showed leishmanicidal activity.

None of the selected *Ficus* species have ever been chemically studied or biologically tested. Neither *Ficus trigona* nor *Ficus caballina*. The other *Moraceae* species within the selected plants, i.e. *Brosimum alicastrum*, has been chemically studied once.

Compounds isolated from other *Ficus* species have demonstrated antinflammatory activity (flavonoids and racemosic acid) (Li et al., 2004; Sackeyfio and Lugeleka, 1986), antibacterial and antifungal activities (phenanthroindolizidine alkaloids, terpenes, isoflavonoids and protocatechuic acid) (Baumgartner et al., 1990; Kuetea et al., 2009; Ogungbamila et al., 1997; Shirata and Takahashi, 1982) and antihelmintic activity (ficine – a toxic proteolytic enzyme complex) (Hansson et al., 1986). Moreover, analgesic, antiviral, antiamoebic, antimalarial, CNS stimulant and diuretic activities have been confirmed in extracts of different *Ficus* species (Sulaiman et al., 2008).

Phenanthroindolizidine alkaloids are a small group of compounds characteristic of the Moraceae family. They are well known for their cytotoxic activity, and also to have antinflammatory properties (Yang et al., 2006).

The only chemical study performed in *Brosimum alicastrum* isolated 2-6-dimethoxy-1-4-benzoquinone (Hausen, 1978). This compound has shown antinflammatory (Otsuka et al., 1981b), antibacterial (Nishina et al., 1991; Pei et al., 1983; Rao and Seshadri, 1955) and antifungal activities (Yokota et al., 1978).

Petrea (Verbenaceae) is a botanical genus of about 50 plant species. Only one of these 50 species has been biologically tested, and just 4 species have been subject to chemical analysis. Four different bioactive compounds have been isolated from *Petrea* species, i.e. aucubin (iridoid glycoside), calceolarioside A, verbascoside and iso-verbascoside (phenylpropanoid glycosides) (Brito et al., 1990; Dominguez and Alcorn, 1985; Garnier et al., 1989; Taoubi et al., 1992). Aucubin and verbascoside have shown antinflammatory and antimicrobial activities. In addition, verbascoside also presented analgesic and CNS depressant activity (Grice et al., 2003; Pieretti et al., 1992). Moreover, calceolarioside A and iso-verbascoside have shown leishmanicidal activity (Emam et al., 1995; Poddara et al., 2008)

Characteristic compounds from *Mansoa alliacea* (Bignoniaceae) are sulfoxides (mainly alliin) and other sulfur compounds. Dunstan et al. (1997) showed that *M. alliacea* extracts have antinflammatory activity in rats and COX-1 inhibitory activity. Moreover, antimicrobial, antifungal and antiviral activities have been confirmed in extracts of *M. alliacea*. Antimicrobial activity has been also confirmed in different alkanes of *M. alliacea*, and antifungal activity for its essential oil (Block et al., 1993; Chaturvedi et al., 1987; Freixa et al., 1998; Sharma, 1993; Zoghbi et al., 2009), which is characterized, such as in *Allium sativum*, by a high amount of allyl sulfides (Zoghbi et al., 2009). Allyl sulfides have demonstrated antinflammatory and antimicrobial activities in many studies.

The genus *Tabernaemontana* (Apocynaceae) is characterised by its content of monoterpene indole alkaloids. Triterpenes and saponins have been also isolated from this genus.

Tabernaemontana sananho has been subject of simple chemical studies where the presence of alkaloids and saponins was confirmed. Some studies have shown antinflammatory and leishmanicidal activities for the plant extracts (De las Heras et al., 1998; Estevez et al., 2007; Ortega et al., 1996; Schultes, 1979).

In *Tabernaemontana undulata*, 22 different indole alkaloids have been described. Some of these alkaloids (i.e. conopharyngine, coronaridine, quebrachidine, voacangine and iso-voacangine) have shown analgesic, antimicrobial, CNS stimulant and diuretic activities (Bruneton et al., 1979; Ladhar et al., 1981; Van Beek and Verpoorte, 1985).

Rourea (Connaraceae) is a genus of about 160 plant species. Only six *Rourea* species have been biologically tested and/or chemical studied, and *R. puberula* is not among them.

Both n-hentriacontane (alkane) and rapanone (benzoquinoid) isolated from *Rourea* species have demonstrated antinflammatory and antimicrobial activities. In addition n-hentriacontane has also shown analgesic and diuretic activities (Meyre-Silva et al., 1998; Rizvi et al., 1985). Moreover, rouremin (glycoside) isolated in *R. minor* has presented antimalarial activity (Bero et al., 2009; Chevrier et al., 1986; Grosvenor et al., 1995; He et al., 2006; Kalegari, 2009).

Ruellia (Acanthaceae) is a genus of about 500 plant species. As far as we know, only 10 of these species have been biologically studied, and just 17 have been chemically investigated. *Ruelllia proxima* has not been studied.

Various compounds isolated from *Ruellia* species have demonstrated antinflammatory, antimicrobial and CNS depressant activities (Ahmad et al., 1990; Costa De Pasquale et al., 1985; Kalashnikova and Gerashchenko, 1974; Leiderman et al., 1996; Misra et al., 1997; Rizvi et al., 1985; Salah, 1999). Furthermore, n-hentriacontane has been also found in *Ruellia* sp.

Both Acanthaceae subfamilies Acanthoideae and Ruellioideae contain large quantities of betaine (Fischer et al., 1988). Betaine and its derivatives have shown antinflammatory and antimicrobial activities (Zeisel, 2008).

Finally, in four of the selected plants a lack of information was found even on a genus level. The species are *Allosanthus trifoliolatus* (Sapindaceae), *Callaeum antifebrile* (Malpighiaceae), *Dicranopygium lugonis* and *Dicranopygium yacu-sisa* (Cyclanthaceae).

We did not found any report in the literature on the chemistry or the biological activity of any species of the genus *Allosanthus* (Sapindaceae). The Sapindaceae family comprises about 1900 species (Buerki et al., 2009). As far as we know, the following chemical groups have been reported from different Sapindaceae: di- and triterpenes, sterols, saponins, essential oils, non-protein amino acids, alkaloids, cyanogenic compounds, cyanolipids, flavonoids, tannins, proanthocyanidins and other phenolic compounds (Bell, 1980; Nair and Subramanian, 1975; Sachdev and Kulshreshta, 1986; Seigler et al., 1987; Umadevi and Daniel, 1991; Umadevi et al., 1987).

Again, none of the species of the genus *Callaeum* (Malpighiaceae) has ever been chemically studied or biologically tested. The chemistry of the Malpighiaceae family is known primarily through the study of the hallucinogenic drinks prepared from a few South America genera and species containing a variety of beta-carboline and tryptamine alkaloids. Hiptagin, polyphenols and saponins are also found in the family (Schultes and Raffauf, 1990).

Lastly, as far as we know, none of the 400 species of the *Cyclanthaceae* family has been the subject of any biological test. Phenolic acids and cyanogenic compounds were reported in the family by Schultes and Raffauf (1990), and Schultz et al. (1999) described a number of new monoterpenes from the flower scent of *Cyclanthus bipartitus*.

All these 22 plants have been reported in strict diets against inflammatory ailments, but only 8 (36%) of these plants have shown some evidence of anti-inflammatory activity in the literature (i.e. for *Brosimum alicastrum*, *Brunfelsia grandiflora*, *Calliandra angustifolia*, *Mansoa alliacea*, *Maytenus macrocarpa*, *Salacia cordata*, *Tabernaemontana sananho*, *Tabernaemontana undulata*). In addition, for those species widely used in strict diets that have not been studied, taking in account the literature data on the chemistry and bioactivity of taxonomically related species, other 9 species (41%) are good candidates to present antinflammatory activities (*Tovomita stylosa*, *Tovomita foldatsii*, *Petrea* sp., *Clusia lineata*, *Clusia loretensis*, *Rourea puberula*, *Ficus caballina*, *Ficus trigona* and *Ruellia proxima*).

Fourteen of the most used species were reported in strict diets against microbia. Of them, four (29%) have some evidence in the literature of antimicrobial activity. Moreover, taking in account the literature data on related taxa, five species (36%) could also have antimicrobial activity (*Tovomita stylosa*, *Tovomita foldatsii*, *Petrea* sp., *Rourea puberula* and *Ficus trigona*).

Plant psychoactivity in strict diets can be originated by pipecolic acid and 5-hydroxy pipecolic acid from *Calliandra angustifolia*, hopamidine and scopoletin from *Brunfelsia grandiflora*, and indole alkaloids from both *Tabernaemontana sananho* and *Tabernaemontana undulata*. However, from taxonomically related chemical and biological literature data, other psychoactive compounds could also be present in non-studied species, i.e. xanthones in *Tovomita* and *Clusia* species, phenylalkylamines and alkaloids in Celastraceae, pipecolic acid derivatives in *Zygia* sp., verbascoside in *Petrea* sp., beta-carbolines and tryptamine alkaloids in *Callaeum* sp., lipids in *Ruellia* sp. or other compounds in *Ficus* species.

Finally, depurative related activities (such as emetic, diuretic or laxative activities) are in general less studied and rarely present in the literature. All diets reported depurative effects, but only 5% of the plants most used have some evidence in the literature. The percentage goes to 32% when literature evidences on related taxa are also considered. In particular, diuretic activity has been shown for indole alkaloids from *Tabernaemontana* species, n-hentriacontane from *Rourea puberula* and *Ruellia proxima*, and extracts of *Ficus* species.

5. Conclusions

Strict diets are traditional medicinal practices in the Peruvian Amazonian valley of Chazuta where plant remedies are consumed with nearly fasting and with some sort of social seclusion. They present a similar chronological structure, which can be divided in 4 stages. The first and second stages correspond to the secluded period in which partial fasting is observed, which usually lasts from one week up to two months. Plants are taken during the first stage. A "cleansing effect" is always attributed to these practices, since depurative effects (e.g. emesis, laxation, diuresis) are observed, which are probably related both to the food regime, where the avoidance of salt plays a major role, and to the plant remedies ingested.

On the whole, 106 plant species used in these medicinal fasting practices were collected and identified. Clusiaceae, Moraceae, Fabaceae, Ficus, Clusia and Tovomita were the botanical families and genera most represented. The plants most times used in strict diets were *Tovomita* aff. *stylosa*, *Tovomita foldatsii* and *Calliandra angustifolia*. Moreover, the plant remedy known by informants as either *bachuja* or *mezcla de palos* was the most reported; it consists of distinct mixtures of different number of plants and locals consider it as the panacea of Chazuta. Altogether, the plant parts most times used were barks and stems, and herbal preparations that entailed some sort of aqueous extraction were the most common.

Plant species used in strict diets in Chazuta can contribute to their effects, such as depuration, brain function alteration, antinflammation and antiinfective. These effects are also conditioned by the physiological state due to nearly fasting and seclusion.

Overall, regarding those diets were the most used plants were employed (22 plant species in 86 strict diets), the correlation between literature evidence of plant activity and effects reported for the correspondent diet (i.e. in which the plant was used) are 36% (8 of 22 plant species) for antinflammatory activity, 29% (4 of 14) for antimicrobial activity, 18% (4 of 22) for psychoactivity and 5% (1 of 22) for depurative related activities. The percentages go to 77% (17 of 22 plant species), 64% (9 of 14), 73% (16 of 22) and 32% (7 of 22) respectively, when literature evidences on related taxa are also considered. The low correlation for depurative related activities is due to the fact that in general they are less studied and rarely present in the literature.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.jep.2011.05.021.

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4.3. Publicació 3

Plants as medicinal stressors, the case of depurative practices in Chazuta valley (Peruvian Amazonia)

Jaume Sanz-Biset, Salvador Cañigueral

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Resum

Les pràctiques depuratives, basades en el consum de plantes emètiques i la restricció en la ingesta d'aliments, s'usen freqüentment en la medicina tradicional de Chazuta (Amazònia peruana) no només per restablir la salut, sinó també per mantenir-la. L'objectiu d'aquest estudi és descriure les pràctiques depuratives de Chazuta, dins d'un marc teòric que estableix el "sistema de l'estrès" i defineix el rol de les plantes medicinals usades com a "estimuladors medicinals d'estrès". Aquest model biomèdic és més inclusiu en relació amb la varietat d'usos medicinals registrats per a aquestes pràctiques.

La informació es va obtenir a la vall de Chazuta de l'octubre del 2004 a l'agost del 2005 a través d'entrevistes de camp semiestructurades fetes al 6,3% de la població adulta rural del districte (140 individus, el 75% dels quals van ser considerats quítxues). Posteriorment, els resultats van ser analitzats i confrontats amb les dades bibliogràfiques existents. En total, es van registrar 191 pràctiques depuratives a Chazuta, on es van reportar i identificar 114 espècies vegetals diferents. Depenent del seu grau de severitat i durada, les pràctiques depuratives poden ser classificades com a lleus o estrictes. La gran varietat d'usos medicinals reportats justifica la consideració de respostes adaptatives a l'estrès en les pràctiques depuratives i la contemplació de les plantes emprades en aquestes pràctiques com a "estimuladors medicinals d'estrès".

A través de l'estimulació moderada d'estrès a nivells segurs, les pràctiques depuratives de Chazuta podrien originar respostes adaptatives amb efectes protectors contra les conseqüències perjudicials de l'estrès crònic i de les malalties relacionades amb

l'estrès. Aquesta hipòtesi podria ajudar a comprendre la diversitat d'usos medicinals registrats durant l'estudi de camp. Així doncs, els remeis vegetals emprats en aquestes pràctiques a Chazuta podrien ser considerats "estimuladors medicinals d'estrès", ja que, a través de l'estimulació del vòmit, s'originaria la necessària activació neuroendocrina del sistema de l'estrès.

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Plants as medicinal stressors, the case of depurative practices in Chazuta valley (Peruvian Amazonia)

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ABSTRACT

Ethnopharmacological relevance: Depurative practices, based on taking emetic plants and the restriction of food intake, are very much used in the traditional medicine of Chazuta (Peruvian Amazon) not only to restore health but also to maintain it.
Aim of the study: To describe Chazuta's depurative practices, within a theoretical framework that involves the stress system and which defines the role played by the medicinal plants used as medicinal stressors. This biomedical model is more inclusive in relation to the variety of medicinal uses found for these practices.
Material and methods: The information was obtained in the valley of Chazuta from October 2004 to August 2005 through semi-structured interviews to the 6.3% of its rural adult population (i.e., 140 individuals, 75% belonging to the San Martin Quechua's ethnic group). Thereafter, results were analysed and confronted to the existing literature.
Results: Overall, 191 depurative practices were reported in Chazuta where 114 different plant species were recorded and identified. Depending on their level of severity and duration, depurative practices can be classified as mild or strict. The wide range of medicinal uses reported supports both the involvement of adaptive stress responses in depurative practices and the consideration of the plants employed in this practices as medicinal stressors.
Conclusions: By inducing moderate stress within safe levels, depurative practices in Chazuta could produce adaptive responses that would protect against the detrimental consequences of chronic stress and stress-related diseases. This hypothesis could help to understand the diversity of the medicinal uses recorded in the field. Thus, plant remedies used in these practices in Chazuta could be considered as "medicinal stressors" as through vomiting the necessary neuroendocrine stress activation would be produced. In addition, other bioactivities that plants may harbour could converge with the whole stress reactivity process.

1. Introduction

The use of medicinal plants in Chazuta (Peruvian Amazon) has been the study subject of recent publications of our group (Sanz-Biset and Cañigueral, 2011; Sanz-Biset et al., 2009). A particular aspect highlighted by these works has been the wide use of plant remedies in what we have described as depurative practices.

We use the term depurative to differentiate a group of practices in Chazuta that locals considered to be medicinal because it prompted a general cleansing effect. This cleansing effect was believed to be induced first by the ingestion of medicinal plants with emetic effects (sometimes also being purgative and often considered with other various medicinal effects) and second by reducing food intake. The local belief is that this depurative effect, whether induced by emetic medicinal plants and/or through calorie restriction, produces a "general cleansing" that enhances health broadly speaking.

It is not uncommon for depurative practices to be used for bodily purification or detoxification in complementary and alternative medicine (Kayne, 2009). Nowadays, in medicine the term depurative is mainly used in the clinical management of poisoning and around the concept of dialysis, the method that removes waste and excess water from the blood in renal failure. However, in ethnopharmacology, the term depurative is often used to indicate medicinal plants with effects such as diuretic, purgative, perspirative, choleretic, cholagogue or emmenagogue. These have been reported in regions across the world among different historical periods (Gurib-Fakim, 2006).

Some depurative practices that we reported in Chazuta were employed against different ailments prevalent in the region.

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For some of those, we found some correlation in between the medicinal uses reported and the available bibliographic data on plant bioactivity or active compounds (Sanz-Biset and Cañigueral, 2011). In part, those results may explain the use of plants in some depurative practices due to plant activities such as antinflammatory and antimicrobial. Indeed, besides the emetic effect, local informants also considered many other medicinal effects for the plants employed in these practices. However, in many occasions depurative practices in Chazuta were generally employed to tone and strengthen the body.

When we faced these more unspecific medicinal uses, we found ourselves limited with the conventional approach of targeting precise biological activities or active compounds, as there this relationship became less clear. Therefore, we were led to consider other biomedical models that could explain the broad spectrum of the physiological effects reported.

As a result, the explanation proposed here relates to the moderate activation of stress responses. The theoretical framework used to support these explanations is described in Appendix A (see the supplementary file). To sum up, it is known that both emesis and calorie restriction stimulate the neuroendocrine activation of the stress system (Eversmann et al., 1978, Masoro, 1998). As Chazuta's depurative practices mimic two very primitive and really stressful conditions that human beings can be encountered with, i.e., intoxication and starvation, it is feasible to consider the induction of moderate stress in a way that is medicinal. Considering models of beneficial exposure to stress is common in the study of physical exercise, diet restriction and other conditions (Jackson and Dishman, 2006; Sinclair, 2005; Tapia, 2006). Similarly to physical activity, depurative practices in Chazuta could elicit an adequate stimulation of the stress system, activating several centres such as the HPA axis, the autonomic nervous system and certain centres in the CNS. This activation could be within safe levels and could produce the corresponding adaptive responses conducive to beneficial stress resistance effects in different systems, e.g., gastrointestinal, endocrine, cardiovascular, respiratory or immune (Chrousos, 2006; Tsigos and Chrousos, 2002; Fig. 1).

Then, plant remedies used in depurative practices in Chazuta could be considered as "medicinal stressors" as through vomiting they could prompt the necessary stress to trigger adaptive stress responses. In addition, other bioactivities that plants are known to harbour could converge with the whole stress reactivity process.

The aim of this paper is to describe Chazuta's depurative practices within this more inclusive theoretical framework of adaptive stress responses that is able to indicate the biological processes that would explain the variety of medicinal uses found for these practices; and ultimately, to clarify the role that medicinal plants play in these practices as medicinal stressors. The present paper also brings data to the topic of plants and practices used for depuration, purification or detoxification. Even though this is a common subject in complementary and alternative medicine, papers rarely focus on it. Hence, ethnopharmacological data on this area is especially interesting and can prove to be useful in future studies.

2. Methods

The information collected in the field was obtained through semi-structured interviews to the 6.3% of the district's rural adult population (140 individuals, 60% men, 40% women, 75% of which was considered Quechua). The data presented in this paper is based in a wider fieldwork performed in the studied region from October 2004 to August 2005. In a previous published paper about the medicinal plants of Chazuta (Sanz-Biset et al., 2009), precise information was already given on the study site, its ethnicity, the demography, its socio cultural context, the historical background, the present medical system of Chazuta, how the selection of informants was done for the study, the type of interviews used, how plants were collected, which botanists participated in determining plant species, and how local consent for the investigation in Chazuta was obtained. Moreover, permit for the collection and exportation of voucher herbarium specimens was covered by official authorisations issued by the Agricultural Ministry of Peru's INRENA: Collection licence 087–2004-INRENA-IFFS-DCB and Exportation permit 005780-AG-INRENA.

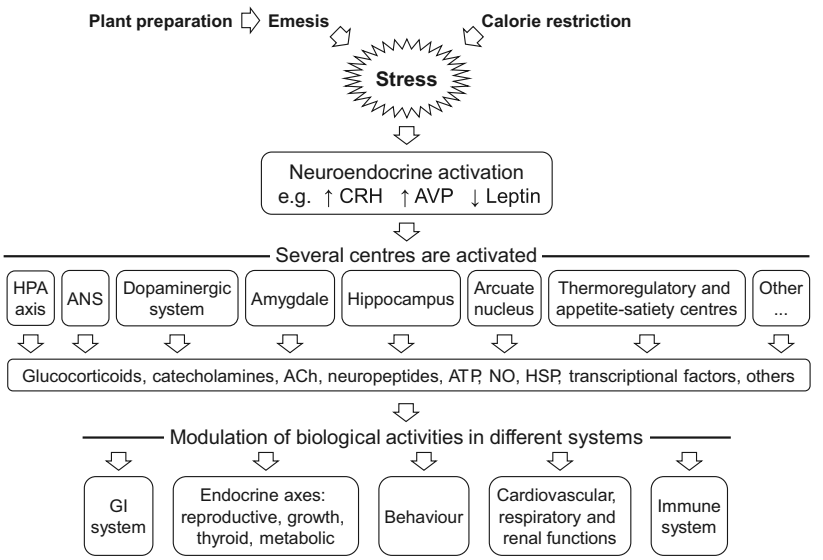

Fig. 1. Neuroendocrine infrastructure triggered by stress which could be activated by depurative practices in Chazuta valley. ACh: acetylcholine, ANS: autonomic nervous system, ATP: adenosine triphosphate, AVP: arginine vasopressin, CRH: corticotropin-releasing hormone, GI: gastrointestinal, HPA: hypothalamic–pituitary–adrenal, HSP: heat-shock proteins, NO: nitric oxide.

Results obtained in the field were thereafter analysed and confronted to the existing literature.

3. Results and discussion

In this section, results are shown and discussed in the following sequence. First, quantitative results obtained in recording depurative practices in Chazuta valley are given. Then, depuratives practices are described whether considered being mild or strict depending on their severity and duration. Also, the different medicinal uses reported are shown. Finally, the function of plants in depurative practices is discussed.

3.1. Depurative practices reported in Chazuta

On the whole, 318 plant species used for medicinal purposes by people living in the Chazuta district were collected and identified. Of these, 114 species were found to be used in 191 depurative practices recorded in the survey.

Most of the plant remedies observed to be taken in depurative practices in Chazuta, were aqueous extracts, often unbearably bitter, highly unpleasant to drink, which seemed to act mainly as irritants of the gastric and intestinal mucosa triggering nausea conducive to emesis (Fig. 2).

The usual drastic vomiting caused by the herbal preparations administered in depurative practices in Chazuta, naturally brings the need to follow a more constrained food and behavioural regime (known as *dieta* in Chazuta). This can go from simply restricting some types of food, to becoming so strict that could even imply fasting. In the cases where fasting was present, salt limitation and rest in social seclusion was also prescribed.

Fig. 2. The act of vomiting, which is highly regarded in the ethnomedicine of Chazuta valley.

Also, the use of emetic plants as well as the depurative practices themselves can be more or less prolonged in time. From having just a single cup of the squeezed juice of *Aristolochia leuconeura*'s leaves, to drink every morning for seven days a litre of a decoction made from *Tabernaemontana sananho*'s root barks. Also, the calorie restriction prescribed can be less-or-more severe and extended in time. Normally, the prolonged the emesis, the stronger the calorie restriction and the whole regime is. Due to their severity and length in time, depurative practices can be clearly classified either as mild or strict.

3.2. Mild depurative practices.

These practices are characterised by a moderate calorie restriction that never reaches fasting, where neither seclusion nor the restriction of the ingestion of salt are prescribed. They are generally short in time, many lasting just one day where only a single dose of a plant remedy is taken. In total, we recorded 93 reports of mild depurative practices, which are shown in Table 1.

The remedy most reported (35 times) in these shorter depurative practices was the worldwide famous ayahuasca mixture, made with the decoction of *Banisteriopsis caapi* stems with *Psychotria viridis* leaves, and sometimes (16 reports) also adding other plant species. In comparison with other areas of the Peruvian Amazon, we observed that the traditional ingestion of these mixtures hardly entailed any complex ritual. As mentioned by Lamb (1985), it seems that even more than half a century ago, Chazuta's medicine men were not familiar with managing the psychotropic effects commonly experienced with ayahuasca. Nowadays, it is difficult to track the original use of ayahuasca since its tourist boom experienced in recent years has spread throughout the country. Even a bar recently opened in the valley was named as Ayahuasca, and there is a thriving tourist industry in the region based on offering ayahuasca trips into the jungle.

The use of ayahuasca that we reported in Chazuta, differs from what is shown in many other studies of other regions of western Amazonia (Baer, 1979; Cárdenas-Timoteo, 1989; Chaumeil, 1979; Fericgla, 1994; Luna, 1986). In Chazuta, it looks like as if this plant mixture has been included into the local repertoire of *purgas*. In a few occasions, we observed traditional healers giving out ayahuasca mixtures to patients. Except in those healers that had been already in contact with westerners that searched for "trips", the remedy was dispensed as another *purga* where the main goal was to produce that cleansing effect, i.e., the depurative effect. Thus, the healers did not expect any psychotropic effect rather than a simple *mareacion*, i.e., sickness conducive to vomiting. It is obvious that the international popularity of ayahuasca arrived years ago in this valley, however, and at least until recently, this trend seemed to have adapted and shaped quite well into the local traditional medical system, using ayahuasca more as a depurative than a psychotropic. Most likely, ayahuasca could have been introduced relatively recently in Chazuta's ethnomedicine and the high number of reports found explained by the external pressure. Acculturation in these regions advances fast and it is likely that such a fragile environment in front of such a strong western current would quickly put ordinary farmers into singing in the middle of the night in a high, wearing condor feathers and jaguar tooth, which sincerely, it is hard to say considering the first one original, which one of the three specimens is more extinct.

3.3. Strict depurative practices

Strict depurative practices are characterised by a severe calorie restriction, usually leading to fasting. In these cases, both social

Table 1
Plant remedies used in mild depurative practices in Chazuta valley (Peruvian Amazon).

Scientific name (botanical family) (C=cultivated and/or W=wild) (voucher herbarium specimen)	**Local name**	**Part(s) used**	**Unspecific use reports[a] *N**:repeated reports[a]**	**Specific use reports *N**:repeated reports**		**Mode of preparation** (administration is oral)
Ardisia guyanensis (Aubl.) Mez (Myrsinaceae) (W) (BCN 40225)	Puka chakruna	Leaf	1	0		Decocted with *Banisteriopsis caapi* stems
Aristolochia leuconeura Linden (Aristolochiaceae) (C) (BCN 40090)	Yawar panka, Machakuy or Omagway waska, Wankawi sacha	Leaf	4	11	Cough (5), Bronchitis (5), Tobacco and cocaine addiction (1)	Squeezed, the juice obtained is drunk
			1	1	Tobacco and cocaine addiction. (1)	Decocted with *Banisteriopsis caapi* stems and *Psychotria viridis* leaves
Banisteriopsis caapi (Spruce ex Griseb.) C.V. Morton (Malpighiaceae) (C) (BCN 40135)	Ayawaska, Ayawaska negra, Ayawaska amarilla, Purgawaska	Stem	14	5	For hunting and fishing preparedness[b] (3), Stomach pains (2)	Decocted with *Psychotria viridis* leaves
			10+1*	0		Decocted: w/ *Ardisia guyanensis* leaves (1*), w/ *Psychotria alba* leaves (1), w/ *P. carthagenensis* leaves (1), w/ *P. ernestii* leaves (1), w/ *P. viridis* and *Gonzalagunia cornifolia* (2), w/ *P. viridis* and *Petiveria alliacea* (2), w/ *P. viridis* and *Pterocarpus rohrii*(2) w/*P. viridis*, *Rosenbergiodendron longifolium* and *Toxosiphon trifoliatus* (1)
			1	1	Rheumatism (1)	Decocted with *Psychotria viridis*, *Mansoa alliacea* and *Piper callosum*
			1	1	Rheumatism (1)	Decocted w/ *Psychotria viridis*, *P. carthagenensis*, *Cornutia microcalycina*, *Croton draconoides*, *Himatanthus sucuuba*, *Licaria* sp., *Mikania* sp. and *Virola calophylla*
			1	1	Lumbago (1)	Decocted w/ *Psychotria viridis*, *P. alba*, *Brugmansia suaveolens*, *Calliandra angustifolia*, *Couroupita guianensis*, *Tovomita* aff. *stylosa* and *Zygia longifolia*
			1*	1*	Tobacco and cocaine addiction (1*)	Decocted with *Psychotria viridis* and *Aristolochia leuconeura*
Brugmansia suaveolens (Humb. & Bonpl. ex Willd.) Bercht. & J. Presl (Solanaceae) (C) (BCN 40186)	Toe, Toe de flor blanca	Leaf	1*	1*	Lumbago (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. alba*, *Calliandra angustifolia*, *Couroupita guianensis*, *Tovomita* aff.*stylosa* and *Zygia longifolia*
Brunfelsia grandiflora subsp. ***grandiflora*** (Solanaceae) (C) (BCN 40340)	Chirik sanango	Root bark	4	11	Febrifuge (7), For hunting and fishing preparedness[b] (4)	Macerated in fresh water for some minutes
Calliandra angustifolia Spruce ex Benth. (Fabaceae) (C) (BCN 40154)	Bobensana	Stem	1*	1*	Lumbago (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. alba*, *Brugmansia suaveolens*, *Couroupita guianensis*, *Tovomita* aff.*stylosa and Zygia longifolia*
Cornutia microcalycina Pav. & Moldenke (Verbenaceae) (C and W) (BCN 40316)	Shinkurisacha	Leaf	1*	1*	Rheumatism (1*)	Decocted w/ *Banisteriopsis caapi*, *Psychotria viridis*, *P.carthagenensis*, *Croton draconoides*, *Himatanthus sucuuba*, *Licaria* sp., *Mikania* sp. and *Virola calophylla*
Couroupita guianensis Aubl. (Lecythidaceae) (C) (BCN 40136)	Aya uma	Bark	1*	1*	Lumbago (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. alba*, *Brugmansia suaveolens*, *Calliandra angustifolia*, *Tovomita* aff. *stylosa* and *Zygia longifolia*
Croton draconoides Müll. Arg. (Euphorbiaceae) (W) (BCN 40216)	Sangre de grado	Bark	1*	1*	Rheumatism (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. carthagenensis*, *Cornutia microcalycina*, *Himatanthus sucuuba*, *Licaria* sp., *Mikania* sp. and *Virola calophylla*
Gonzalagunia cornifolia (Kunth) Standl. (Rubiaceae) (W) (BCN 40275)	Pichana sacha, Pichana kaspi, Yaku lucero	Aerial part	2*	0		Decocted with *Banisteriopsis caapi* stems and *Psychotria viridis* leaves
Guarea macrophylla Vahl (Meliaceae) (C) (BCN 45069)	Requia	Bark	2	0		Decoction
Himatanthus sucuuba (Spruce ex Müll. Arg.) Woodson (Apocynaceae) (C) (BCN 40862)	Bellaco kaspi	Bark	2	2	Vermifuge (2)	Decoction
			1*	1*	Rheumatism (1*)	Boiled with *Banisteriopsis caapi*, *Psychotria viridis*, *P.carthagenensis*, *Cornutia microcalycina*, *Croton draconoides*, *Licaria* sp., *Mikania* sp. and *Virola calophylla*
Hura crepitans L. (Euphorbiaceae) (W) (BCN 40265)	Catahua	Latex	2	2	Vermifuge (2)	A small dose of the crude latex is drunk. This remedy is considered very toxic if overdose occurs.
Jatropha curcas L. (Euphorbiaceae) (C) (BCN 40263)	Piñon blanco	Leaf & seed	2	0		Squeezed, the juice obtained is drunk
Jatropha gossypiifolia L. (Euphorbiaceae) (C) (BCN 40264)	Piñon colorado	Leaf & seed	2	0		Squeezed, the juice obtained is drunk
Kalanchoe pinnata (Lam.) Pers. (Crassulaceae) (W) (BCN 40358)	Rakta panka, Aire sacha	Leaf	1	1	Pain when passing water (1)	Squeezed, then a great quantity of the juice obtained needs to be taken

Licaria sp. (Lauraceae) (W) (BCN 40116)	Canela	Bark	1*	1*	Rheumatism (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P.carthagenensis*, *Cornutia microcalycina*, *Croton draconoides*, *Himatanthus sucuuba*, *Mikania* sp. and *Virola calophylla*
Mansoa alliacea (Lam.) A.H. Gentry (Bignoniaceae) (C and W) (BCN 40100)	Ajo sacha, Ajo sacha macho, Ajo sacha hembra	Stem and root bark	2	2	For hunting and fishing preparedness [b] (2)	Macerated in fresh water for some minutes
			1*	1*	Rheumatism (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis* and *Piper callosum* leaves
***Mikania* sp**. (Asteraceae) (C)(JSB-513) [c]	Sinchi toe	Aerial part	1*	1*	Rheumatism (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *P. carthagenensis*, *Cornutia microcalycina*, *Croton draconoides*, *Himatanthus sucuuba*, *Licaria* sp. and *Virola calophylla*
Minquartia guianensis Aubl. (Olacaceae) (W) (BCN 40145)	Huacapú	Bark	5	0		Decoction (in 3 reports), Macerated in fresh water for some minutes (in 2 reports)
Petiveria alliacea L. (Phytolaccaceae) (C) (BCN 40892)	Mukura hembra, Mukura macho	Aerial part	2*	0		Decocted with *Banisteriopsis caapi* and *Psychotria viridis*
Piper callosum Ruiz & Pav. (Piperaceae) (C and W) (BCN 40846)	Guayusa macho or hembra	Leaf	1*	1*	Rheumatism (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis* and *Mansoa alliacea*
Psychotria alba Ruiz & Pav. (Rubiaceae) (W) (BCN 40291)	Chakruna	Leaf	1*	0		Decocted with *Banisteriopsis caapi* stems
			1*	1*	Lumbago (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *Brugmansia suaveolens*, *Calliandra angustifolia*, *Couroupita guianensis*, *Tovomita* aff. *stylosa* and *Zygia longifolia*
Psychotria carthagenensis Jacq. (Rubiaceae) (C and W) (BCN 40292)	Yaku bushiklla, Chakruna	Leaf	1*	0		Decocted with *Banisteriopsis caapi* stems
			1*	1*	Rheumatism (1*)	Decocted with *Banisteriopsis caapi*, *Psychotria viridis*, *Cornutia microcalycina*, *Croton draconoides*, *Himatanthus sucuuba*, *Licaria* sp., *Mikania* sp. and *Virola calophylla*
Psychotria ernestii K. Krause (Rubiaceae) (W) (BCN 40294)	Chakruna	Leaf	1*	0		Decocted with *Banisteriopsis caapi* stems
Psychotria viridis Ruiz & Pav. (Rubiaceae) (C) (BCN 40296)	Chakruna, Chakruna negra	Leaf	21*	5*	For hunting and fishing preparedness [b] (3*), Stomach pains (2*)	Decocted: w/ *Banisteriopsis caapi* (19*), w/ *B. caapi* & *Gonzalagunia cornifolia* (2*), w/ *B. caapi* & *Petiveria alliacea* (2*), w/ *B. caapi* & *Pterocarpus rohrii* (2*), w/ *B. caapi*, *Rosenbergiodendron longifolium* & *Toxosiphon trifoliatus* (1*)
			1*	1*	Rheumatism (1*)	Decocted with *Banisteriopsis caapi*, *Cornutia microcalycina*, *Croton draconoides*, *Himatanthus sucuuba*, *Licaria* sp., *Mikania* sp., *Psychotria carthagenensis* and *Virola calophylla*
			1*	1*	Rheumatism (1*)	Decocted with *Banisteriopsis caapi*, *Mansoa alliacea* and *Piper callosum*
			1*	1*	Lumbago (1*)	Decocted with *Banisteriopsis caapi*, *Brugmansia suaveolens*, *Calliandra angustifolia*, *Couroupita guianensis*, *Psychotria alba*, *Tovomita* aff. *stylosa* and *Zygia longifolia*
			1*	1*	Tobacco & cocaine addiction (1*)	Decocted with *Banisteriopsis caapi* and *Aristolochia leuconorrea*
Pterocarpus rohrii Vahl (Fabaceae) (C) (BCN 40159)	Yawar kaspi	Bark	2*	0		Decocted with *Banisteriopsis caapi* stems and *Psychotria viridis* leaves
Rosenbergiodendron longiflorum (Ruiz & Pav.) Fagerl. (Rubiaceae) (W) (BCN 40304)	Lucero sacha	Whole plant	1*	0		Decocted with *Banisteriopsis caapi*, *Psychotria viridis* and *Toxosiphon trifoliatus*
Tovomita* aff. *stylosa Hemsl. (Clusiaceae) (W) (BCN 44882)	Bachuja, Chullachaki kaspi/ hembra	Bark	1*	1*	Lumbago (1*)	Decocted w/ *Banisteriopsis caapi*, *Psychotria viridis*, *P. alba*, *Brugmansia suaveolens*, *Calliandra angustifolia*, *Couroupita guianensis* & *Zygia longifolia*
Toxosiphon trifoliatus (Pilg.) Kallunki (Rutaceae)(W)(JSB-145) [c]	Lucero sisa, Lucero sacha	Whole plant	1*	0		Decocted w/ *Banisteriopsis caapi*, *Psychotria viridis* & *Rosenbergiodendron longiflorum*
Virola calophylla (Spruce) Warb. (Myristicaceae) (W) (BCN 40115)	Cumala roja	Bark	1*	1*	Rheumatism (1*)	Decocted w/ *Banisteriopsis caapi*, *Psychotria viridis*, *P. carthagenensis*, *Cornutia microcalycina*, *Croton draconoides*, *Himatanthus sucuuba*, *Licaria* sp. & *Mikania* sp.
Zygia longifolia (Humb. & Bonpl. ex Willd.) Britton & Rose (Fabaceae) (W) (BCN 44887)	Yaku or Untai shimbillu, Shimbillu	Bark	1*	1*	Lumbago (1*)	Decocted w/ *Banisteriopsis caapi*, *Psychotria viridis*, *P. alba*, *Brugmansia suaveolens*, *Calliandra angustifolia*, *Couroupita guianensis* & *Tovomita* aff. *Stylosa*

[a] Unspecific use reports were those which informants considered that the cleansing effect produced by depurative practices brought a general and unspecific tonic effects (see Table 3).

[b] In Chazuta, it was common to endure depurative practices to achieve the necessary fitness to go out in hunting and fishing expeditions. Moreover, through the depurative effect most of the corporal scent was expected to disappear, hence making human presence unnoticeable for wild animals which then become easier whether to hunt or fish.

[c] BCN codes unavailable. Instead, the collection number, i.e., **Jsb-xxx**, is provided. If needed, a duplicate must be found in USM (Lima, Peru), where these specimens were yet to be entered.

Table 2
Plant remedies used in strict depurative practices in Chazuta valley (Peruvian Amazon).

Scientific name (C=cultivated and/or W=wild) (voucher herbarium specimen)	Local name	Part used	Unspecific use reports[a] *N**: repeated reports [a]	Specific use reports* *N**: repeated reports	**Mode of preparation** (Administration is oral)
Aspidosperma rigidum Rusby (Apocynaceae) (W) (BCN 40686)	Tashkum remo kaspi, Remo kaspi	Bark	1	0	Decocted with the root bark of *Tabernaemontana undulata*
Banisteriopsis caapi (Spruce ex Griseb.) C. V. Morton (Malpighiaceae) (C) (BCN 40135)	Ayawaska negra, A. amarilla, Purgawaska	Stem	0	1 Pulmonary disease (1)	Decocted with *Psychotria viridis* leaves
Brosimum alicastrum subsp. ***bolivarense*** (Pittier) C.C. Berg (Moraceae) (C and W) (BCN 40699)	Manchinga	Latex	0	3 Rheumatism (3)	One spoonful of the latex is mixed with warm water
Brunfelsia grandiflora subsp. ***grandiflora*** (Solanaceae) (C) (BCN 40340)	Chirik sanango	Root bark	1	13 Rheumatism (12), Inguinal hernia[b] (1)	Macerated in fresh water
Callaeum antifebrile (Griseb.) D. M. Johnson (Malpighiaceae) (C and W) (BCN 40246)	Shillinto blanco, Shillinto negro	Stem	1	4 Abscess (1), Leishmaniosis[c] (1), Tumors (1), AIDS (1)	The crushed stem, (sometimes previously roasted), is macerated in fresh water. Normally, a single dose is given
Calyptranthes bipennis O. Berg (Myrtaceae) (C) (BCN 40119)	Guayusa macho Ullku guayusa	Leaf	1	0	Infusion
Couepia chrysocalyx (Poepp.) Benth. ex Hook. f. (Chrysobalanaceae) (W) (BCN 44897)	Parinari	Bark	0	1 Tumors (1)	Decocted with *Remijia megistocaula*, Smilax longifolia and *Trichilia maynasiana*
Esenbeckia amazonica Kaastra (Rutaceae) (W) (BCN 40831)	Munichi sacha	Leaf	2	0	Decoction
Ficus trigona L.f. (Moraceae) (C and W) (BCN 40702)	Millwa renaquillo, Millwa renaco, M.r. macho, M.r. hembra, M.r. de hoja ancha, M.r. de hoja pequeña	Bark	1	0	Decoction
Heliconia acuminata Rich. (Heliconiaceae) (W) (BCN 40361)	Mishki panka	Leaf	0	1 For hunting and fishing preparedness[d] (1)	Infusion, for drinking and, in addition, bathing
Mansoa alliacea (Lam.) A.H. Gentry (Bignoniaceae) (C and W) (BCN 40100)	Ajo sacha macho/ hembra	Stem and root bark	1	8 Rheumatism (8)	Macerated in fresh water
Maytenus aff. ***macrocarpa*** (Ruiz & Pav.) Briq. (Celastraceae) (W) (BCN 40217/ 40218)	Chuchuwasha Chuchuwasha Blanca	Bark	0	2 Inguinal hernia[b] (1), Broken bones (1)	Macerated in fresh water
Phthirusa stelis (L.) Kuijt (Loranthaceae) (C) (BCN 40133)	Suelda con suelda de hoja menuda, Pishku isman de hoja menuda	Stem	0	1 Inguinal hernia[b] (1)	Decoction
Physalis angulata L. (Solanaceae) (W) (BCN 40877)	Bolsa mullaka	Whole plant	0	1 Malaria (1)	Infusion
Piper callosum Ruiz & Pav. (Piperaceae) (C and W) (BCN 40846)	Guayusa macho, Guayusa hembra	Leaf	2	0	Infusion
Poulsenia armata (Miq.) Standl. (Moraceae) (W) (BCN 40578)	Yanchama blanca, Yanchama negra	Latex	0	1 Rheumatism (1)	A few spoonfuls are mixed with warm water
Psychotria viridis Ruiz & Pav. (Rubiaceae) (C) (BCN 40296)	Chakruna, Chakruna negra	Leaf	0	1* Pulmonary disease (1*)	Decocted with crushed stems of *Banisteriopsis caapi*
Remijia megistocaula K. Krause (Rubiaceae) (W) (BCN 40270)	Capirona blanca	Bark	0	1* Tumors (1*)	Decocted with *Couepia chrysocalyx*, *Smilax longifolia* and *Trichilia maynasiana*
Renealmia aromatica (Aubl.) Griseb. (Zingiberaceae) (W) (BCN 40836)	Ñukñuk panka	Leaf	0	1 For hunting and fishing preparedness[d] (1)	Infusion, for drinking and, in addition, bathing
Smilax longifolia Rich. (Smilacaceae) (W) (BCN 40850)	Zarza, Zarzaparrilla	Root	0	1* Tumors (1*)	Decocted with *Couepia chrysocalyx*, *Remijia megistocaula* and *Trichilia maynasiana*.
Strychnos ramentifera Ducke (Loganiaceae) (W) (USM 206354)	Suifa, Waska chuchuwasha	Stem	0	1 Malaria (1)	Decoction

Strychnos solimoesana Krukoff (Loganiaceae) (W) (USM 206381)	Suifa, Waska chuchuwasha	Stem	0	1	Rheumatism (1)	Decoction
Tabernaemontana sananho Ruiz & Pav. (Apocynaceae) (C and W) (BCN40859)	Uchu sanango	Root bark	5	5	Rheumatism (3), Inguinal hernia[b] (1), Vermifuge (1)	Macerated in fresh water
Tabernaemontana undulata Vahl (Apocynaceae) (C and W) (BCN 40725)	Ushpawasha sanango, Ayac sanango	Root bark	1 1*	3 0	Rheumatism (2), Malaria (1)	Decocted or macerated in fresh water. Decocted with the bark of *Aspidosperma rigidum*.
Tovomita brasiliensis (Mart.) Walp. (Clusiaceae) (W) (BCN 45070)	Bachuja, Chullachaki kaspi, C. k. macho	Bark	0	1	Rheumatism (1)	Macerated with other plants to conform a particular Bachuja mixture[e].
Tovomita aff. stylosa Hemsl. (Clusiaceae) (W) (BCN 44882)	Bachuja, Chullachaki kaspi, C. k. hembra	Bark	17	17	Rheumatism (7), Broken bones (5), Abscess (1), Inguinal hernia[b] (1), Leishmaniosis[c] (1), Vaginal pains (1), Urine infection (1)	Decocted (18) or macerated in fresh water (16), with other plants to conform the plant mixture known as Bachuja[f].
Trichilia maynasiana C. DC. (Meliaceae) (W) (BCN 44884)	Shatunillu	Bark	0	1*	Tumors (1*)	Decocted with *Couepia chrysocalyx*, *Remijia megistocaula* and *Smilax longifolia*.

[a] Unspecific use reports were those which informants considered that the cleansing effect produced by depurative practices brought a general and unspecific tonic effect (see Table 3).

[b] We consider that the disorder known in Chazuta as *bajada de testos* (descendent testicles) refers to inguinal hernia. It is a much prevalent ailment among "Chazutian" men that is usually caused when carrying heavy weights.

[c] We consider that the disease known in Chazuta as *uta* refers to leishmaniosis. Even though it is rare in Chazuta, individuals who spend days deep inside the forest (normally involved in illegal tree felling) are especially prone to leishmania infection.

[d] In Chazuta, it was common to endure depurative practices to achieve the necessary fitness to go out in hunting and fishing expeditions. Moreover, through the depurative effect most of the corporal scent was expected to disappear, hence making human presence unnoticeable for wild animals which then become easier whether to hunt or fish.

[e] This particular Bachuja mixture is prepared by macerating the bark of Tovomita brasiliensis with the following plants: Calliandra angustifolia Spruce ex Benth. (Fabaceae) (BCN 40154) (1 report), Clusia aff. palmicida Rich. ex Planch. and Triana (Clusiaceae) (BCN 44874) (1), Erythroxylum sp. (Erythroxylaceae) (BCN 40234) (1), Ficus nymphaeifolia Mill. (Moraceae) (BCN 40638) (1), Ficus vs. paraensis (Miq.) Miq. (Moraceae) (BCN 40711) (1), Ficus ypsilophlebia Dugand (Moraceae) (BCN 40580) (1), Tovomita cf. longifolia (Rich.) Hochr. (Clusiaceae) (BCN 44878) (1) and Zygia longifolia (Humb. and Bonpl. ex Willd.) Britton and Rose (Fabaceae) (BCN 44887) (1).

[f] Bachuja mixtures are either macerations in fresh water or decoctions of *Tovomita* aff. *stylosa* bark with the following plants: *Tovomita foldatsii* Cuello (Clusiaceae) (BCN 44883) (29 reports), *Calliandra angustifolia* Spruce ex Benth. (Fabaceae) (BCN 40154) (20), *Maytenus* aff. *macrocarpa* (Ruiz & Pav.) Briq. (Celastraceae) (BCN 40217/40218) (13), *Zygia longifolia* (Humb. & Bonpl. ex Willd.) Britton & Rose (Fabaceae) (BCN 44887) (13), *Allosanthus trifoliolatus* Radlk. (Sapindaceae) (BCN 40140) (12), *Petrea* sp. (Verbenaceae) (BCN 40266) (12), *Clusia* aff. *lineata* (Benth.) Planch. & Triana (Clusiaceae) (BCN 44873) (10), *Dicranopygium* aff. *lugonis* Harling (Cyclanthaceae) (BCN 40083) (10), *Dicranopygium yacu-sisa* Harling (Cyclanthaceae) (BCN 40082) (10), *Rourea puberula* Baker (Connaraceae) (BCN 40691) (7), *Ficus trigona* L.f. (Moraceae) (BCN 40702) (6), *Clusia* aff. *loretensis* Engl. (Clusiaceae) (BCN 44872) (4), *Salacia cordata* (Miers) Mennega (Celastraceae) (BCN 40566) (4), *Ficus caballina* Standl. (Moraceae) (BCN40710) (3), *Ruellia proxima* Lindau (Acanthaceae) (BCN 40220) (3), *Ardisia huallagae* Mez (Myrsinaceae) (BCN 40226) (2), *Clusia* sp.2. (Clusiaceae) (JSB24)[g] (2), *Clusia* sp.3. (Clusiaceae) (USM 207186) (2), *Clusia* sp.4. (Clusiaceae) (JSB-261)[g] (2), *Eugenia biflora* (L.) DC. (Myrtaceae) (BCN 40110) (2), *Ficus casapiensis* (Miq.) Miq. (Moraceae) (BCN 40647) (2), *Aspidosperma rigidum* Rusby (Apocynaceae) (BCN 40686) (1), *Asplundia sp.* (Cyclanthaceae) (JSB263)[g] (1), *Capparis sola* J.F. Macbr. (Capparaceae) (BCN 46106) (1), *Carpotroche* aff. *longifolia* (Poepp.) Benth. (Flacourtiaceae) (BCN 40258) (1), *Casearia* sp. (Flacourtiaceae) (BCN 40087) (1), *Chomelia paniculata* (Bartl. ex DC.) Steyerm. (Rubiaceae) (BCN 40305) (1), *Chrysochlamys ulei* Engl. (Clusiaceae) (BCN 40227) (1), *Clusia* aff. *flavida* (Benth.) Pipoly (Clusiaceae) (BCN 45073) (1), *Clusia* aff. *palmicida* Rich. ex Planch. & Triana (Clusiaceae) (BCN 44874) (1), *Clusia* sp.1. (Clusiaceae) (JSB271)[g] (1), *Clusia* sp.5. (Clusiaceae) (JSB-469)[g] (1), *Condaminea corymbosa* (Ruiz & Pav.) DC. (Rubiaceae) (BCN40271) (1), *Copaifera paupera* (Herzog) Dwyer (Fabaceae) (BCN 40153) (1), *Coussarea brevicaulis* K. Krause (Rubiaceae) (BCN 40310) (1), *Doliocarpus* aff. *dentatus* (Aubl.) Standl. (Dilleniaceae) (BCN 40192) (1), *Ficus americana* subsp. *guianensis* (Desv. ex Ham.) C.C. Berg (Moraceae) (USM 206345) (1), *Ficus eximia* Schott (Moraceae) (BCN 40697) (1), *Ficus macbridei* Standl. (Moraceae) (BCN 40696) (1), *Ficus* vs. *maxima* Mill. (Moraceae) (BCN 40639) (1), *Ficus obtusifolia* Kunth. (Moraceae) (BCN 208763) (1), *Ficus pertusa* L.f. (Moraceae) (BCN 40694) (1), *Ficus tonduzii* Standl. (Moraceae) (BCN 40648) (1), *Ficus ypsilophlebia* Dugand (Moraceae) (BCN 40580) (1), *Forsteronia graciloides* Woodson (Apocynaceae) (BCN 40684) (1), *Garcinia madruno* (Kunth) Hammel (Clusiaceae) (JSB-139)[g] (1), *Heteropsis flexuosa* (Kunth) G.S. Bunting (Araceae) (BCN 40328) (1), *Hevea guianensis* Aubl. (Euphorbiaceae) (BCN 40260) (1), *Hippotis tubiflora* Spruce ex K. Schum. (Rubiaceae) (BCN 40277) (1), *Inga ruiziana* G. Don (Fabaceae) (BCN 44889) (1), *Inga semialata* (Vell.) Mart. (Fabaceae) (BCN 44885) (1), *Marcgravia* cf. *crenata* Poepp. ex Wittm. (Marcgraviaceae) (JSB-250)[g] (1), *Matelea rivularis* Woodson (Asclepiadaceae) (BCN 40332) (1), *Maxillaria* sp. (Orchidaceae) (JSB-159)[g] (1), *Phthirusa stelis* (L.) Kuijt (Loranthaceae) (BCN 40133) (1), *Psittacanthus cucullaris* (Lam.) Blume (Loranthaceae) (BCN 40313) (1), *Psychotria carthagenensis* Jacq. (Rubiaceae) (BCN 40292) (1), *Rinorea viridifolia* Rusby (Violaceae) (BCN 46108) (1), *Sida setosa* Mart. ex Colla (Malvaceae) (BCN 44891) (1), *Solanum monadelphum* Van Heurck & Müll. Arg. (Solanaceae) (JSB-259)[g] (1), *Strychnos ramentifera* Ducke (Loganiaceae) (USM 206354) (1), *Swartzia arborescens* (Aubl.) Pittier (Fabaceae) (BCN 40173) (1), *Swartzia simplex* (Sw.) Spreng. (Fabaceae) (W) (BCN 40172) (1), *Tovomita carinata* Eyma (Clusiaceae) (BCN 44877) (1), *Toxosiphon trifoliatus* (Pilg.) Kallunki (Rutaceae) (JSB-145)[g] (1) and *Unonopsis* sp. (Annonaceae) (W) (BCN 40720) (1).

[g] BCN and USM codes unavailable. Instead, the collection number, i.e., **Jsb-xxx**, is provided. If needed, a duplicate must be found in USM (Lima, Peru), where these specimens were yet to be entered.

seclusion and the restriction of the ingestion of salt are often prescribed. They are longer in time than mild depurative practices and usually a plant remedy is ingested multiple times. For this second type of depurative practices, which are shown in Table 2, we obtained 98 reports.

These more severe depurative practices are known as strict diets and have been the study subject in a previous paper (Sanz-Biset and Cañigueral, 2011). Informants stressed that the intention to take emetic remedies and to fast was again to produce this general cleansing effect considered medicinally beneficial by itself. It is common sense to see that the rejection of salt in such regimes may participate in the depurative effect as this restriction clearly enhances diuresis as well as other corporal secretions such as perspiration. The plant remedy known by informants as either *bachuja* or *mezcla de palos* was the most reported (34 times) in the survey for being taken in strict diets. It is a plant mixture that always contain species of the genus *Tovomita* (Clusiaceae) (Fig. 3) and which locals consider as the panacea of Chazuta.

3.4. Uses of depurative practices and the function of plants

Depurative practices in the traditional medicine of Chazuta are used either to restore health or to maintain it. Even though we expected informants to bring in strong irrational beliefs to explain the function of their vomiting and starvation practices, the main argument they put forward persistently was the concept that cleansing, whether through emesis or by restricting food, was salutiferous. In addition, in Chazuta informants also stressed that if plants were to be used for curing, the necessary *dieta* was needed to be followed. In some occasions, fasting was said to be the main cure and plant remedies just used to complement it. In a way, the fact that vomiting and starving was not avoided but desired, left us puzzled at the beginning, as it seemed to contradict our conventional western medical beliefs on health and healing.

Depurative practices reported in Chazuta were employed against different ailments prevalent in the region. The most common diseases in Chazuta have an infectious aetiology due to the tropical climate and lack of sewer systems. Musculoskeletal ailments are also frequent, due to the rural lifestyle. However, in many occasions depurative practices were employed to tone and strengthen the body, thus to cope better with the labour of being a *chacarero* (farmer), *montaraz* (hunter) and *mitayero* (rural worker in general). These terms partially compile the region's view of a capable, strong and healthy individual, i.e., someone able to sustain his/her family and clan, which until recently mainly depended upon the food harvested from the orchards, the animals hunted in the jungle and fished in the rivers, as well as upon the maintenance of a certain social balance (Salas-Fasabi, 2001; Weiss, 1949). It is considered that the cleansing produced by these practices brings a more general tonic effect expressed in Chazuta in ways such as: (a) augmenting work performance, (b) enhancing endurance (*hacerse más bizarro*), (c) increasing weight carrying, (d) extending cold resistance, (e) sharpening the senses, (f) lessening sluggishness (*dejar de ser arragán*), (g) preventing illnesses, or (h) improving sexual function.

The wide range of medicinal uses recorded for these practices, which can be separated as either being specific (103 reports) or unspecific (88), are shown in Table 3.

Determining the function of plants in depurative practices is less straightforward as, often, precise plant activities can not be

Fig. 3. *Tovomita* aff. *stylosa* with a single stilt root (left), and *Tovomita foldatsii* showing multiple stilt roots (right). Both are the plants most employed in the strict depurative practices in Chazuta valley.

Table 3
Medicinal uses reported in the 191 depurative practices recorded in Chazuta valley (Peruvian Amazon).

Specific medicinal uses recorded (103 reports)	Unspecific medicinal uses recorded (88 reports)
Rheumatism (40 reports)	Depurative tonic
For hunting and fishing preparedness (11)	Cleansing tonic
Febrifuge (7), malaria (3)	Tonic
Broken bones (6), inguinal hernia (5)	To augment work performance
Cough (5), bronchitis (5)	To enhance endurance (*hacerse más bizarro*)
Vermifuge (5), stomach pains (2)	To increase weight carrying
Tobacco and cocaine addiction (2)	To extend cold resistance
Abscesses (2), leishmaniosis (2)	To sharpen the senses
Tumors (2)	To lessen sluggishness (*dejar de ser arragán*)
Urine infection (2), vaginal pains (1)	To prevent illnesses
Lumbago (1)	To improve sexual function
Pulmonary disease (1)	
AIDS (1)	

directly associated. In some cases plants are considered to play an important role in depurative practices used against specific ailments, mainly diseases where pain, inflammation and infection are present. Indeed, many plants employed in strict depurative practices are known to harbour activities such as antinflammatory and antimicrobial (Sanz-Biset and Cañigueral, 2011).

Nevertheless, the broadness of the use reports obtained is maintained in depurative practices—either these being mild or strict, either these using one plant remedy or another. Thus, once the depurative effect is induced, Chazutians expect this wide array of medicinal effects from it. A similar pattern applies for the plants employed in these practices, where the depuration considered to produce the broad spectrum of medicinal effects is fundamentally triggered by the stimulation of emesis.

The broadness of the use reports, the high number of unspecific uses reported and the fact that the induction of emesis is a common factor for the plants used suggest the involvement of adaptive stress responses in depurative practices and also support considering plants as medicinal stressors, that is, as inducers of beneficial levels of stress. Bearing in mind plants as medicinal stressors can lead to targeting different bioactivities.

In addition, a quick look at the plants mostly used in Chazuta's depurative practices clearly indicates the likely presence of CNS activity, especially in those plants belonging to the *Apocynaceae*, *Clusiaceae*, *Loganiaceae*, *Malpighiaceae*, *Solanaceae and Rubiaceae* families. Species of those botanical families were involved in 127 depurative practices reports (66% of all). It is clear that CNS activity could take part into the whole activation of the stress system. Also, a psychological aspect may contribute to the use of such drastic practices that depurations are. When the body is put under such pressure, whether through vomiting or starving, the state of the mind may be expected to follow a particular pattern where CNS plant activity may have its role.

4. Conclusions

Overall, 191 depurative practices were reported in Chazuta using 114 different plant species which were recorded and identified. These practices can be classified as mild (93 reports) or strict (98) depending on how severe in restrictions and prolonged in time they are. By inducing moderate stress through emesis and calorie restriction and within safe levels, depurative practices in Chazuta could produce adaptive responses that would protect against the detrimental consequences of chronic stress and stress-related diseases. This hypothesis could help to understand the diversity of the medicinal uses that we recorded in the field, either specific (103 reports) or unspecific (88). The experimental data shown in this paper supports considering plant remedies used in these practices in Chazuta as "medicinal stressors" as through vomiting the necessary neuroendocrine stress activation would be produced. In addition, CNS activity and other bioactivities that plants may harbour could converge with the whole stress reactivity process.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.jep.2012.09.053.

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Plants as medicinal stressors, the case of depurative practices in Chazuta valley (Peruvian Amazonia)

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Supplementary file:
Theoretical framework

1. Introduction

At the beginning of studying Chazuta's depurative practices, particularly in regards to their more unspecific medicinal uses, we found ourselves limited with the conventional approach of targeting precise biological activities or active compounds, as there this relationship became less clear. Therefore, we were lead to consider other biomedical models that could explain the broad spectrum of the physiological effects reported in the field.

This supplementary file shows the theoretical framework that allowed us to end up considering an adaptive stress response model for the study of Chazuta's depurative practices. This is discussed in the following order. First, the biological processes involved in nausea, emesis, calorie restriction, fasting, mitohormesis and the physiology of stress are described. Then, adaptive response models are considered. Finally, the medicinal uses reported for depurative practices are suggested to be explained as adaptive stress responses.

2. Nausea and vomiting

Most of the plant remedies observed to be taken in depurative practices in Chazuta, were aqueous extracts, often unbearably bitter, highly unpleasant to drink, which seemed to act mainly as irritants of the gastric and intestinal mucosa triggering nausea conducive to emesis

The vomiting response appears in many species, found in most vertebrates (Borison et al., 1981), as a physiological capability that has been presumably developed to deal with the real danger of food poisoning and toxin ingestion. On the other hand, humankind has historically developed practices were vomiting was considered a therapeutic tool in different medical systems throughout time such as in Galenic medicine (Snaith, 2004), Ayurveda (Gupta and Shaw, 2009) or in 19th century's western medicine (Leonard, 2004).

Nausea is seen as a complex control mechanism that in humans appears a) when food is perceived as repulsive so inhibits eating it, or when food has been previously associated with nausea and/or vomiting (i.e. in aversion reactions activated by taste or smell); b) when the stomach is malfunctioning because of pathology or due to the ingestion of a toxin (motion sickness is believed to provoke nausea because it activates a neurological reaction similar to the one brought by the ingestion of toxins); c) in threatening situations that have nothing to do with eating, e.g., immediately before a speech in front of an audience (Stern and Koch, 1996).

Different studies support that the sensation of nausea is originated by gastric tachyarrhythmia due to an increase in sympathetic nervous system activity and a decrease in parasympathetic nervous system activity (Imai et al., 2006; Meissner et al., 2011). These results are obtained by collecting data from healthy individuals exposed to a rotating drum that induces motion sickness. Then, data is collected from both subjective reports of symptoms and electrogastrographic (EGG) data (electrogastrograms are non-invasive instruments that record gastric myoelectrical activity from the abdominal surface with cutaneous electrodes). The disruption in normal gastric myoelectric activity due to motion sickness is usually followed by reports of nausea and an increase in vasopressin levels in the blood in symptomatic subjects along with reports of nausea, and vasopressin decrease as nausea subsides. In contrast, levels of stress hormones such as epinephrine increase with reports of nausea, but do not decrease until long after nausea subsides. Asymptomatic subjects developed neither gastric dysrhythmias nor increased vasopressin release during drum rotation (Stern, 2002).

In another example where motion sickness was stimulated by sitting in a rotating chair the secretion of vasopressin was the most sensitive indicator for the stress of motion sickness whereas growth hormone, prolactin, and cortisol responses were more delayed and less pronounced (Eversmann et al., 1978). In addition, many other reports of vasopressin increase related to nausea have been found, such as with injection of the emetic drug apomorphine (Feldman et al., 1988), or with cancer chemotherapy agents (Edwards et al., 1989). However, determining the brain's final common pathway and central pattern generator for nausea and vomiting is largely unsolved, present attempts being controversial, as the neural system for nausea and vomiting is contained within a highly complex neuronal network of the central nervous system (Horn, 2008).

3. Calorie restriction and fasting

The usual drastic vomiting caused by the herbal preparations administered in depurative practices in Chazuta, naturally brings the need to follow a more constrained food and behavioural regime. This can go from simply restricting some types of food, to become so strict that could even imply to fast. In these cases were fasting was present, salt limitation and rest in social seclusion was also prescribed. As mentioned earlier, the prolonged the emesis, the longer and severe the calorie restriction and the whole regime was.

Throughout history, numerous societies have considered the health benefits of food limitation such as the Ancient Greeks and Romans (Dehmelt, 2004). And fasting has been practised by humankind for religious purposes, own discipline, political intentions and as a mean of restoring health (Lützner, 1999). In modern science, calorie or diet restriction (without malnutrition) has been a popular subject of study since first McCay et al. (1935) reported that caloric restriction increased maximal longevity in rats. To sum up, studies mainly in rodents have shown that calorie restriction both slows and protects against ageing, as well as decreasing the incidence of ailments (Weindruch and Sohal, 1997). Although research on humans is still scarce, available data suggests that calorie reduction decrease blood pressure, fasting blood glucose, insulin, cholesterol, triiodothyronine and white blood cells (Walford et al., 2002). Hence, calorie restriction may reduce the risk of developing Type 2 diabetes and atherosclerosis, as well as activate the same adaptive responses that calorie restriction in laboratory animals has shown (Holloszy and Fontana, 2007). Actually, it has been suggested that calorie

restriction acts by inducing low-level stress that culminates in increased stress resistance, ultimately longevity and beyond (Masoro, 1998; Sinclair, 2005). This would reflect an adaptive response commonly defined as hormesis, i.e. favourable biological responses to low exposures to stressors (Calabrese et al., 2007). However, according to Thayer et al. (2005) the acceptation of a low-dose stimulation and a high-dose inhibition by a certain agent is only justified if there is an understanding of the biological processes underpinning that specific dose response behaviour. This has been one of the main points of controversy (Shrader-Frechette, 2010) on many papers published over the past years on the concept of hormesis mainly related to environmental exposure to toxic agents (Calabrese and Baldwin, 2003).

On the contrary, in recent years the concept of mitohormesis has been developed based on biological mechanisms (Ristow and Zarse, 2010; Tapia, 2006). The concept is developed from recent data showing that calorie restriction induces mitochondrial metabolism to extend life span in various model organisms (Piper and Bartke, 2008). In conflict with Harman's free radical theory of ageing, these effects may be caused by increased formation of reactive oxygen species within the mitochondria. This would originate an adaptive response that culminates in subsequently increased stress resistance assumed to ultimately cause a long-term reduction of oxidative stress (Ristow et al., 2009).

Fasting is a subject that also enjoys a wide array of literature that relates more or less with the uses of depurative practices that we have recorded in Chazuta. Studies on fasting in humans have been performed in various settings such as in the practice of therapeutic fasting in western clinics or the exercise of Ramadan. For example, fasting in humans has shown efficacy with regards to psychosomatic diseases, irritable colon syndrome, neurocirculatory asthenia, mild diabetes mellitus, obesity, borderline hypertension (Yamamoto et al., 1976), rheumatoid arthritis (Al-Dubeikil and Abdul-Lateef, 2003), pain syndromes (Kjeldsen-Kragh et al., 1991) and gastrointestinal disorders (Kanazawa et al., 2006). Also, fasting enhanced immune effector's mechanisms in obese subjects (Wing et al., 1983), stimulate lymphocyte and neutrophyl function (McMurray et al., 1990), increased brain availability of serotonin, endogenous opioids, endocannabinoids (Komaki et al., 1990; Michalsen, 2010), lead to mood enhancement and it improved the quality of sleep and daytime performance in non-obese subjects (Michalsen et al., 2003).

In the early phases of fasting, as blood glucose levels falls there is a decrease in insulin and a rise in regulatory hormones such as glucagons, ephinephrine and cortisol that produce glucose from hepatic glycogen stores. As fasting progresses, low insulin stimulates lipolysis and ketone body production which means a switch to fat-based metabolism. The net effect of the metabolic response to fasting mediated by lack of insulin is to supply alternate efficient fuels for metabolism, while reducing the need for glucose, and thereby preventing protein catabolism and protecting lean mass (Ahima, 2000). This and other changes in hormone levels are largely unknown but all seem to promote survival and conserve energy. However, in excesive prolonged fasts, the catabolism of vital muscular tissue can occur, which can lead to morbid effects (McCue, 2012).

Fasting suppresses the sympathetic nervous activity, activates the hypothalamic-pitutiary-adrenal axis and suppresses reproductive and thyroid hormones (Bergendahl et

al., 1999). Also, levels of leptin hormone, which are directly proportional to energy stores in adipose tissue, decrease with fasting. Therefore suggesting the fall in leptin as an important mediator of the adaptation to fasting (Flier et al., 1997).

4. Suggesting an adaptive stress response model

In part due to the unspecific medicinal uses reported of depurative practices in Chazuta and given the wide range of them we have to consider biomedical models that could explain the broad spectrum of medicinal uses reported. As seen above, the two main physiological effects found in depurative practices, i.e. vomiting and starving, activate the stress system. Therefore it is plausible to consider adaptive stress response models for Chazuta's depurative practices.

It is beyond the scope of this paper to discus the multiple findings on stress physiology, since excellent reviews on this topic have been published (Chrousos, 2006; Tsigos and Chrousos, 2002). To sum up, adaptive responses are a complex repertoire of physiological and behavioural responses aimed to re-establish a state of homeostasis threatened by stress. ''Stress'' is defined as a state of disharmony or threatened homeostasis. Adaptive responses to stress trigger a precise neuroendocrine infrastructure leaded by activation of the Hypothalamic-Pituitary-Adrenal (HPA) axis thereafter causing effects on behaviour, the major endocrine axes, and the gastrointestinal and immune systems. Altered regulation or dysregulation of the adaptive responses is studied as the biological mechanism in various physiologic and pathophysiologic states. Stress responses are triggered by a great diversity of neurosensory and blood-borne signals, which can be stimulated in a stressor-specific fashion. However, as the potency of the stressor increases, the specificity of the response decreases to eventually produce the relatively non-specific stress response syndrome. Then, arousal, alertness and vigilance are increased, analgesia enhanced, core temperatures elevated and vegetative functions inhibited such as appetite, feeding and reproductive function. At the same time, oxygen and nutrients are directed to the CNS and the parts of the body where they are needed the most, cardiovascular tone and respiratory rate increase, and metabolism procures availability of vital substrates (gluconeogenesis, lipolysis). First, stress activates central components in the hypothalamus and in the brainstream such as corticotropin-releasing hormone (CRH) and vasopressin (AVP). Thereafter these will activate the peripheral limbs of stress which are the hypothalamic-pituitary-adrenal (HPA) axis, together with autonomic nervous system (ANS). In nonstressful conditions, both CRH and AVP are secreted in a circadian rhythm, while when stress is present their secretion increases. These and other complex neuroendocrine pathways activate the HPA axis which will finally release glucocorticoids modulating many different biological activities through different pathways such as heat-shock proteins and transcriptional factors. In addition, the ANS (both sympathetic and parasympathetic systems) also respond rapidly to stressors and controls a wide range of functions such as cardiovascular, respiratory, gastrointestinal, renal, endocrine and others. In addition to acetylcholine and norepinephrine, other mediators are also involved such as a variety of neuropeptides, adenosine triphosphate, nitric oxide or lipid mediators. The stress system also interacts with other CNS elements such as the dopaminergic system (motivational/reinforcement/reward phenomena), amygdale (retrieval and emotional analysis), hippocampus (inhibits other stress centres), arcuate nucleus (inhibits central components of stress and produces analgesia, euphoria and dependence) and the thermoregulatory and appetite-satiety centre. Healthy

individuals present different responsiveness to stress that depend of many factors some of these even being inherited, as genetic studies have indicated. This stress response in healthy individuals, with the resultant activation of the HPA axis and other centres, is meant to be acute or at least of a limited duration. However, chronicity of stress system activation may lead to a pathological state such as diabetes mellitus, hyperthyroidism, melancholic depression or anorexia nervosa. On the other hand, hypoactivation of the stress system may result in other ailments such as rheumatoid arthritis, hypothyroidism, fibromyalgia or adrenal insufficiency.

Therefore, we can indicate that depurative practices would clearly activate the stress system through both emesis (which is characterised by an early peak secretion of vasopressin) and calorie restriction (which is distinguished by a decrease in leptin levels, at least when fasting is involved) (Fig. 1).

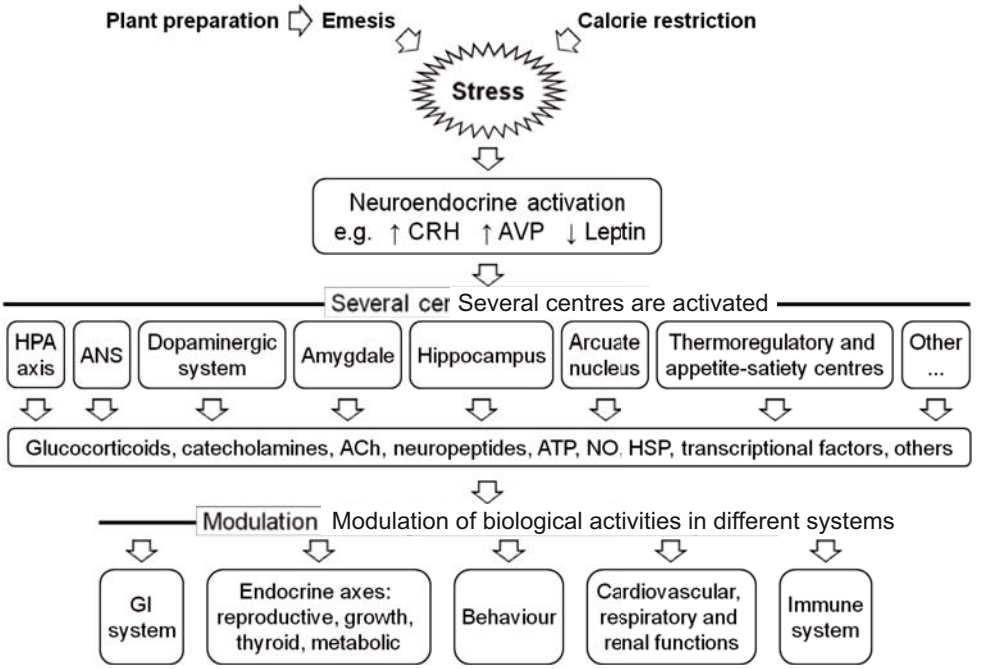

Fig. 1: Neuroendocrine infrastructure triggered by stress which could be activated by depurative practices in Chazuta valley. ACh: acetylcholine, ANS: autonomic nervous system, ATP: adenosine triphosphate, AVP: arginine vasopressin, CRH: corticotropin-releasing hormone, GI: gastrointestinal, HPA: hypothalamic-pituitary-adrenal, HSP: heat-shock proteins, NO: nitric oxide.

5. Beneficial exposure to stress

The concept of acquiring stress resistance or optimal stress activation by exposure to low levels of stress is common. For example, in the case of practising exercise that is designed to elicit an improvement in aerobic fitness.

Nowadays, it is generally accepted that physical exercise enhances health (Hu et al., 2004). The links between obesity, the metabolic syndrome, diabetes, vascular disease, cancer, and a sedentary lifestyle, are now clear. The decline in optimal stress reactivity

in modern life may be leading to increased systemic subclinical inflammatory tone, decreased metabolic flexibility and suppression of willingness to practice exercise. All of which translate into a significant increase in chronic diseases. Long and healthy life needs to include regular exposure to occasional doses of environmental stressors such as exercise (Nunn et al., 2010).

Many studies in physical activity have investigated its effect with the cardiovascular system. However, and as shown by recent meta-analyses published on the subject (Forcier et al., 2006; Hamer et al., 2006; Jackson and Dishman, 2006) results linking fitness and stress reactivity are contradictory. For example, whereas some studies found no effect of fitness on norepinephrine and epinephrine levels in plasma or urine, others reported higher norepinephrine levels in plasma in trained subjects early on in the stress period. Jackson and Dishman (2006) agreed that there is a need to consider much more study variables and to study them in real life stress tasks, before drawing a final conclusion. First, variables related to the cardiovascular function other than the usual ones such as hearth rate and blood pressure. Second, by also considering individual differences besides the level of fitness (e.g. gender, age or race). But also, they stressed the need to clarify whether increases in cardiorespiratory fitness or physical activity alter hemodynamic, vascular, hemostatic, cellular, and molecular components of integrated stress responses in ways that affect cardiovascular health.

For instance, the mitohormesis hypothesis is an example of how cellular and molecular components of stress responses can be clarified. Mitohormesis (shown earlier in section 3) it is also used to explain the health promoting effects of physical exercise in humans (Tapia 2006). This suggests that calorie restriction and physical exercise share, at least in part, a common metabolic denominator, i.e. increased mitochondrial metabolism and reactive oxygen species formation inducing an adaptive response that culminates in increased stress resistance, antioxidant defense, extended life span, and other salutiferous effects (Ristow and Zarse, 2010) such as improving cardiovascular health. This type of retrograde response may in addition be applicable to part of the health promoting effects of Chazuta's depurative practices.

6. Conclusion

Therefore, similarly to physical activity the beneficial effects reported for Chazuta's depurative practices could be generally explained as a beneficial exposure to stress. The corresponding adaptive stress responses originated would protect against the detrimental consequences of chronic stress and stress-related diseases. This could not only help to explain the uses of depurative practices in Chazuta of a more specific nature such as anti-inflammatory, gastrointestinal or behavioural, but also the more unspecific ones.

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5

Resum global dels resultats obtinguts i de la seva discussió

Aquest capítol agrupa amb una redacció contínua els principals resultats i discussions de les tres publicacions que aquesta tesi compendia. La continuïtat del desenvolupament argumental és menys aparent si es llegeixen per separat les tres publicacions. Tanmateix, existeix un ordre en les publicacions, en el qual el tercer article (apartat 4.3) és fruit de les conclusions obtingudes del primer i del segon (apartats 4.1 i 4.2), i alhora el segon article és en part conseqüència del primer.

5.1. Famílies i gèneres botànics de les plantes amb usos medicinals

Es van recol·lectar i identificar 318 espècies diferents de plantes usades amb fins medicinals per la població del districte de Chazuta. Aquestes espècies apareixen a la taula 1 de l'apartat 4.1, a les taules 2 i 3 de l'apartat 4.2 i a les taules 1 i 2 de l'apartat 4.3.

Les 318 espècies vegetals recol·lectades a Chazuta, i posteriorment identificades, pertanyen a 87 famílies botàniques diferents. Les famílies que inclouen un nombre més alt d'espècies recol·lectades a Chazuta són *Fabaceae* (amb 28 espècies), *Moraceae* (27), *Clusiaceae* (18), *Rubiaceae* (16), *Euphorbiaceae* i *Solanaceae* (13), *Apocynaceae* (11), *Araceae*, *Bignoniaceae* i *Piperaceae* (9), *Asteraceae* (8) i *Verbenaceae* (6). Aquests resultats divergeixen relativament poc d'altres estudis realitzats en regions de l'Amazònia peruana ecològicament properes. Per exemple, en un estudi efectuat a la zona contigua de Loreto, les famílies botàniques amb el contingut més alt d'espècies vegetals medicinals emprades van ser *Fabaceae*, seguida d'*Apocynaceae*, *Solanaceae* i *Rubiaceae* (Jovel et al., 1996). Una de les característiques dels resultats obtinguts de Chazuta i poc habituals de trobar a la literatura és l'alt percentatge d'espècies medicinals de la família *Clusiaceae* utilitzades.

Les 318 espècies vegetals identificades pertanyen a 219 gèneres diferents, els més freqüents dels quals són: *Ficus* (16 espècies), *Clusia* (9), *Piper* i *Solanum* (6), *Tabernaemontana*, *Tovomita* i *Annona* (5), *Aristolochia* i *Psychotria* (4). En aquest apartat, espècies dels gèneres *Clusia* i *Tovomita* representen gairebé la totalitat de les espècies recol·lectades a Chazuta pertanyents a la família *Clusiaceae*.

5.2. Nomenclatura local de les plantes recol·lectades i identificades

En total, es van registrar 393 noms locals de plantes per a les 318 espècies vegetals identificades amb usos medicinals a Chazuta. Paraules d'origen quítxua es troben al 58,5% dels noms registrats (el 28% són noms totalment quítxues i el 30,5% restant contenen almenys una paraula quítxua). D'altra banda, paraules d'origen castellà es troben al 43,7% de tots els noms de plantes medicinals registrats a Chazuta (el 12,7% són totalment castellans i el 31% restants contenen almenys una paraula castellana). A més, en 148 noms de plantes (37,6%) hi ha almenys una paraula no identificable en cap de les dues llengües, és a dir, són paraules el significat de les quals la gent de Chazuta no va saber explicar. Molts d'aquests mots tendeixen a una fonètica que s'apropa al quítxua, com per exemple *huacapu*, *pichirina*, *shimikwa*, *winku* o *yanchama*. També, molts dels noms vernaculars són mots compostos amb paraules d'ambdues llengües. Per exemple, el nom *pishku isman de hoja menuda* té una part quítxua (*pishku isman*, que significa 'menjar d'ocell') i una part castellana (*hoja menuda*). En general, es pot observar que la progressiva disminució de l'ús del quítxua a la regió també es reflecteix en els noms usats per anomenar les plantes emprades medicinalment a Chazuta.

5.3. Tipus de planta i parts de planta emprades

De totes les plantes registrades amb usos medicinals a la vall de Chazuta, 233 espècies (73%) eren llenyoses (arbre, arbust o liana) i 85 espècies eren herbàcies. D'altra banda, 233 plantes van ser recol·lectades en estat salvatge, 74 espècies estaven cultivades i 10 plantes més van ser recollides en ambdós estats. En total, de les 318 espècies vegetals identificades, la part de planta més usada va ser la fulla (en 115 espècies, encara que en 41 d'aquestes la fulla va ser utilitzada amb altres parts). L'escorça va ser el segon tipus de part de planta més usada, el qual es va registrar en 111 plantes diferents (en 94 espècies es va utilitzar l'escorça de la tija, en 12 l'escorça de l'arrel i en 5 es van emprar ambdues escorces) (**figura 8**). Altres parts utilitzades freqüentment van ser la branca i la tija (en 32 plantes), la part aèria d'herbes (26), el làtex (25), el fruit (13), la llavor (9) i el tubercle (5). En 26 espècies va ser utilitzada la planta sencera. Per tant, les parts aèries de plantes són altament utilitzades a Chazuta (84,3% del total). La combinació de parts aèries i subterrànies va ser emprada el 9% de les vegades, i només parts subterrànies el 6,7% del total. L'ús predominant de fulles

i escorces és habitual a la regió Amazònica tal com indiquen altres estudis (Desmarchelier et al., 1996; Jovel et al., 1996). Contràriament, en regions més properes però ecològicament diverses, com la serra Andina o la costa del Pacífic, les plantes llenyoses són utilitzades menys freqüentment en medicina tradicional (Bussmann i Sharon, 2006; De Feo, 1992; De la Cruz et al., 2007; Hammond et al., 1998).

5.4. Preparacions vegetals utilitzades

D'acord amb Schultes i Raffauf (1990), a l'Amazònia nord-occidental és comuna la ingesta de plantes medicinals a través de preparats orals en forma d'extractes aquosos, ja siguin infusions o decoccions, fredes o calentes. Els resultats obtinguts del treball de camp de Chazuta ho confirmen. Es van registrar 447 preparats vegetals diferents de les 318 espècies vegetals identificades a Chazuta amb usos medicinals. D'aquestes 447 preparacions, el 67% van ser preparacions aquoses on les parts de planta seleccionades van ser bullides relativament durant bastant de temps (en 151 preparacions), lleugerament bullides (45), infusionades (31), mesclades amb aigua calenta (18) i macerades (55) o mesclades (2) amb aigua a temperatura ambient. D'altra banda, un 8% de totes les preparacions vegetals registrades van comportar algun tipus d'extracció alcohòlica: maceració amb aiguardent (en 28 preparacions), mesclades amb aiguardent (4), mesclades o macerades amb vi (2) i macerades amb una mescla de vi i aiguardent (1). L'aiguardent emprat es produeix localment a partir de la fermentació i posterior destil·lació del suc de la canya de sucre. El 24% restant del total de les preparacions vegetals amb usos medicinals registrades a Chazuta consistien en l'aplicació directa de parts de plantes. Per exemple, aplicant làtex a sobre de ferides, fregant fulles picades al cap o instil·lant sàvia als ulls.

5.5. Modes d'administració

El 67% de les preparacions vegetals registrades van ser d'administració oral, el 27,9% tòpica, el 4,9% oral i tòpica, i el 0,2% restant van ser inhalades.

D'altra banda, molt sovint a Chazuta es prescriuen restriccions en l'alimentació i en altres activitats juntament amb l'ús de plantes medicinals. Això és el que es coneix a

Chazuta com a *dieta*, terme que dóna significat a la tan freqüent expressió local *dietar plantas*. En general, quan es pren qualsevol remei s'aconsella descansar, moderar l'activitat sexual, com també deixar d'ingerir aliments pesants i alcohol, abandonar l'ús de perfums i evitar exposar-se a olors fortes. La creença popular troba fonamental el compliment d'aquestes restriccions per permetre que les plantes medicinals desenvolupin el seu màxim potencial terapèutic. La gent de Chazuta molt sovint expressa aquesta noció exclamant: *¡en la dieta está la curación!* De fet, la mateixa concepció s'empra en utilitzar qualsevol remei, també de farmàcia. Per diverses raons, a vegades les restriccions de dieta augmenten fins a un punt que obliguen a complir règims de dejuni parcial en retir que inclouen evitar el consum de sal i durant els quals es prenen remeis vegetals emètics. Aquestes pràctiques s'anomenen *dietes estrictes* i són el subjecte de l'apartat següent.

5.6. Dietes estrictes

Tot i que certament algunes dietes estrictes tenen un significat simbòlic important en la vida de l'home chazutí i en la formació dels *vegetalistas* (un tipus de curanderos locals), la raó principal per la qual es fan servir sembla principalment medicinal. Fins i tot els gossos de cacera, per tal de ser enfortits, són obligats a dejunar de tant en tant. En aquests casos, amb l'ajuda d'embuts s'administren als gossos preparats vegetals iguals als que prenen homes i dones.

La gent de Chazuta afirmava que les dietes estrictes produeixen un enfortiment general que es tradueix en un increment del rendiment laboral, un augment de la capacitat de transportar pesos pesants, una millor resistència al fred, ajuden a no emmalaltir, alleugen els dolors reumàtics, curen malalties, contribueixen a la pèrdua d'olor corporal (especialment valorada per ajudar a caçar i a pescar) (**figura 9**) i optimitzen la funció sexual. A vegades, alguns informants de camp van mencionar l'obtenció de certs poders magicoreligiosos a través de les dietes estrictes, ja que sota condicions de dejuni i retir, algunes vegades semblen ocórrer estats no ordinaris de consciència. Aquests poden representar des d'un increment de l'activitat onírica fins a l'experimentació d'estats de naturalesa mística. A part dels *vegetalistas*, són molt pocs els individus a Chazuta que van mencionar efectes de tipus més místic en fer dietes estrictes.

Figura 8. Escorces de l'arrel de *Tabernaemontana undulata* (esquerra superior), de branques de *Tovomita foldatsii* (dreta superior) i de troncs de *Zygia longifolia* (esquerra inferior) i *Maytenus* aff. *macrocarpa* (dreta inferior).

Figura 9. Pesca amb xarxa als ràpids de Yurakyaku de la vall de Chazuta durant l'estació seca. El peix, un cop extretes les vísceres, es preserva en salaó (imatge inferior dreta).

Es van registrar 122 dietes estrictes (apartat 4.2). Tot i que aquestes presentaven característiques diverses (durada, indicació, tipus de plantes emprades i grau de restriccions), la majoria van mostrar una certa proporcionalitat estructural i temporal. Bàsicament, les dietes estrictes es componen de quatre etapes cronològiques, tal com es mostra a la **figura 10**.

Etapa	I	II	III	IV
Durada temporal relativa	t	t	t	3t
Reclusió	Sí		No	
Dejuni	Sí		No	
Ingestió de remeis vegetals	Sí	No		
Grau de restriccions	Alt		Mitjà	Baix

Figura 10. Estructura cronològica i característiques generals de les dietes estrictes de la vall de Chazuta (Amazònia peruana). En relació amb la durada de cada etapa, *t* representa des d'uns pocs dies fins a un parell de mesos; excepcionalment pot representar alguns mesos més.

La primera i la segona etapes corresponen al període en què es realitza el dejuni parcial sota retir, durant un període que sol tenir una llargada des d'una setmana fins a dos mesos. Els preparats vegetals es prenen durant aquesta primera etapa. A Chazuta un "efecte depuratiu" medicinal sempre s'atribueix a les dietes estrictes. La depuració és evident per l'acció emètica dels preparats que s'ingereixen. Aquest efecte depuratiu és probablement augmentat pel règim alimentari, i molt concretament per l'abstenció del consum de sal. Majoritàriament, les dietes estrictes registrades en aquest treball es van fer servir per restaurar o envigorir la salut i com a preparació per sortir a caçar o a pescar. De tota manera, les dietes semblen operar una experiència intensa que a Chazuta es considera medicinal perquè: *a*) sempre produeix un efecte depuratiu; *b*) usualment origina altres efectes fisiològics o farmacològics que es consideren enfortidors de la salut o útils contra desordres musculoesquelètics o patologies infeccioses, i *c*) algunes vegades indueixen estats de naturalesa mística.

5.7. Plantes més usades

De les 318 espècies vegetals recol·lectades i identificades a Chazuta, la **taula 1** mostra aquelles amb més reports d'usos registrats. Són un total de 23 espècies, cadascuna de les quals té més d'onze reports d'ús.

Taula 1. Plantes esmentades més d'onze vegades amb usos medicinals a Chazuta (Amazònia peruana)

Nom científic	Usos medicinals o malalties tractades	Reports d'usos medicinals
Maytenus aff. *macrocarpa*	8	101
Mansoa alliacea	8	71
Ficus insipida	1	45
Tovomita aff. *stylosa*	10	41
Brunfelsia grandiflora	6	40
Banisteriopsis caapi	8	39
Psychotria viridis	8	35
Tovomita foldatsii	6	32
Calliandra angustifolia	7	30
Ficus trigona	4	25
Zygia longifolia	7	21
Croton draconoides	9	19
Aristolochia leuconeura	5	17
Phthirusa stelis	6	17
Allosanthus trifoliolatus	6	16
Petrea sp.	6	16
Forsteronia graciloides	7	14
Malachra alceifolia	6	13
Poulsenia armata	5	13
Rourea puberula	7	13
Anacardium occidentale	8	12
Licaria sp.	5	12
Petiveria alliacea	9	12

Maytenus aff. *macrocarpa* (coneguda a Chazuta com a *chuchuwasha*) va ser amb diferència la planta de la qual més reports d'ús es van registrar. Les escorces d'espècies del gènere *Maytenus* de l'Amazònia nord-occidental són altament reputades per les seves propietats medicinals (Schultes i Raffauf, 1990). Aquestes escorces tenen un cert valor comercial, ja que es venen sovint als mercats locals i nacionals (**figura 8**). Aquesta és una de les principals raons per les quals a Chazuta, com també a altres regions veïnes, els arbres del gènere *Maytenus* s'extingeixen ràpidament. Una situació semblant passa amb els arbres que s'anomenen localment *canela* (*Licaria* spp.). La

sostenibilitat d'extracció de material és més fràgil per als arbres, ja que necessiten més temps per regenerar-se.

Moltes de les altres plantes més usades a Chazuta també s'empren sovint en altres regions de l'Amazònia. Aquest és el cas de *Mansoa alliacea* (71 reports), *Ficus insipida* (45), *Brunfelsia grandiflora* (40), *Banisteriopsis caapi* (39), *Psychotria viridis* (35) i *Calliandra angustifolia* (30) (Gupta, 1995; Lorenzi i Abreu-Matos, 2002; Roth i Lindorf, 2002). Contràriament, dins d'aquest grup de plantes medicinals més emprades hi ha dues espècies que no solen ser reportades amb freqüència: *Tovomita* aff. *stylosa* (41 reports) i *Tovomita foldatsii* (32). Aquestes plantes són la base d'una de les preparacions vegetals més apreciades a Chazuta, coneguda com a mescla de la *bachuja* o mescla de *palos*.

5.8. La mescla de la bachuja

Es tracta d'un tipus de decocció de diferents mescles que es considera una panacea a Chazuta (**figura 11**). Aquestes mescles solen contenir un diferent nombre de plantes (les que es van identificar apareixen a la taula 3 de l'apartat 4.2). Aquesta mescla va ser la que es va preparar més vegades a les dietes estrictes (35 reports). El terme *bachuja* també anomena la planta que gairebé sempre s'utilitza en la preparació de la mescla: *Tovomita* aff. *stylosa* (34 reports). Aquesta *Tovomita* també és coneguda amb el nom quítxua *chullachaki kaspi*, que significa 'arbrell del follet coix o del follet amb peu de cérvol'. El follet *chullachaki* és un dels esperits més populars de l'imaginari amazònic, considerat l'esperit protector de la selva. *Tovomita* aff. *stylosa* presenta una arrel xanca (**figura 12**), que la gent de Chazuta associa amb el peu coix del *chullachaki*. Simbòlicament, doncs, es considera que l'esperit del follet habita dins de l'arbrell, com també dins de la mescla preparada a partir de la mateixa planta.

A més, la base de la mescla també es conforma amb altres plantes que tenen diferents significats simbòlics. Per exemple, les espècies vegetals anomenades *yaku shimbillu*, *yaku sisa*, *yaku bushiklla* (*yaku* significa 'aigua' en quítxua) i *bobensana*, les quals creixen a les riberes de rierols i rius i s'empren habitualment en la preparació d'aquestes mescles. La gent de Chazuta afirma que aquestes plantes resisteixen forts corrents, especialment en temps de crescudes durant les estacions humides. Es creu

que la resistència i fortalesa d'aquestes plantes es transmet a la mescla preparada a partir d'aquestes espècies. D'aquesta manera simbòlica, els dos grans móns de la cosmologia amazònica es fusionen en una mescla única: el món de l'aigua (rius, llacs i llacunes) a través de plantes riberenques, i el món del bosc a través del *chullachaki kaspi* (**figura 13**). En part, és així com a Chazuta s'atribueixen propietats medicinals extraordinàries a aquesta mescla.

5.9. Usos medicinals reportats

Es van registrar 1.058 reports d'usos medicinals per a les 318 espècies vegetals identificades a Chazuta. La majoria dels reports van ser de preparats d'ús humà (97,5%), i tan sols una petita part (2,5%) van correspondre a usos per a animals. Les principals categories d'usos medicinals apareixen a la **taula 2**.

Taula 2. Usos o patologies tractades amb les 318 plantes recol·lectades i identificades a Chazuta (Amazònia peruana) amb un percentatge per sobre de l'1% del total d'usos medicinals registrats (1.058 reports)

Ús o patologies tractades	% del total d'usos medicinals reportats
Desordres musculoesquelètics	30,7%
Problemes gastrointestinals	12,1%
Trastorns de la pell	11,9%
Tònics	11,3%
Depuratius	4,8%
Desordres respiratoris	4,5%
Alteracions reproductives	4,3%
Febre / Malària	3,3%
Síndromes culturals	3,2%
Usos veterinaris	2,5%
Mals de cap	1,9%
Trastorns genitals	1,7%
Modificadors d'olor corporal per ajudar a caçar	1,3%
Hèrnies inguinals	1,3%
Desordres oculars	1,2%

A Chazuta, les plantes medicinals es van emprar principalment per tractar desordres musculoesquelètics (30,7% del total dels usos medicinals reportats), problemes gastrointestinals (12,1%) i trastorns de la pell (11,9%). A altres regions peruanes

Figura 11. Separació de les diferents parts de planta de diverses espècies utilitzades per a la decocció de la mescla de la *bachuja*.

Figura 12. Tronc de *Tovomita* aff. *stylosa*. A la part inferior es pot observar una arrel xanca.

Figura 13. Bosc i riu conformen l'hàbitat natural de Chazuta a partir del qual deriva una forta càrrega simbòlica.

Figura 14. L'activitat rural afavoreix el patiment de trastorns musculoesquelètics.

també són habituals els usos de plantes medicinals contra desordres musculoesquelètics i gastrointestinals, tal com indiquen estudis en àrees ecològicament properes (Jovel et al., 1996) i distants (Bussmann i Sharon, 2006; De la Cruz et al., 2007; Hammond et al., 1998). També hi ha un ús freqüent de plantes medicinals contra trastorns de la pell a Suni Miraño (Loreto, Amazònia peruana) (Jovel et al., 1996) i al Callejón de Huaylas (Ancash, Andes centrals peruans) (Hammond et al., 1998). Tanmateix, només un 4,5% dels usos registrats a Chazuta corresponen a desordres respiratoris, mentre que en els altres estudis l'ús de plantes per tractar aquest tipus de trastorns és més freqüent (Bussmann i Sharon, 2006; Hammond et al., 1998; Jovel et al., 1996). D'altra banda, Bussmann i Sharon (2006) van trobar que el principal ús de plantes medicinals va ser per tractar patologies magicoreligioses. Aquells resultats es van obtenir a partir de dades de mercats locals de la costa septentrional peruana. A Chazuta, només un 3,2% de tots els usos registrats correspon al tractament de síndromes culturals.

La majoria dels trastorns musculoesquelètics tractats amb plantes medicinals van correspondre a dolors reumàtics inespecífics (270 reports) i fractures òssies (28 reports). Aquest tipus de patologies, juntament amb d'altres com les hèrnies inguinals (19 reports), assenyalen un tipus de societat, la chazutina, prominentment rural. El clima humit, juntament amb l'activitat agrícola essencialment de realització manual, afavoreix el patiment de trastorns musculoesquelètics (**figura 14**).

D'altra banda, en un nombre important de casos es va reportar l'ús de plantes medicinals contra malalties que poden tenir una etiologia infecciosa. Això es va observar en molts dels trastorns gastrointestinals, dermatològics, respiratoris, reproductius, febrils, genitals i oculars registrats a Chazuta. De fet, tal com s'ha assenyalat anteriorment, les morbiditats de tipus infeccions van ser les més tractades al centre públic d'atenció primària de salut de Chazuta (ECSC, 2003). En part, això va ser degut a la gairebé total falta de clavegueram als assentaments humans de la vall i al clima tropical.

5.10. Estimació bibliogràfica d'activitats antiinflamatòries i antimicrobianes

Part dels resultats obtinguts a Chazuta suggerien per a algunes de les plantes més

emprades efectes farmacològics antiinflamatoris i antimicrobians. Per avaluar aquesta hipòtesi, es va consultar la bibliografia en relació amb aquestes dues bioactivitats per a aquelles espècies vegetals l'ús de les quals va ser registrat més de dues vegades en dietes estrictes realitzades per humans. En total es van avaluar 22 espècies diferents. Encara que les 22 espècies van ser seleccionades a partir de la seva participació en les dietes estrictes, aquestes eren també representatives dels resultats totals, ja que agrupen la meitat de les plantes amb un nombre total de reports d'ús més elevat (**taula 1**). A la **figura 15** es mostra la relació d'usos registrats d'aquestes 22 espècies a tres nivells diferents.

Es va analitzar també la informació bibliogràfica existent sobre els constituents i les activitats biològiques de les espècies seleccionades. En general, la majoria de les 22 plantes seleccionades no han estat estudiades, ni des d'un punt de vista fitoquímic ni per les seves activitats biològiques. Per aquesta raó la recerca bibliogràfica es va expandir i van considerar taxonomies relacionades. En resum, es van trobar algunes evidències d'activitat antiinflamatòria per al 36% de les espècies (*Brosimum alicastrum*, *Brunfelsia grandiflora*, *Calliandra angustifolia*, *Mansoa alliacea*, *Maytenus macrocarpa*, *Salacia cordata*, *Tabernaemontana sananho* i *Tabernaemontana undulata*). En considerar espècies taxonòmicament properes, 9 plantes més (77% en total) van semblar bones candidates a presentar activitat antiinflamatòria (*Tovomita stylosa*, *Tovomita foldatsii*, *Petrea* sp., *Clusia lineata*, *Clusia loretensis*, *Rourea puberula*, *Ficus caballina*, *Ficus trigona* and *Ruellia proxima*).

D'altra banda, el 14% de les plantes seleccionades presenten algun tipus d'evidència d'activitat antimicrobiana (*Brunfelsia grandiflora*, *Mansoa alliacea* i *Maytenus macrocarpa*). En considerar espècies taxonòmicament properes, 6 plantes més (41% en total) van semblar bones candidates a presentar activitat antimicrobiana (*Tovomita stylosa*, *Tovomita foldatsii*, *Clusia lineata*, *Clusia loretensis*, *Ficus caballina* i *Ficus trigona*).

5.11. L'ús de plantes medicinals amb efectes depuratius

Un dels resultats obtinguts de l'estudi de les plantes medicinals de Chazuta va ser

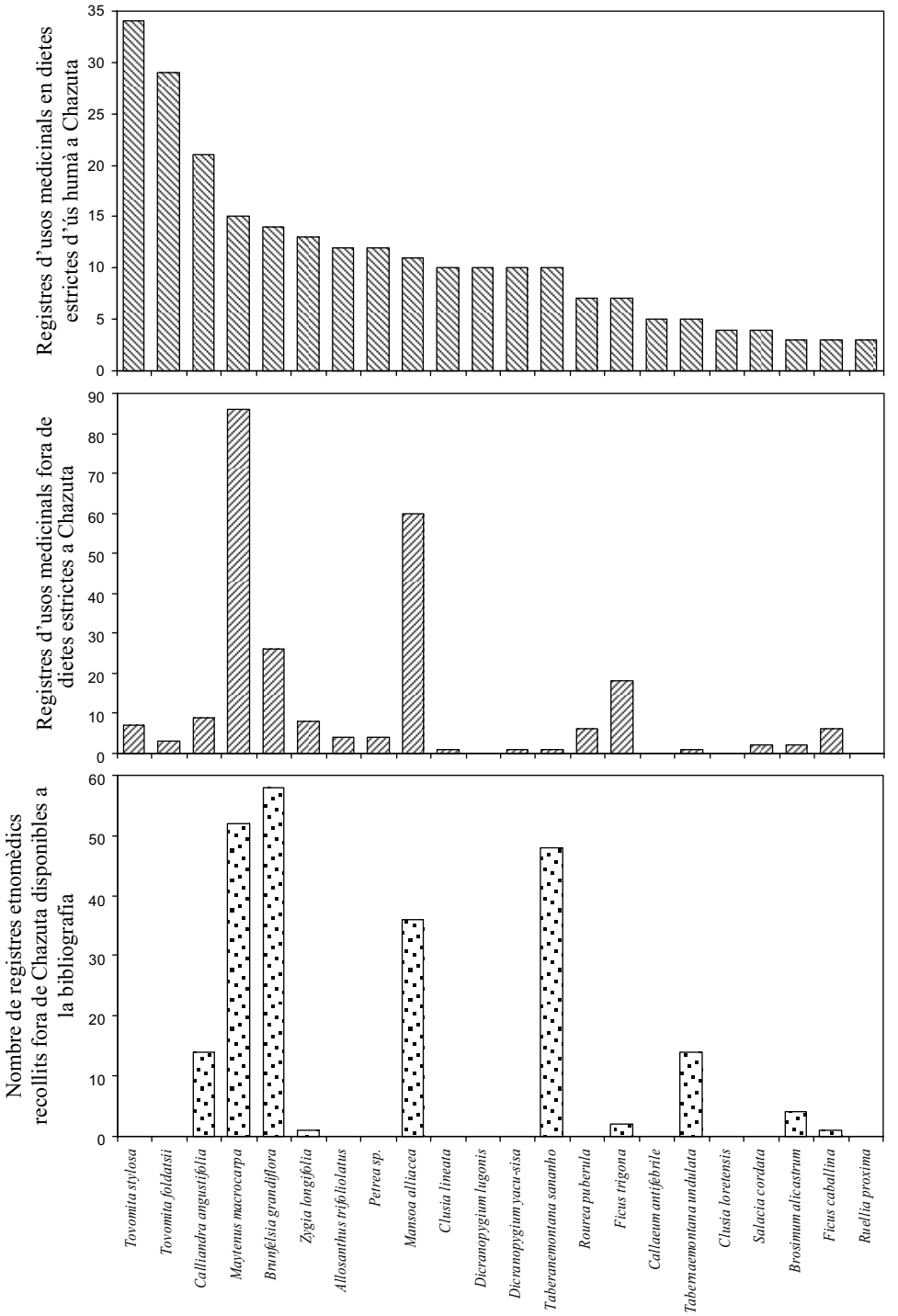

Figura 15. Comparació del nombre de reports obtinguts per a les 22 plantes emprades més vegades en dietes estrictes a tres nivells: *a*) en dietes estrictes realitzades per humans a Chazuta (apartat 4.2); *b*) a Chazuta exceptuant quan s'usen en dietes estrictes (apartat 4.1), i *c*) fora de Chazuta, segons dades bibliogràfiques obtingudes a partir de NAPRALERT i altres fonts.

l'alta freqüència amb la qual es van emprar diferents remeis vegetals pels seus efectes depuratius. En total es va registrar l'ús de 114 espècies diferents en 191 pràctiques depuratives (apartat 4.3). Aquesta tesi utilitza el terme *depuratiu* per anomenar aquell grup de pràctiques que la gent de Chazuta va considerar medicinal principalment per l'estimulació d'un "efecte general de neteja física interior". La gent de Chazuta considera que aquest efecte de "neteja" està induït primerament per la ingesta de plantes medicinals amb efectes emètics (i algunes vegades també purgatius), i en segon lloc per la reducció en la ingesta d'aliments. La creença local és que aquest efecte depuratiu, o bé induït per plantes emètiques i/o bé per una reducció calòrica, produeix la "neteja interna general" considerada tan salutífera.

La majoria dels remeis depuratius observats a Chazuta van ser extraccions aquoses, extremadament amargues i de tast molt desagradable, que deurien actuar principalment com a irritants gàstrics o intestinals desencadenants de nàusea i vòmit. Aquests efectes dràstics de manera natural obliguen a realitzar règims alimentaris lleugers i de descans. Aquests règims poden ser entesos com un tipus de dietes (apartat 5.5). Depenent del grau de severitat i duració (ingesta aïllada o repetida de remeis emètics forts o suaus; compliment de dietes lleus o severes, curtes o llargues), les pràctiques depuratives poden ser diferenciades com a lleus (93 reports) o estrictes (98 reports). De fet, en aquest context les dietes estrictes (apartat 5.6) eren considerades pràctiques depuratives estrictes.

Com es pot veure a la **taula 3**, es va registrar una gran varietat d'usos per a les pràctiques depuratives observades a Chazuta. Davant de la varietat d'usos medicinals registrats per a les pràctiques depuratives, una gran part dels quals de naturalesa inespecífica, l'estudi etnofarmacològic quedava molt limitat si es restringia a la simple identificació d'activitats biològiques concretes i compostos actius precisos. Aquesta via, utilitzada al segon article (apartat 4.2), va resultar insuficient per explicar el conjunt de les observacions de camp. Va ser per aquesta raó que es van considerar altres models biomèdics que poguessin explicar l'ample espectre dels efectes fisiològics registrats a l'estudi de camp per a les pràctiques depuratives. Com a resultat, es va proposar una explicació relacionada amb l'activació moderada de respostes adaptatives a l'estrès, la qual es desenvolupa en el següent apartat.

Taula 3. Usos medicinals registrats per a les 191 pràctiques depuratives reportades a Chazuta (Amazònia peruana)

Usos medicinals específics registrats (103 reports)	Usos medicinals inespecífics registrats (88 reports)
Reumatisme (40 reports)	
Com a preparació per caçar i pescar (11)	Tònic depuratiu
Febrífug (7), malària (3)	Tònic netejador
Fractures òssies (6), hèrnies inguinals (5)	Tònic
Tos (5), bronquitis (5)	Per augmentar el rendiment del treball
Vermífug (5), dolors estomacals (2)	Per ser més fort (*hacerse más bizarro*)
Addicció al tabac i a la cocaïna (2)	Per poder carregar més pesos
Abscessos (2), leishmaniosi (2)	Per resistir millor el fred
Tumors (2)	Per aguditzar els sentits
Infeccions urinàries (2), dolors vaginals (1)	Per fer fora la mandra (*dejar de ser arragán*)
Lumbago (1)	Com a prevenció de malalties
Malaltia pulmonar (1)	Per millorar la funció sexual
Sida (1)	

5.12. Respostes adaptatives a l'estrès

El marc teòric que dóna suport a l'argumentació que aquest apartat presenta es pot trobar a l'apèndix A de la tercera publicació (apartat 4.3). En resum, és sabut que tant l'emesi com la restricció calòrica estimulen l'activació neuroendocrina del sistema de l'estrès (Eversmann et al., 1978; Masoro, 1998). D'aquesta manera, en part es pot considerar que les pràctiques depuratives de Chazuta imiten dues situacions estressants molt primitives davant les quals l'ésser humà pot trobar-se confrontat: la intoxicació i la inanició. Al mateix temps, és sabut que l'estimulació moderada d'estrès fisiològic pot resultar beneficiosa per a la salut, tal com s'ha descrit en estudis sobre l'activitat física, la restricció calòrica i d'altres (Jackson i Dishman, 2006; Sinclair, 2005; Tapia, 2006). De manera similar a l'activitat física, les pràctiques depuratives de Chazuta podrien provocar una estimulació adequada del sistema de l'estrès, activant diversos centres com l'eix HHA (hipotalàmic-hipofisiari-adrenal), el sistema nerviós autonòmic i alguns centres del SNC (sistema nerviós central). Aquesta activació podria passar dins d'uns nivells segurs (sense arribar a nivells compromesos d'intoxicació i/o inanició) i provocar les corresponents respostes adaptatives, la qual cosa afavoriria efectes beneficiosos resistents a l'estrès en diferents sistemes. Per exemple, als sistemes gastrointestinals, endocrins, cardiovasculars, respiratoris o immunes (Chrousos, 2006; Tsigos i Chrousos, 2002; **figura 16**).

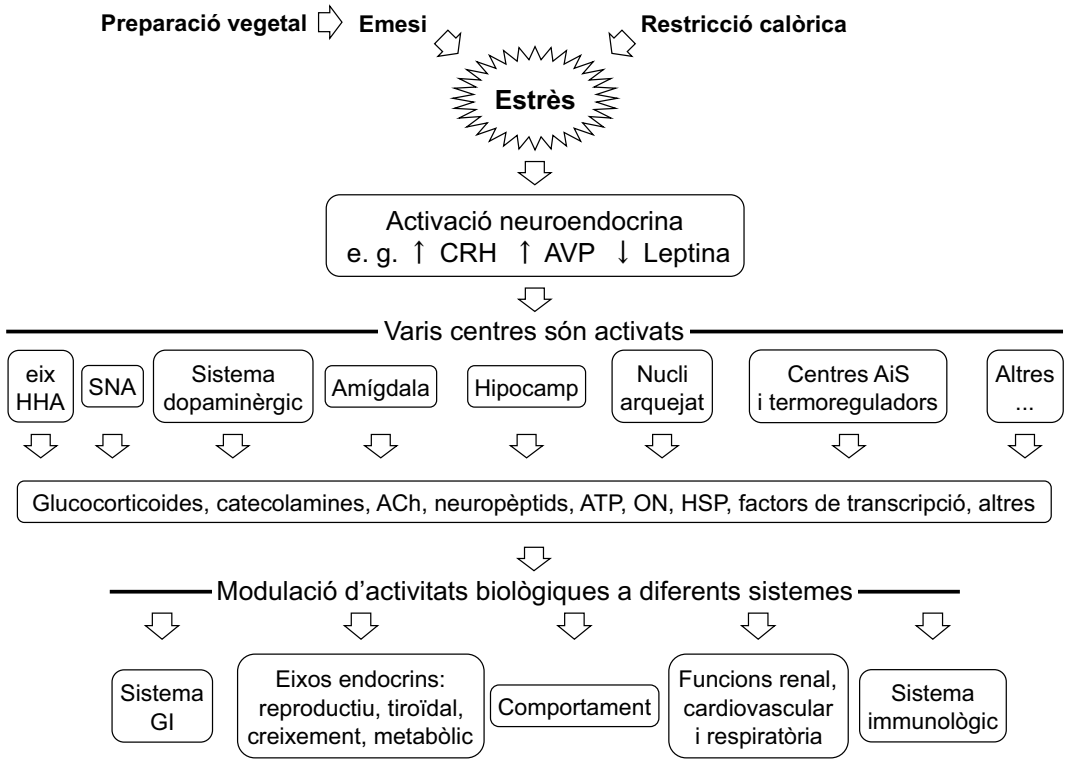

Figura 16. Infraestructura neuroendocrina desencadenada per estrès, el qual podria ser activat per les pràctiques depuratives de Chazuta. ACh: acetilcolina, SNA: sistema nerviós autònom, AiS: alimentació i sacietat, ATP: adenosina trifosfat, AVP: arginina vasopressina, CRH: hormona alliberadora de corticotropina, GI: gastrointestinal, HHA: hipotalàmic-hipofisiari-adrenal, HSP: proteïnes de xoc tèrmic, ON: òxid nítric.

Segons aquesta hipòtesi, les plantes emprades en les pràctiques depuratives de Chazuta podrien ser considerades "estressants medicinals": a través de l'emesi, aquestes plantes provocarien l'estrès necessari per estimular el sistema de l'estrès d'una manera conduent posteriorment a una major homeòstasi. A més, altres bioactivitats de les plantes podrien convergir amb el procés reactiu d'estrès. *A priori*, aquesta proposta a partir de respostes adaptatives a l'estrès és més inclusiva i suggereix una sèrie de processos biològics que podrien explicar la varietat dels usos medicinals registrats per a les pràctiques depuratives observades a Chazuta. Així també, aquesta explicació aclariria el paper que les plantes medicinals tindrien en aquestes pràctiques.

5.13. Tractament de síndromes culturals i altres aspectes magicoreligiosos

Un altre dels resultats obtinguts de l'estudi de les plantes medicinals de Chazuta va ser la constatació d'una realitat magicoreligiosa en el tractament de malalties i l'ús de plantes medicinals. En total, per a quatre tipus principals de síndromes culturals es va observar la utilització de remeis vegetals: *cutipas*, *mal aires*, *sustos* i *daños*. Els trastorns anomenats *cutipas* es basen en la creença que per diverses raons els esperits d'objectes, éssers i fenòmens causen malalties que manifesten alguna de les seves característiques. La diagnosi i el tractament d'aquests trastorns sol determinar-se per la lògica definida per "la doctrina de les signatures". Per exemple, si un nadó plora massa durant la nit, es pot sospitar que un dels pares hagi menjat carn de la mona nocturna anomenada *choshna* (i per això és nocturn també el plor de l'infant). Contra aquesta *cutipa* es recomana l'ús de *Tournefortia cuspidata* ja que és una planta amb una pubescència similar a la de la mona *choshna*. Fora del tractament de *cutipas*, la lògica de "la doctrina de les signatures" també és molt present en altres plantes medicinals, per exemple en el cas ja explicat de la mescla de la *bachuja* (apartat 5.8).

Disseminats de dalt a baix de l'Amèrica Llatina, els *mal aires*, *sustos* i *robos de alma* també passen a Chazuta, principalment entre els infants. En els *sustos* es creu que esperits malèvols roben l'ànima a través d'un espant. La mateixa creença s'aplica en el cas dels *robos de alma* però sense l'experiència aterridora. D'altra banda, els *mal aires* són impactes d'esperits malignes transportats per cops d'aire. D'una altra manera, en els *daños* objectes patògens s'introdueixen dins dels cossos gràcies a l'art de la bruixeria. De fet, a vegades, desordres aparentment naturals com alguns reumatismes van ser atribuïts a actes de bruixeria. Dins d'aquesta concepció, segons la qual esperits exògens originen trastorns per penetració, l'ús de plantes emètiques a vegades pot adquirir altres significats, ja que en aquests casos la "neteja física" o l'"efecte depuratiu" es creu que també opera en aquesta altra dimensió.

En aquest context magicoreligiós, l'aplicació del tractament sovint es restringeix als *vegetalistas*, un tipus de curanderos tradicionals gairebé extingits avui a Chazuta. Els *vegetalistas* utilitzen de manera exclusiva algunes tècniques terapèutiques com xuclar *daños*, invocar a través del cant les ànimes perdudes per un *susto* o restablir l'equilibri en *cutipas* o *mal aires*. També es va observar la utilització de cants per part dels

vegetalistas en altres rituals, com per exemple en algun moment d'una dieta estricta o en prendre la mescla coneguda com a *ayahuasca* (apartat 5.14).

Molts dels efectes registrats per als usos medicinals de tipus magicoreligiosos van semblar pertànyer a una dimensió més psicològica o de creences. En alguns casos, però, com en els explicats anteriorment en parlar de les dietes estrictes, algunes plantes podrien participar en l'origen d'estats modificats de consciència. L'activitat d'algunes plantes sobre el sistema nerviós central es discuteix en el següent apartat.

5.14. Activitat sobre el sistema nerviós central de les plantes medicinals de Chazuta

Un dels resultats obtinguts de l'estudi de les dietes estrictes de Chazuta suggereix que les plantes emprades en aquestes pràctiques no només poden ser rellevants com a causants d'efectes farmacològics depuratius, antiinflamatoris i antimicrobials, sinó també d'alteració de la funció cerebral (apartat 4.2). Es coneix la psicoactivitat d'alguns compostos aïllats en algunes de les plantes usades en dietes estrictes. Per exemple, derivats de l'àcid pipecòlic de *Calliandra angustifolia*, hopamidina i escopoletina de *Brunfelsia grandiflora* i alcaloides indòlics de *Tabernaemontana sananho* i *Tabernaemontana undulata*. Si es tenen en compte dades bibliogràfiques d'espècies properes taxonòmicament, es poden esperar psicoactivitats amb xantones d'espècies dels gèneres *Tovomita* i *Clusia*, fenilalquilamines i alcaloides en plantes de la família *Celastraceae*, derivats de l'àcid pipecòlic en espècies del gènere *Zygia*, verbascòsid en plantes del gènere *Petrea*, betacarbolines i alcaloides triptamínics d'espècies del gènere *Callaeum*, així com amb certs lípids en plantes del gènere *Ruellia* o amb altres compostos psicoactius coneguts en espècies del gènere *Ficus*.

D'altra banda, és probable la presència d'activitats sobre el SNC (sistema nerviós central) entre les plantes més utilitzades a les pràctiques depuratives de Chazuta (apartat 4.3), particularment en plantes pertanyents a les famílies *Apocynaceae*, *Loganiaceae*, *Malpighiaceae*, *Solanaceae* i *Rubiaceae*. Una de les conclusions finals del treball sobre les pràctiques depuratives indica que l'activitat de plantes sobre el SNC podria participar en l'estimulació del sistema de l'estrès. A més, un aspecte psicològic podria contribuir a l'ús de pràctiques tan dràstiques com les pràctiques

depuratives. Quan l'organisme és sotmès a pressió, ja sigui pel fet de vomitar o de no menjar, l'estat de la ment podria comportar-se d'una manera en la qual l'activitat sobre el SNC d'algunes plantes pugui tenir un paper determinat.

D'altra banda, existeix evidència clara de psicoactivitat a la famosa mescla anomenada *ayahuasca*, també utilitzada a Chazuta. L'*ayahuasca* va ser el remei més vegades registrat (35 reports) a les pràctiques depuratives lleus. Aquestes pràctiques es caracteritzen per la prescripció d'una restricció calòrica moderada que mai arriba al dejuni ni produeix reclusió, com tampoc evita el consum de sal. Generalment, són pràctiques depuratives curtes, sovint de tot just un dia de durada, on només s'ingereix el remei emètic corresponent una sola vegada. Van ser registrades 93 pràctiques depuratives lleus (apartat 4.3).

La mescla de l'*ayahuasca* a Chazuta es prepara amb tiges de *Banisteriopsis caapi* i fulles de *Psychotria viridis*, i a vegades (16 reports) també s'hi afegeixen altres plantes. En comparació amb altres àrees de l'Amazònia peruana, es va observar que la ingesta tradicional d'aquestes mescles es feia amb rituals més simples. Tal com va assenyalar Lamb (1985), mig segle enrere la gent de Chazuta no semblava estar acostumada als efectes psicotròpics experimentats en prendre la mescla. Avui dia és difícil rastrejar l'origen dels usos de l'*ayahuasca* en part a causa del boom turístic que hi ha hagut recentment i que s'ha propagat al llarg de tot el país. L'ús d'*ayahuasca* observat a Chazuta difereix en diversos aspectes de l'ús descrit en altres zones de l'Amazònia occidental (Baer, 1979; Cárdenas-Timoteo, 1989; Chaumeil, 1979; Fericgla, 1994; Luna, 1986). A Chazuta semblaria com si aquesta mescla hagués quedat inclosa al repertori local de purgues depuratives. En poques ocasions, es va observar *vegetalistas* administrar el remei en rituals complexos. Així doncs, a Chazuta l'*ayahuasca* s'ingereix fonamentalment com a remei depuratiu, el principal objectiu del qual és produir la tan considerada "neteja" o efecte depuratiu (apartat 5.11). A Chazuta, el principal efecte psicoactiu de l'*ayahuasca* se sol reduir al mareig desencadenant d'emesi.

Encara que la popularitat de l'*ayahuasca* va arribar anys enrere a la vall de Chazuta, de moment sembla que l'ús d'aquesta mescla s'hagi adaptat al sistema de la medicina tradicional local, el qual utilitza l'*ayahuasca* més com a depuratiu que com a

psicotròpic. D'altra banda, també podria ser que l'ús de la mescla s'hagués introduït de manera relativament recent a Chazuta i que l'alt nombre de reports d'ús obtinguts en el treball de camp reflecteixi la pressió externa. Certament, en regions com Chazuta els processos d'aculturació corren de pressa.

6

Conclusions

De l'estudi etnofarmacològic realitzat a la vall de Chazuta en aquesta tesi es deriven les conclusions següents:

1. A la vall de Chazuta s'han identificat 318 espècies vegetals amb usos medicinals, les quals pertanyen a 219 gèneres botànics de 87 famílies.

2. Les famílies botàniques més representades són *Fabaceae* (28 espècies), *Moraceae* (27), *Clusiaceae* (18), *Rubiaceae* (16), *Euphorbiaceae* (13), *Solanaceae* (13) i *Apocynaceae* (11). L'alt percentatge d'espècies de la família *Clusiaceae* no és habitual a la literatura. Els gèneres botànics més representats són *Ficus* (16 espècies), *Clusia* (9), *Piper* (6), *Solanum* (6), *Tabernaemontana* (5), *Tovomita* (5) i *Annona* (5).

3. S'han registrat 393 noms vernacles per a les 318 espècies identificades. Un 58,5% dels noms inclouen paraules d'origen quítxua i un 43,7% n'inclouen d'origen castellà.

4. Les 318 plantes medicinals de Chazuta identificades són principalment espècies llenyoses (73%) i majoritàriament (76%) es recol·lecten en estat silvestre. Les parts més emprades són fulles (36%) i escorces (35%).

5. Les formes d'utilització més emprades son preparacions obtingudes per extracció aquosa (67%), seguides per l'aplicació directa de parts de plantes (24%) i extraccions alcohòliques (8%). Els preparats s'administren principalment per via oral (67%) i per via tòpica (27,9%).

6. A Chazuta és freqüent la prescripció de restriccions en l'alimentació i en altres activitats juntament amb l'ús de plantes medicinals. Això és el que es coneix a Chazuta com a *dieta*, la qual aconsella descansar, abstenir-se d'aliments pesants, evitar l'alcohol, així com eludir perfums i altres olors fortes.

7. En alguns casos, les restriccions de dieta augmenten fins a un punt que obliguen a complir règims de dejuni parcial en retir que inclouen evitar el consum de sal. En

aquests casos s'ingereixen preparats vegetals amb efectes emètics. Aquestes pràctiques s'anomenen *dietes estrictes*, i se'n van registrar 122.

8. Les dietes estrictes presenten una estructura cronològica concreta que es pot dividir en quatre etapes, les quals estan determinades pel grau de restriccions, la severitat de la reclusió, la ingesta de plantes i la prescripció de dejuni parcial.

9. A Chazuta, les dietes estrictes es consideren medicinals perquè: *a*) sempre produeixen un efecte depuratiu; *b*) usualment originen altres efectes fisiològics o farmacològics que es consideren que enforteixen la salut o que són útils contra desordres musculoesquelètics o patologies infeccioses, i *c*) algunes vegades indueixen estats de naturalesa mística.

10. De les 318 plantes medicinals identificades a Chazuta, *Maytenus* aff. *macrocarpa* va ser l'espècie amb més reports d'ús (101 reports), seguida per *Mansoa alliacea* (71), *Ficus insipida* (45), *Brunfelsia grandiflora* (40), *Banisteriopsis caapi* (39), *Psychotria viridis* (35) i *Calliandra angustifolia* (30).

11. Dues espècies del gènere *Tovomita, T.* aff. *stylosa* (41 reports) i *T. foldatsii* (32), van ser de les més reportades i constitueixen la base de la mescla anomenada *bachuja*. Aquesta va ser la preparació més utilitzada en dietes estrictes (35 reports). A Chazuta aquesta mescla es considera una panacea i se li atribueix una forta càrrega simbòlica.

12. S'han registrat 1.058 reports d'usos medicinals per a les 318 plantes identificades a Chazuta. Principalment corresponen al tractament de trastorns musculoesquelètics (30,7%), gastrointestinals (12,1%) i de la pell (11,9%). En part, aquestes dades reflecteixen l'alta incidència de patologies inflamatòries i infeccioses a causa del context rural, climatològic i d'economia subdesenvolupada. Per a les 22 plantes més emprades, es va trobar evidència bibliogràfica d'activitat antiinflamatòria en un 36% dels casos (8 plantes) i antimicrobiana en un 14% (3). Els percentatges es van incrementar al 77% (17) i al 41% (9), respectivament, en tenir en compte dades bibliogràfiques de plantes taxonòmicament properes.

13. La freqüència de l'ús de plantes medicinals en remeis emprats pels seus efectes depuratius a Chazuta és alta, ja que inclou 114 espècies vegetals i 191 pràctiques depuratives reportades.

14. La diversitat d'usos de les pràctiques depuratives es podria explicar per una activació moderada de respostes adaptatives a l'estrès: l'estimulació moderada d'estrès a través de l'emesi i la restricció calòrica afavoriria respostes adaptatives protectores de les conseqüències nocives de l'estrès crònic, així com altres desordres relacionats amb l'estrès. D'acord amb aquesta hipòtesi, les plantes medicinals emprades a Chazuta en pràctiques depuratives es podrien considerar "estressants medicinals", ja que a través de l'efecte emètic procurarien l'activació neuroendocrina necessària del sistema de l'estrès.

15. L'activitat sobre el sistema nerviós central podria tenir un paper important en alguns usos de plantes medicinals a Chazuta, especialment en dietes estrictes i altres pràctiques depuratives.

16. Les plantes medicinals a Chazuta també s'utilitzen en un context de salut i malaltia on la dimensió magicoreligiosa és important. Això s'observa, principalment, en el tractament de síndromes culturals, l'aplicació de la doctrina de les signatures, la realització de certs rituals i l'existència dels curanderos locals anomenats *vegetalistas*.

7

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8

Annexos

8.1. Autoritzacions per a la realització d'investigació etnofarmacològica a les localitats chazutines de Llucanayaku, Mushuk Llakta de Chipaota i Ramón Castilla

"AÑO DEL ESTADO DE DERECHO Y LA GOBERNABILIDAD DEMOCRATICA"

Llucanayacu, 20 de Noviembre del 2004

ASUNTO: LO QUE INDICA

El señor **ARTIDORO CHUJANDAMA AMASIFUEN**, Agente Municipal de la comunidad de Llucanayacu con número de DNI 01128854 y el señor **MANUEL SABOYA AMASIFUEN**, Teniente Gobernador de la comunidad de Llucanayacu con número de DNI 01126596.

HACEN CONSTAR QUE EL SEÑOR:

JAUME SANZ BISET con número de pasaporte P322963 de nacionalidad española, licenciado en Farmacia por la Facultat de Farmacia de la Universitat de Barcelona (Catalunya, España). Director del proyecto de investigación denominado "Dietas y plantas maestras", el cual cuenta con la supervisión de la Facultat de Farmacia de la Universitat de Barcelona, la colaboración del Museo de Historia Natural de la Universidad Nacional de San Marcos de Lima (Perú) y que dispone de la autorización número 86-2004-INRENA-IFFS-DCB del INRENA para la investigacion científica con colecta de flora silvestre fuera de Areas Naturales Protegidas.

HA PEDIDO PERMISO para realizar su estudio "Dietas y plantas maestras" en la comunidad de Llucanayacu del Distrito de Chazuta en el Departamento de San Martín.

Las autoridades de Llucanayacu autorizan la realización de dicho estudio así como la extracción de flora y acceso al conocimiento colectivo. Y para que conste firman el presente documento en Llucanayacu, a veinte de Noviembre del 2004.

Artidoro Chujandama Amasifuen

Manuel Saboya Amasifuen

Santa Rosa, 8 de HAYO del 2005

ASUNTO: LO QUE INDICA

El señor DARWIN ISUIZA SHAPIAMA , Apu de la comunidad de Santa Rosa con número de DNI 01082312

HACE CONSTAR QUE EL SEÑOR:

JAUME SANZ BISET con número de pasaporte P322963 de nacionalidad española, licenciado en Farmacia por la Facultat de Farmàcia de la Universitat de Barcelona (Catalunya, España). Director del proyecto de investigación denominado "Dietas y plantas maestras", el cual cuenta con la supervisión de la Facultat de Farmàcia de la Universitat de Barcelona, la colaboración del Museo de Historia Natural de la Universidad Nacional de San Marcos de Lima (Perú) y que dispone de la autorización número 86-2004-INRENA-IFFS-DCB del INRENA para la investigación científica con colecta de flora silvestre fuera de Áreas Naturales Protegidas.

HA PEDIDO PERMISO para realizar su estudio "Dietas y plantas maestras" en la comunidad de Santa Rosa del Distrito de Chazuta en el Departamento de San Martín.

El Apu de Santa Rosa autoriza la realización de dicho estudio. Y para que conste firma el presente documento en Santa Rosa, a día 8 de HAYO del 2005.

Darwin Iguiza Sh
Presidente de la comunidad.
Nativa C.C. N.N.
APU

"AÑO DEL ESTADO DE DERECHO Y LA GOBERNABILIDAD DEMOCRATICA"

Ramón Castilla, 11 de Diciembre del 2004

ASUNTO: LO QUE INDICA

El señor **JANOVER APAGÜEÑO ZUMBA**, Agente Municipal de la comunidad de Ramón Castilla con número de DNI ..40300198..... y el señor **RUSVEL GUERRA SHAPIAMA**, Teniente Gobernador de la comunidad de Ramón Castilla con número de DNI ..80217094..... .

HACEN CONSTAR QUE EL SEÑOR:

JAUME SANZ BISET con número de pasaporte P322963 de nacionalidad española, licenciado en Farmacia por la Facultat de Farmacia de la Universitat de Barcelona (Cataluña, España). Director del proyecto de investigación denominado "Dietas y plantas maestras", el cual cuenta con la supervisión de la Facultat de Farmacia de la Universitat de Barcelona, la colaboración del Museo de Historia Natural de la Universidad Nacional de San Marcos de Lima (Perú) y que dispone de la autorización número 86-2004-INRENA-IFFS-DCB del INRENA para la investigación científica con colecta de flora silvestre fuera de Áreas Naturales Protegidas.

HA PEDIDO PERMISO para realizar su estudio "Dietas y plantas maestras" en la comunidad de Ramón Castilla del Distrito de Chazuta en el Departamento de San Martín.

Las autoridades de Ramón Castilla autorizan la realización de dicho estudio. Y para que conste firman el presente documento en Ramón Castilla, a día 11 de Diciembre del 2004.

AGENTE MUNICIPAL CASERIO RAMON CASTILLA

Janover Apagüeño Zumba

Rusvel Guerra Shapiama

8.2. Llicència de recol·lecció 087-2004-INRENA-IFFS-DCB

MINISTERIO DE AGRICULTURA
INSTITUTO NACIONAL DE RECURSOS NATURALES
INRENA

INRENA

Autorización N° 087 - 2004-INRENA-IFFS-DCB

Vista la solicitud presentada por el Sr. Jaime Sanz Biset, identificado con PAS Nº P322963 y el informe N° 313-2004-INRENA-IFFS-DCB, se autoriza la investigación científica con colecta de flora silvestre (muestras para herbario) fuera de Areas Naturales Protegidas en los Departamentos de San Martín, Ucayali, Amazonas, Madre de Dios y Loreto como parte del proyecto de investigación denominado "Dietas y Planta Maestras" a realizarse por el periodo comprendido entre noviembre del 2004 hasta octubre del 2005, a los señores investigadores:

JAUME SANZ BISET	PAS Nº P322963
JOSE CAMPOS DE LA CRUZ	DNI Nº 06263455
JOAQUINA ALBAN CASTILLO	DNI Nº 08555549

Los investigadores se comprometen a:

a) No extraer ejemplares de flora y fauna silvestres no autorizados.

b) No ingresar a Areas Naturales Protegidas por el Estado.

c) No ceder a terceros los especímenes o parte de éstos (tejido, cromosomas u otros) para investigaciones relacionadas con acceso a recursos genéticos.

d) Si por razones científicas acotadas, se requiere enviar al extranjero parte del material colectado, los interesados deberán gestionar el correspondiente Permiso de Exportación ante el INRENA y pasar el control respectivo.

e) Entregar el 50% del material colectado a una entidad científica nacional, incluyendo los ejemplares únicos de los grupos taxonómicos colectados y holotipos, los cuales sólo podrán ser exportados en calidad de préstamo.

f) Entregar al INRENA tres (03) copias del informe final como resultado de la autorización otorgada, copias del material fotográfico y/o slides que puedan ser utilizadas para difusión. Así mismo entregar seis (06) copias de las publicaciones producidas a partir de la investigación realizada.

INTENDENCIA FORESTAL Y DE FAUNA SILVESTRE - INRENA - Antonio Mitsuaki Tau - INTENDENCIA

Se expide la presente, de conformidad con el Texto Unico de Procedimientos Administrativos (TUPA) del Instituto Nacional de Recursos Naturales - INRENA aprobado mediante Decreto Supremo N° 014-2004-AG, la Ley Forestal y de Fauna Silvestre aprobada por Ley N° 27308, el Reglamento de la Ley Forestal y de Fauna Silvestre aprobado por Decreto Supremo 014-2001-AG, la Ley Orgánica del Ministerio de Agricultura aprobada por Decreto Ley N° 25902, que crea el Instituto Nacional de Recursos Naturales (INRENA) y el Decreto Supremo N° 002-2003-AG que aprueba el Reglamento de Organización y Funciones del INRENA.

El INRENA no se responsabiliza por accidentes o daños sufridos por los solicitantes de esta autorización, durante la ejecución del proyecto.

Calle Diecisiete N° 355
San Isidro, Lima-27
Apartado Postal 4452

Teléfono (51 1) 224-3298
Facsimile (51 1) 224-3218
LIMA - PERU

El INRENA a través de la Intendencia Forestal y de Fauna Silvestre, se reserva el derecho de demandar del proyecto de investigación los cambios a que hubiese lugar en los casos en que se dicten nuevas disposiciones legales o se formulen ajustes sobre la presente autorización.

Los derechos otorgados sobre los recursos biológicos no otorgan derechos sobre los recursos genéticos contenidos en ellos.

El incumplimiento de los compromisos adquiridos será causal para denegar futuras autorizaciones a nivel institucional.

Lima, 29 OCT. 2004

MINISTERIO DE AGRICULTURA - Intendencia Forestal y de Fauna Silvestre - INRENA

Ing. Antonio Morizaki Taura
Intendente Forestal y de Fauna Silvestre

8.3. Llicència d'exportació 005780-AGINRENA

REPUBLICA DEL PERU

MINISTERIO DE AGRICULTURA
INSTITUTO NACIONAL DE RECURSOS NATURALES
INRENA

Nº 005780 -AG-INRENA

PERMISO PARA FAUNA Y FLORA SILVESTRE

Este permiso debe adjuntarse con los especimenes y/o productos a exportar, importar o re-exportar.

☒ EXPORTACION ☐ IMPORTACION ☐ RE-EXPORTACION

Válido por 60 días calendarios

Nombre : **JAUME SANZ BISET**

Domicilio : **Calle Riera Matamoros No. 27 At.1. 08911 Barcelona - España**

Documento de Identidad : **PAS P322963**

Producto (s) : **Muestras botánicas herborizadas con fines de investigación científica pertenecientes a las siguientes familias: Apiaceae (1): *Eryngium foetidum* (1); Araceae (9): *Caladium sp.* (1), *Dieffenbachia sp.* (1), *Dracontium spruceanum* (1), *Heteropsis flexuosa* (3), *Iriartea deltoides* (1), *Monstera dubia* (1), *Philodendron sp.* (1); Arecaceae (1): *Geonoma sp.* (1); Aristolchiaceae (4): *Aristolochia cauliflora* (2), *Aristolochia sp.* (2); Smilacaceae (4): *Smilax obliquata* (1), *Smilax papyracea* (3); Asteraceae (9): *Chaptalia nutans* (1), *Clibadium sp.* (1), *Hebeclinium macrophyllum* (1), *Tagetes erecta* (1), *Tilesia baccata* (2), *Vernonanthura patens* (1), *Vernonia patens* (2); Campanulaceae (1): *Centropogon cornutus* (1); Capparaceae (1): *Capparis sola* (1); Chenopodiaceae (2): *Chenopodium ambrosioides* (2); Nyctaginaceae (4): *Neea aff. floribunda* (1), *Neea sp.* (3); Phytolaccaceae (5): *Gallesia integrifolia* (1), *Petiveria alliacea* (3), Continúa en anexo 1.....**

Los derechos otorgados sobre los recursos biológicos no otorgan derechos sobre los recursos genéticos contenidos en ellos (Art. 1, inciso f del Decreto Supremo 014-2001-AG).

Lugar de Procedencia : **San Martín, Ucayali, Amazonas, Madre de Dios y Loreto. Autorización Nº 086-2004-INRENA-IFFS-DCB**

Destinatario : **FACULTAD DE FARMACIA – UNIVERSIDAD DE BARCELONA**

Dirección : **Av. Juan XIII s/n 08028. Barcelona ESPAÑA**

Lima, 14 de 07 del 2005

Sello y firma del representante de la Autoridad
CITES - PERU
INRENA

Sello y firma del Control - INRENA
FECHA 23/08/05 ACTO Nº 506-05
HORA 05:53
Pas. P322963

El titular del presente permiso conoce las disposiciones legales vigentes en la materia y es responsable de su cumplimiento y sujeto a las sanciones correspondientes en caso del incumplimiento total o parcial.

MINISTERIO DE AGRICULTURA
INSTITUTO NACIONAL DE RECURSOS NATURALES
INRENA

Anexo 1

Permiso Nº 005780- AG-INRENA

PERMISO PARA FAUNA Y FLORA SILVESTRE

Relación de especies:

Continúa del Permiso de Exportación Nº 005780.....*Phytolacca rivinoides* (1); Portulacaceae (2): *Talinum paniculatum* (2); Hippocrateaceae (6): *Salacia acreana* (6); Commelinaceae (1): *Tradescantia zanonia* (1); Cyclanthaceae (3): *Dicranopygium sp.* (3); Dilleniaceae (1): *Doliocarpus sp.* (1); Caprifoliaceae (1): *Sambucus sp.* (1); Sapotaceae (1): *Sarcaulus brasiliensis* (1); Euphorbiaceae (25): *Croton draconoides* (10), *Croton tarapotensis* (1), *Euphorbia heterophylla* (2), *Jatropha curcas* (1), *Jatropha gossypiifolia* (1), *Hevea guianensis* (3), *Hura crepitans* (1), *Mabea sp.* (2), *Margaritaria nobilis* (1), *Pedilanthus tithymaloides* (1), *Phyllantus orbicularis* (1), *Sapium marmieri* (1); Fabaceae (45): *Apuleia leiocarpa* (1), *Bauhinia aff. guianensis* (2), *Bauhinia tarapotensis* (1), *Bauhinia sp.* (1), *Brownea sp.* (1), *Caesalpinia pulcherrima* (1), *Calliandra angustifolia* (5), *Copaifera paupera* (1), *Desmodium adscendens* (2), *Entada polyphilla* (1), *Erythrina fusca* (1), *Erythrina sp.* (1), *Inga aff. marginata* (1), *Inga ruiziana* (3), *Machaerium isadelphum* (1), *Mimosa pellita* (2), *Myroxylon balsamum* (1), *Prosopis pallida* (2), *Pterocarpus rohrii* (1), *Pterocarpus sp.* (1), *Senna obtusifolia* (1), *Senna occidentales* (1), *Senna reticulata* (1), *Senna aff. ruiziana* (1), *Senna sp.* (2), *Swartzia arborescens* (3), *Swartzia auriculata* (1), *Swartzia brachyrachis* (1), *Swartzia aff. brachyrachis* (1), *Zygia longifolia* (3); Apocynaceae (34): *Aspidosperma myristicifolium* (1), *Aspidosperma rigidum* (1), *Forsteronia graciloides* (3), *Himatanthus sucuuba* (2), *Rauvolfia praecox* (5), *Tabernaemontana cymosa* (7), *Tabernaemontana sananho* (7), *Tabernaemontana undulata* (3), *Tabernaemontana aff. vanheurckii* (2), *Thevetia peruviana* (3); Asclepiadaceae (2): *Asclepias curassavica* (1), *Matelea rivularis* (1); Loganiaceae (4): *Potalia amara* (1), *Strychnos parviflora* (2), *Strychnos sp.* (1); Oxalidaceae (2), *Oxalis lespedezioides* (2), Haemodoraceae (1): *Xiphidium caeruleum* (1); Boraginaceae (2): *Cordia nodosa* (1), *Cordia sp.* (1); Lamiaceae (7): *Hyptis mutabilis* (2), *Leonotis nepetifolia* (1), *Ocimun micranthum* (4); Verbenaceae (15): *Aegiphila integrifolia* (3), *Aegiphilia sp.* (5), *Lippia alba* (1), *Petrea sp.* (4), *Priva lappulacea* (1), *Verbena litoralis* (1); Lauraceae (3): *Licaria sp.* (3); Monimiaceae (5): *Siparuna aff. cervicornis* (4), *Siparuna sp.* (1); Lecythidaceae (5): *Couroupita guianensis* (1), *Eschweilera coriacea* (3), *Grias sp.* (1); Annonaceae (8): *Annona montana* (1), *Annona muricata* (1), *Unonopsis sp.* (5), *Xylopia cuspidata* (1); Myristicaceae (3): *Otoba parvifolia* (2), *Virola sp.* (1); Bombacaceae (5): *Ceiba insignis* (1), *Ceiba samauma* (2), *Eriotheca sp.* (2); Sterculiaceae (3): *Herrania mariae* (1), *Sterculia sp.* (2); Malvaceae (4): *Malachra alceifolia* (1), *Pavonia fruticosa* (2), *Pavonia sp.* (1); Tiliaceae (3): *Corchorus hirtus* (1), *Heliocarpus americanus* (2); Lythraceae (1): *Adenaria floribunda* (1); Melastomataceae (6): *Miconia aff. amnicola* (1), *Miconia lamprophylla* (1), *Miconia triplinervis* (4); Myrtaceae (5): *Campomanesia lineatifolia* (2), *Eugenia aff. biflora* (3); Piperaceae (13): *Peperomia circinnata* (1), *Peperomia sp.* (1), *Piper aduncum* (1), *Piper aleyreanum* (1), *Piper callosum* (4), *Piper laevigatum* (1), *Piper reticulatum* (1), *Piper umbellatum* (2), *Piper sp.* (1); Plantaginaceae (1): *Plantado major* (1); Poaceae (1): *Cortaderia sp.* (1); Malpighiaceae (10): *Banisteriopsis caapi* (4), *Banisteriopsis sp.* (3), *Mascagnia psilophylla* (3); Polygalaceae (1): *Polygala acuminata* (1); Polygonaceae (4): *Triplaris americana* (4); Myrsinaceae (3): *Ardisia huallagae* (2), *Cybianthus sp.* (1); Menispermaceae (6): *Abuta grandifolia* (3), *Chondrodendron tormentosum* (1), *Sciadotenia toxifera* (2); Vitaceae (3): *Cissus sicyoides* (3); Chrysobalanaceae (3): *Couepia bernardii* (3); Connaraceae (4): *Rourea puberula* (4); Crassulaceae (1): *Kalanchoe pinnata* (1); Rubiaceae (43): *Calycophyllum spruceanum* (2), *Capirona decorticans* (1), *Condaminea corymbosa* (2), *Cussarea sp.* (1), *Genipa americana* (2), *Geophila sp.* (2), *Gonzalagunia sp.* (4), *Hippotis aff. tubiflora* (1), *Macrocnemum roseum* (1), *Psychotria alba* (4), *Psychotria tenuicaulis* (3), *Psychotria trichotoma* (1), *Psychotria viridis* (6), *Psychotria sp.* (6), *Randia ruiziana* (1), *Remijia sp.* (2), Uncaria guianensis (2), Uncaria tomentosa (2); Loranthaceae (2): *Phthirusa retroflexa* (2); Olacaceae (3): *Heisteria aff. ovata* (3); Viscaceae (2): *Phoradendron sp.* (2); Anacardiaceae (5): *Anacardium occidentale* (4), *Spondias mombin* (1); Burseraceae (1): *Crepidospermum sp.* (1); Meliaceae (3): *Guarea sp.* (2), *Trichilia maynasiana* (1); Rutaceae (4): *Dictyoloma peruvianum* (2), *Esembeckia aff. amazonica* (1), *Zanthoxylum ekmanii* (1); Sapindaceae (3): *Paullinia sp.* (3); Acanthaceae (4): *Aphelandra goodspeedii* (1), *Fittonia albivenis* (1), *Pseuderanthemun lanceolatum* (1), *Sanchezia sp.* (1); Bignoniaceae (16): *Cybistax antisyphilitica* (1), *Jacaranda copaia* (2), *Jacaranda glabra* (1), *Macfadyena unguis-cati* (1), *Mansoa alliacea* (6), *Memora cladotricha* (1), *Tynanthus panurensis* (1), *Tynanthus polyanthus* (2), *Tynanthus sp.* (1). Continúa en anexo 2.....

Sello y Firma del Control - INRENA

Acta Nº 506-05

Sello y Firma de la autoridad CITES
INRENA

El titular del presente permiso conoce las disposiciones legales vigentes en la materia y es responsable de su cumplimiento y sujeto a las sanciones correspondientes en caso del incumplimiento total o parcial.

MINISTERIO DE AGRICULTURA
INSTITUTO NACIONAL DE RECURSOS NATURALES
INRENA

Anexo 2

Permiso Nº 005780 **- AG-INRENA**

PERMISO PARA FAUNA Y FLORA SILVESTRE

Relación de especies:

Continúa de Permiso de Exportación Nº 005780..... Gesneriaceae (2): *Drymonia coccinea* (2); Scrophulariaceae (2): *Scoparia dulcis* (2); Solanaceae (17): *Brugmansia suaveolens* (1), *Brunfelsia grandifolia* (4), *Cestrum* silvaticum (1), *Cestrum strigilatum* (1), *Phylasis angulata* (1), *Solanum caricifolium* (2), *Solanum grandiflorum* (1), *Solanum huallagense* (1), *Solanum mite* (2), *Solanum sp.* (2), *Witheringia solanacea* (1); Clusiaceae (43): *Chrysochlamys ulei* (2), *Clusia sp.* (15), *Dystovomita sp.* (13), *Garcinia macrophylla* (1), *Garcinia madruno* (1), *Tovomita aff. brasiliensis* (1), *Tovomita laurina* (7), *Vismia angusta* (1), *Vismia aff. cayennensis* (1), *Vismia sp.* (1); Cecropiaceae (1): *Pourouma sp.* (1); Moraceae (41): *Brosimun alicastrum* (2), *Maclura tinctoria* (1), *Ficus caballina* (1), *Ficus aff. castellviana* (2), *Ficus aff. citrifolia* (1), *Ficus erythrosticta* (2), *Ficus euomphala* (4), *Ficus insipida* (1), *Ficus krukovii* (2), *Ficus longifolia* (1), *Ficus macbridei* (1), *Ficus mathewsii* (2), *Ficus maxima* (1), Ficus aff. maxima (1), Ficus obtusifolia (1), *Ficus paraensis* (1), *Ficus yopoensis* (6), *Ficus ypsilophlebia* (3), *Ficus sp.* (3), *Prevea guianensis* (1), *Pseudolmedia laevis* (3), *Sorocea hirtella* (1); Ulmaceae (2): *Celtis iguanaea* (1), *Trema micrantha* (1); Urticaceae (4): *Pilea microphylla* (1), *Urera baccifera* (1), *Urera aff. baccifera* (1), *Urera sp.* (1); Bixaceae (3): *Bixa orellana* (1), *Bixa platycarpa* (2); Caricaceae (1): *Jacaratia digitata* (1), Flacourtiaceae (8): *Casearia negrensis* (2), *Casearia sp.* (3), *Lunania parviflora* (3); Passifloraceae (1): *Pasiflora quadrangularis* (1); Violaceae (2): *Leonia glycycarpa* (1), *Rinorea viridiflora* (1); Heliconiaceae (1): *Heliconia acuminata* (1); Zingiberaceae (3): *Costus sp.* (2), *Renealmia aromatica* (1); No identificados (25). CON FINES DE INVESTIGACION CIENTIFICA ++

No se encuentran especies categorizadas en vías de extinción según la Resolución Ministerial Nº 01710-77-Ag/DGFF.

Es obligatoria la entrega de los holotipos de nuevos taxa y ejemplares únicos, sólo pueden ser exportados en calidad de préstamo (Artículo 328º D. S. Nº 014-2001-AG). El presente permiso no autoriza la investigación a nivel genético o de sus derivados, como extractos, compuestos bioquímicos y otros (Artículo 329º D. S. Nº 014-2001-AG).

Sello y Firma del Control - INRENA
ACTA Nº 506 - 01

Sello y Firma de la autoridad CITES
INRENA

El titular del presente permiso conoce las disposiciones legales vigentes en la materia y es responsable de su cumplimiento y sujeto a las sanciones correspondientes en caso del incumplimiento total o parcial.