Medicinal plants used in Northern Peru for reproductive problems and female health

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Abstract
Infections of the reproductive tract, complications after childbirth, and reproductive problems continue to be a major health challenge worldwide. An impressive number of plant species is traditionally used to remedy such afflictions, and some have been investigated for their efficacy with positive results. A total of 105 plant species belonging to 91 genera and 62 families were documented and identified as herbal remedies for reproductive problems in Northern Peru. Most species used were Asteraceae (9.52%), followed by Lamiaceae and Fabaceae (8.57% and 6.67%). The most important families are clearly represented very similarly to their overall importance in the local pharmacopoeia. The majority of herbal preparations for reproductive afflictions were prepared from the leaves of plants (22.72%), the whole plant (21.97%), and stems (21.21%), while other plant parts were used less frequently. More than 60% of the cases fresh plant material was used to prepare remedies. Over 70% of the remedies were applied orally, while the remaining ones were applied topically. Many remedies were prepared as mixtures of multiple ingredients.

Little scientific evidence exists to prove the efficacy of the species employed as reproductive disorder remedies in Northern Peru. Only 34% of the plants found or their congeners have been studied at all for their medicinal properties. The information gained on frequently used traditional remedies might give some leads for future targets for further analysis in order to develop new drugs.

Background
According to 1999 WHO estimates reproductive problems, including, 340 million new cases of curable Sexually Transmitted Diseases (STIs; syphilis, gonorrhoea, chlamydia and trichomoniasis) occur annually throughout the world in adults aged 15-49 years. In developing countries, STIs and their complications rank in the top five disease categories for which adults seek health care. Infection with STIs can lead to acute symptoms, chronic infection and serious delayed consequences such as infertility, ectopic pregnancy, cervical cancer and the untimely death of infants and adults [1].

Traditional Medicine (TM) is used globally and is rapidly growing in economic importance. In developing countries, TM is often the only accessible and affordable treatment available. The WHO reports that TM is the primary health care system for 80% of the population in developing countries. In Latin America, the WHO Regional Office for the Americas (AMRO/PAHO) reports that 71% of the population in Chile and 40% of the population in Colombia have used TM. The WHO indicates that in many Asian countries TM is widely used, even though Western medicine is often readily available, and in Japan, 60-70% of allopathic doctors prescribe TMs for their patients [2].

Complementary Alternative Medicine (CAM) is gaining popularity in many developed countries. Forty-two percent of the population in the US have used CAM at least once [3], and the use of at least one of 16 alternative therapies increased from 34% in 1990 to 42% in 1997 [4]. The number of visits to providers of CAM now exceeds by far the number of visits to all primary care physicians in the US [5,6]. The expenses for the use of TM and CAM are exponentially growing in many parts of the world. The 1997 out-of-pocket CAM expenditure was estimated at US$ 2.7 billion in the USA, and the world market for herbal medicines based on traditional knowledge is now estimated at US$ 60 billion [7].

Northern Peru is believed to be the center of the Central Andean Health Axis [8], and traditional medicinal practices in this region remain an important component...
of everyday life [9-13]. TM is also gaining acceptance by national governments and health providers. Peru’s National Program in Complementary Medicine and the Pan American Health Organization recently compared Complementary Medicine to allopathic medicine in clinics and hospitals operating within the Peruvian Social Security System. The results showed that the cost of using Traditional Medicine was less than the cost of Western therapy. In addition, for each of the criteria evaluated – clinical efficacy, user satisfaction, and future risk reduction – Traditional Medicine’s efficacy was higher than that of conventional treatments, including fewer side effects, higher perception of efficacy by both the patients and the clinics, and a 53-63% higher cost efficiency of Traditional Medicine over that of conventional treatments for the selected conditions [14]. According to [6], the sustainable cultivation and harvesting of medicinal species is one of the most important challenges for the next few years.

The present study attempts to give an overview on medicinal plant species employed in Northern Peru in traditional remedies for reproductive problems and female health, and compare this use to the western scientific evidence regarding their efficacy.

Materials and Methods

Plant Collections

Plants for the present study were collected in the field, in markets, and at the homes of traditional healers (curanderos) in Northern Peru in 10 2-3 months long field visits between 2001 and 2009, as a larger scale project following initial collections in southern Ecuador (Figure 1). The same 116 informants (healers and market vendors) in the Trujillo and Chiclayo area were repeatedly interviewed during this time, using structured questionnaires. The informants were always provided with fresh (non-dried) plant material, either collected with them, by them, or available at their market stands. The questionnaires did not include any reference as to disease concepts, plant parts or preparations. In contrast, the participants were asked simple questions along the lines “What is this plant used for, which part, which quantity, how is it prepared, are any other plants added to the mixture.” All questions were asked in the same order. All informants were of Mestizo origin, and spoke only Spanish as their native language, and all interviews were conducted in Spanish. The study covered the four existing medicinal plant markets of the region, and included all vendors present. All interviews were conducted with the same set of participants. The specimens are registered under the collection series “RBU/PL,” “ISA,” “GER,” “JULS,” “EHCHL,” “VFCHL,” “TRUBH,” and “TRUVANERICA,” depending on the year of fieldwork and collection location. Surveys were conducted in Spanish by fluent speakers. Surveyors would approach healers, collectors and market vendors and explain the premise for the study, including the goal of conservation of medicinal plants in the area.

Vouchers of all specimens were deposited at the Herbario Truxillensis (HUT, Universidad Nacional de Trujillo), and Herbario Antenor Orrego (HAO, Universidad Privada Antenor Orrego Trujillo). In order to recognize Peru’s rights under the Convention on Biological Diversity, most notably with regard to the conservation of genetic resources in the framework of a study treating medicinal plants, the identification of the plant material was conducted entirely in Peru. No plant material collected either in this study in Northern Peru, or the previous study in Southern Ecuador was exported in any form whatsoever.

Species identification and nomenclature

The nomenclature of plant families, genera, and species follows the Catalogue of the Flowering Plants and Gymnosperms of Peru [15] and the Catalogue of Vascular Plants of Ecuador [16]. The nomenclature was compared to the TROPICOS database. Species were identified using the available volumes of the Flora of Peru [17], as well as [18-20], and the available volumes of the Flora of Ecuador [21].

Results

A total of 105 plant species belonging to 91 genera and 62 families were documented and identified as herbal remedies for reproductive problems in Northern Peru. Most species used were Asteraceae (9.52%), followed by Lamiaceae and Fabaceae (8.57% and 6.67%). Other families were less important, and 44 contributed only one species each to the pharmacopoeia (Table 1). The most important families are clearly represented very similarly to their overall importance in the local pharmacopoeia (Table 1) [9].

The majority of herbal preparations for reproductive issues were prepared from the leaves of plants (22.72%), the whole plant (21.97%), and stems (21.21%), while other plant parts were used much less frequently (Table 2). This indicates that the local healers count on a very well developed knowledge about the properties of different plant parts. In almost 62% of the cases fresh plant material was used to prepare remedies, which differs little from the average herbal preparation mode in Northern Peru. Over 70% of the remedies were applied orally, while the remaining ones were applied topically. Many remedies were prepared as mixtures of multiple ingredients by boiling plant material either in water or in sugarcane spirit.

A complete overview of all plants encountered is given in Table 3.
Discussion

Little scientific evidence exists to prove the efficacy of the species employed as reproductive disorder remedies in Northern Peru. Only 34% of the plants found or their congeners have been studied at all for their medicinal properties. *Aloe* spp. are known to have oestrogenic activity [22,23]. [24] reported that *Artemisia* spp. had effects on female health amongst the Cumash. A variety of other Asteraceae has been shown to be used against menopausal symptoms (*Clidadium*: [25]; *Matricaria*: [26-28]; *Taraxacum*: [29,30]. [23] found hormonal effects in *Cordia* sp., while [31-35] reported on anti-fertility effects of *Dioscorea* sp. *Cupressus* sp. are well known abortifacients (e.g. [36]), while pumpkin seed oil showed testosterone-inhibitory effects (e.g. [23,37-39]). *Chamaesyce* sp. showed promise in the treatment of male infertility, while *Mimosa* sp. on the contrary are used to reduce spermal fertility [23,40].

A wide range of Lamiaceae have been shown to exhibit contraceptive efficacy, and the same species are used in Peru for similar purposes (*Mentha* spp.: [41-44]; *Ocimum* spp.: [45-48]; *Origanum majorana*: [44,49,50]; *Rosmarinus*...
Similar efficacy has been shown for *San-guisorba officinalis* [51], and *Ruta graveolens* [23, 52-55]. Various species of *Passiflora* have aphrodisiac activity [56-60], and *Myristica fragrans* as well as *Syzygium aromaticum* [61, 62], and extracts of *Lantana camara* [63, 64] and *Pilea* spp. [23] fulfil the same purpose, while *Portulaca oleracea* showed efficacy in relieving uterine bleeding [65, 66].

**Conclusions**

Infections of the reproductive tract, complications after childbirth, and reproductive problems continue to be a major health challenge worldwide. An impressive number of plant species is traditionally used to remedy such

**Table 1 Plants used for reproductive issues in Northern Peru and Comparison of reproductive treatments to the ten most important plant families of the medicinal flora of Northern Peru (after Bussmann & Sharon 2006)**

| Family     | Genera | Species | % Medicinal flora of Northern Peru (most important families) |
|------------|--------|---------|----------------------------------------------------------------|
| Asteraceae | 9      | 10      | 9.52 13.64                                                      |
| Lamiaceae  | 7      | 9       | 8.57 4.87                                                      |
| Fabaceae   | 6      | 7       | 6.67 6.82                                                      |
| Solanaceae | 2      | 4       | 3.81 4.09                                                      |
| Poaceae    | 3      | 3       | 2.84 2.33                                                      |
| Cucurbitaceae | 1       | 3       | 2.84 1.75                                                      |
| Plantaginaceae | 1      | 3       | 2.84                                                           |
| Amaranthaceae | 2      | 2       | 1.92                                                           |
| Anacardiaceae | 2      | 2       | 1.92                                                           |
| Boraginaceae | 2      | 2       | 1.92                                                           |
| Brassicaceae | 2      | 2       | 1.92                                                           |
| Euphorbiaceae | 2      | 2       | 1.92                                                           |
| Olacaceae  | 2      | 2       | 1.92                                                           |
| Rutaceae   | 2      | 2       | 1.92                                                           |
| Dioscoreaceae | 1       | 2       | 1.92                                                           |
| Geraniaceae | 1      | 2       | 1.92                                                           |
| Linaceae   | 1      | 2       | 1.92                                                           |
| Passifloraceae | 1      | 2       | 1.92                                                           |
| Adiantaceae | 1      | 1       | 0.95                                                           |
| Alstroemeriaceae | 1      | 1       | 0.95                                                           |
| Amaryllidaceae | 1      | 1       | 0.95                                                           |
| Apiaceae   | 1      | 1       | 0.95                                                           |
| Apocynaceae | 1      | 1       | 0.95                                                           |
| Asclepiadaceae | 1      | 1       | 0.95                                                           |
| Asphodelaceae | 1      | 1       | 0.95                                                           |
| Balanophoraceae | 1     | 1       | 0.95                                                           |
| Bignoniaceae | 1      | 1       | 0.95                                                           |
| Cactaceae  | 1      | 1       | 0.95                                                           |
| Convolvulaceae | 1      | 1       | 0.95                                                           |
| Cupressaceae | 1      | 1       | 0.95                                                           |
| Cyperaceae | 1      | 1       | 0.95                                                           |
| Dipsacaceae | 1      | 1       | 0.95                                                           |
| Ericaceae  | 1      | 1       | 0.95                                                           |
| Erythroxylaceae | 1      | 1       | 0.95                                                           |
| Gentianaceae | 1      | 1       | 0.95                                                           |
| Illiciaceae | 1      | 1       | 0.95                                                           |
| Isoetaceae | 1      | 1       | 0.95                                                           |
| Krameriaceae | 1      | 1       | 0.95                                                           |
| Lauraceae  | 1      | 1       | 0.95                                                           |
| Loganiaceae | 1      | 1       | 0.95                                                           |
| Loranthaceae | 1      | 1       | 0.95                                                           |
| Lythraceae | 1      | 1       | 0.95                                                           |
| Malvaceae  | 1      | 1       | 0.95                                                           |
| Menispermaceae | 1      | 1       | 0.95                                                           |
| Moraceae   | 1      | 1       | 0.95                                                           |
| Myristicaceae | 1      | 1       | 0.95                                                           |

**Table 2 Plant part used**

| Plant part | %  | Species |
|------------|----|---------|
| Leaves     | 22.72 | 30 |
| Whole plant | 21.97 | 29 |
| Stems      | 21.21 | 28 |
| Flowers    | 9.85  | 13 |
| Root       | 6.82  | 11 |
| Seeds      | 4.75  | 6  |
| Bark       | 4.55  | 9  |
| Fruit      | 2.27  | 3  |
| Latex      | 1.52  | 2  |
| Wood       | 0.76  | 1  |
| Family/Genus/ Species | Indigenous name | Plant part used | Admin. Use | Coll. # |
|-----------------------|-----------------|-----------------|------------|--------|
| **ADIANTACEAE**       |                 |                 |            |        |
| Adiantum concinnum    | Wild. ex H.B.K. | Leaves and     | Oral       | VFCHL29, TRUBH17, RBU/PL265, JULS149 |
|                       |                 | Stems, fresh   |            |        |
|                       |                 | or dried       |            |        |
| **AMARANTHACEAE**     |                 |                 |            |        |
| Alternanthera        |                | Whole plant,   | Topical    | ECHL142, ISAS56, RBU/PL301, RBU/PL324, ECHL93, GER117 |
| pongens (Jacquin)    |                | fresh or dried |            |        |
| Kuntze               | Paja Blanca,   | Whole plant,   | Oral       | JULS75, ISA62 |
|                       | Sangriniaria    | fresh          |            |        |
| **ALSTROEMERIACEAE**  |                 |                 |            |        |
| Bomarea angustifolia  | Cachuljillo     | Whole plant,   | Oral       | ISA27 |
| Benth.                |                 | dried          |            |        |
| **AMARYLLIDACEAE**    |                 |                 |            |        |
| Eustephia coccinea    | Tumapara, Pomanpara, Puma Para, Para Para | Bark, fresh or dried | Oral | RBU/PL313, GER71, ECHL68 |
| Cav.                  |                 |                 | Inflammation of uterus |        |
| **ANACARDIACEAE**     |                 |                 |            |        |
| Mauria heterophylla   | Shimir, Tres Hojas, Trinidad, Chacur, Ahimir, Peregreco | Leaves, fresh | 1. Oral 1. Inflammation of uterus, Inflammation of the ovaries, Cysts, Fibroids | ISA24, JULS17, ECHL83 |
| H.B.K.                |                 |                 | 2. Topical 2. Vaginal cleansing |        |
| Schinus molle L       | Molle, Moy      | Bark and Latex, fresh | Topical | ECHL123, JULS196, GER13 |
| **APIACEAE**          |                 |                 |            |        |
| Petroselinum crispum  | Perejil         | Whole plant,   | Oral       | ISA80, ECHL31, ISAS117, RBU/PL278, JULS225 |
| (Miller) A.W. Hill    |                 | fresh          | Regulation of menstrual cycle |        |
| **APOCYNACEAE**       |                 |                 |            |        |
| Thevetia peruviana    | Mailchin, Maichil, Camalonga, Cabalpongla | Seeds, dried | Oral | ECHL162, TRUVan/Erca19, JULS187, ECHL174, GER225 |
| (Pers.) Schum.        |                 |                 | Menopause |        |
| **ASCLEPIADACEAE**    |                 |                 |            |        |
| Sarcostemma clausum   | Marrajudio      | Leaves,        | Oral       | JULS121, GER43 |
| (Jacquin) Schultes    |                 | Stems, fresh   | Promoting lactation in women after birth |        |
| **ASPHODELACEAE**     |                 |                 |            |        |
| Aloe vera (L.) Burm f. | Sabila, Zabila, Aloe de Hojas de Sabila, Aloe Vera | Leaves, fresh | Topical | JULS274, GER22, ECHL165, VFCHL10 |
| **ASTERACEAE**        |                 |                 |            |        |
| Ambrosia peruviana    | Altamisa, Marco, Artamisa, Manzanilla del Muerto, Ajenjo, Llatama Negra Malera, Llatama Roja Malera | Leaves and Stems, fresh | Topical | JULS108, TRUBH18, RBU/PL370, TRUBH15, JULS90, GER9, GER110 |
| Wild.                 |                 |                 | After birth to reduce inflammation and prevent spasms in the woman’s womb |        |
| Artemisia absinthium  | Ajenco          | Whole plant, preferably Leaves and Stems, fresh | Oral | ISA66, RBU/PL363, GER416 |
| L.                    |                 |                 | Menstrual colics, Menstruation, Regulating the menstrual cycle |        |
| **CHUQUIRAGA**        |                 |                 |            |        |
| sp. huamanpinta C.    | Chuquiragua, Huamanpinta | Leaves, dried | Oral | ECHL168, TRUBH9, JULS276, RBU/PL373 |
| Escurra               |                 |                 | Prostate, Prostate inflammation, Sexual impotence |        |
| **CLENODIUM**         |                 |                 |            |        |
| cf. sylvestre (Aubl.) | Flor de Novia   | Flowers, Leaves and Stems, fresh or dried | Topical | ECHL80 |
| Baill.                |                 |                 | Before marriage |        |
| **MATRICANIA**        |                 |                 |            |        |
| frigidum (HBK)        | Manzanilla      | Whole plant, fresh or dried | Topical | JULS22, ECHL11, TRUBH7 |
| Kunth                 |                 |                 | Inflammation of the vagina |        |
| **MATRICANIA**        |                 |                 |            |        |
| recutita L.           | Manzanillon, Agua de la Banda, Manzanilla Blanca, Manzanilla Amarga, Manzanilla | Whole plant, fresh | Topical | JULS192, RBU/PL306, ISA120, ISA76, GER145 |
| (HBK) Kunth           |                 |                 | 1. Vaginal cleansing |        |
|                       |                 |                 | 2. Menstrual colics |        |

Table 3 Species encountered and used in Northern Peru for reproductive problems

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Table 3 Species encountered and used in Northern Peru for reproductive problems (Continued)

| Species                                      | Common Names                                      | Uses                                                                 | Refs                                                                 |
|----------------------------------------------|--------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|
| Monactis flaverioides H.B.K.                 | Hierba del Susto (Amarillo), Malva, Mocura, Hierba del Susto | Stems and Leaves, fresh                                                 | EHCHL19, RBU/PL274, TRUVan/Erca7, ISA104, ISA72                      |
| Paraneophelius uniflorus Poepp. & Endl.      | Pacha Rosa, Carapa de Chancho                     | Whole plant, fresh or dried                                            | EHCHL133, JU1525                                                     |
| Schkuhria pinnata (Lam.) Kuntze              | Canchalagua, Canchalagua (Chica)                  | Whole plant, fresh                                                     | RBU/PL266, JU1542, VFCHL27, GER228                                  |
| Tanaxacum officinale Wiggers                 | Diente de Leon, Amarglon                          | Whole plant, fresh                                                     | RBU/PL252, JU1510, GER62, GER189                                    |
| BALANOPHORACEAE                              |                                                   |                                                                      |                                                                      |
| Corynnea crassa Hook. F.                     | Huanarpo (hembra & macho)                         | Tubers, Roots, fresh                                                  | JULS171, VFCHL52                                                    |
| BIGNONIACEAE                                 |                                                   |                                                                      |                                                                      |
| Crescentia cujete L.                         | Higuieron                                         | Latex from Leaf, fresh                                                | JULS164                                                             |
| BORAGINACEAE                                 |                                                   |                                                                      |                                                                      |
| Cordia lutea Lam.                            | Overo, Flor de Overo, Overal                      | Flowers, fresh or dried                                              | ISA125, EHCHL77, JULS60, GER10                                      |
| Tiquilia paroronychoides (Phil.) Rich.       | Flor de Arena, Paja de Lagartija, Mario de Raton  | Flowers, fresh or dried                                              | JULS154, EHCHL107, ISA58, GER20                                      |
| BRASSICACEAE                                 |                                                   |                                                                      |                                                                      |
| Brassica rapa L.                             | Nabo                                              | Root, fresh                                                          | JULS201                                                             |
| Capsella bursa-pastoris (L.) Medic.           | Bolista del Pastor, Hierba del Pastor, Bolsa de Pastor | Whole plant, fresh or dried                                        | JULS57, VFCHL42, VFCHL12, RBU/PL257, EHCHL6                         |
| CACTACEAE                                    |                                                   |                                                                      |                                                                      |
| Opuntia ficus-indica (L.) Miller             | Tuna                                             | Leaves, fresh                                                        | JULS263, GER3                                                       |
| CONVOLVULACEAE                               |                                                   |                                                                      |                                                                      |
| Ipomoea batatas (L.) Lamarck                 | Camote                                           | Whole plant, fresh                                                   | JULS120                                                             |
| CUCURBITACEAE                                |                                                   |                                                                      |                                                                      |
| Cucumis dipsaceus Ehrenb.                    | Jaboncillo de Campo, Jaboncillo, Paito de Campo   | Fruits, fresh                                                        | JULS174, GER35, JULS221                                             |
| Cucurbita maxima Duch.                       | Zapallo                                           | Flowers and joints of Stems, fresh or dried                          | JULS272                                                             |
| Cucurbita moschata Duch.                     | Zapallo                                           | Flowers and joints of Stems, fresh or dried                          | GER32                                                               |
| CUPRESSACEAE                                 |                                                   |                                                                      |                                                                      |
| Cupressus lusitanica Miller                  | Cipre, Cipres                                     | Whole plant, fresh                                                   | RBU/PL288, JULS302                                                  |
| CYPERACEAE                                   |                                                   |                                                                      |                                                                      |
| Oreobolus goeppingeri Sues                   | Hierba Chupafior, Hierba de Suerte, Hierba del Carpintero | Leaves, dried                                                       | EHCHL149, TRUVan/Erca17, EHCHL67, GER119                             |
| DIOSCOREACEAE                                |                                                   |                                                                      |                                                                      |
| Dioscorea tambillensis Kunth                 | Papa Semitona                                     | Tuber, fresh                                                         | JULS283, GER140                                                     |
| Dioscorea trifida L.f.                       | Papa Madre, Papa Pacta                            | Tuber, fresh                                                         | JULS214, EHCHL40, JULS212, GER142, JULS213                          |

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| Family              | Species                                      | Common Names                                      | Parts Used                     | Uses                                  | References               |
|---------------------|----------------------------------------------|--------------------------------------------------|--------------------------------|---------------------------------------|--------------------------|
| DIPSACACEAE         | *Scabiosa atropurpurea* L.                   | Ambarina, Ambarina Negra, Flor de Ambarina       | Flowers, fresh                | 1. Oral                              | JULS100, EHCHL111,       |
|                     |                                               |                                                  |                                | 2. Inhaled                           | RBU/PL372, ISA50         |
|                     |                                               |                                                  |                                |                                       |                          |
| ERIACEAE            | *Bejaria aestuans* L.                        | Pullunrosa, Cadillo, Payama, Purenrosa, Rosada,  | Flowers,                     | 1. Oral                              | VFCHL22, JULS50,         |
|                     |                                               | Hierba de la Postema, del buen querer           | Leaves and Stems, fresh or    | Prostate, Menstrual regulation,      | EHCHL39, ISA114, ISA43,  |
|                     |                                               |                                                  | dried                         | Inflammation of uterus, Cysts,       | JULS234, GER121         |
|                     |                                               |                                                  |                                | Inflammation of ovaries, Inflammation of the womb, Uterus, Menstrual pain |                          |
| ERYTHROXYLACEAE     | *Erythroxylon coca* Lam.                     | Coca                                             | Leaves, dried                 | Induce child birth, Strength for woman during childbirth, Helping delivery of newborn | JULS144, GER201         |
| EUPHORBIACEAE       | *Chamaesyce hypericifolia* (L.) Millspaugh   | Lecherita, Lechera                              | Whole plant, fresh            | Promoting lactation in women after birth | JULS67, GER41           |
|                     |                                               |                                                  |                                |                                       |                          |
|                     | *Manhiot esculenta* Crantz                   | Yuca                                             | Tuber, fresh                  | Vaginal infection, Vaginal discharge  | GER192                   |
| FABACEAE            | *Caesalpinia spinosa* (Molina) Kuntze        | Tara, Talla, Chanchalagua                        | Seeds pods, fresh or dried    | Fungus, Inflammation of ovaries, Inflammation of the vagina | ISASS, EHCHL27,          |
|                     |                                               |                                                  |                                |                                       | VFCHL21, JULS255,        |
|                     |                                               |                                                  |                                |                                       | GER143                   |
|                     | *Desmodium mollucatum* (H.B.K.) DC.          | Pie de Perro, Pata-Perro, Pata de Perro, Chancas | Whole plant,                  | Inflammation of the ovaries, Inflammation of the womb | JULS41, RBU/PL268,       |
|                     |                                               | de Comida, Muña, Manayupa                        | fresh or dried                |                                       | GER135, JULS44, EHCHL109,|
|                     |                                               |                                                  |                                |                                       | RBU/PL256                |
|                     | *Indigofera suffruticosa* Miller             | Añil                                             | Stems, fresh                  | Cleaning of the woman, Expelling placenta from woman after giving birth | GER198                   |
|                     |                                               |                                                  |                                |                                       |                          |
|                     | *Inga edulis* C. Martius                     | Huaba, Pacea, Guava, Pacai                      | Flowers, fresh                | Hair growth                          | JULS168, JULS304, GER17  |
|                     |                                               |                                                  | Flowers, fresh                | Hair growth                          | JULS168, JULS304, GER17  |
|                     | *Inga feuillei* DC.                          | Huaba, Pacea, Guava, Pacai                      | Flowers, fresh                | Hair growth                          | JULS265, GER199         |
|                     |                                               |                                                  | Bark, dried                   | Anus cyst, Vaginal pimples, Anal pimples |                          |
|                     | *Mimosa nothacacia* Barneby                  | Uña de Gato de la Costa                         |                                    |                                       |                          |
|                     |                                               |                                                  |                                |                                       |                          |
|                     | *Prosopis pallida* (H. & B. ex Willd.) H.B.K.| Algarobo                                        | Seeds, dried                  | Sexual potency                       | JULS97, GER8            |
| GENTIANACEAE        | *Gentianella bruneotricha* (Gilg.) J.S. Pringle. | Anga Macha                                      | Whole plant, fresh            | Infection of the uterus, After giving birth | JULS282                 |
| GERANIACEAE         | *Pelargonium odoratissimum* (L.) L’Herit.    | Malva de Oro, Malva de Olor, Malva Olorosa      | Whole plant,                  | Inflammation of the ovaries, Inflammation of the womb | TRUVan/Erica14, TRUBH16,|
|                     |                                               |                                                  | fresh or dried                |                                       | EHCHL89, JULS188        |
|                     | *Pelargonium roseum* Willd.                 | Geranio                                          | Flowers and Leaves, fresh     | Hemorrhages, Uterus pain, Inflammation of the uterus | JULS84                   |
| ILLICIACEAE         | *Illicium verum* Hook. f.                    | Anis Estrella                                    | Seeds, dried                  | Expel residues of feces in stomach of newborn babies | JULS102                 |
| ISOETACEAE          | *Isoces andina* R. & P.                     | Piri                                             | Stems, fresh                  | Male impotence                       | ISA100                  |
| KRAMERIACEAE        | *Kramenia lappacea* (Dombey) Berdet & B. Simpson | Ratania, Raima                                  | Leaves and Root, fresh        | Inflammation of the ovaries           | JULS53                   |
| LAMIACEAE           | *Lepechinia meyenii* (Walpers) Eppling       | Salvia, Salvia Real                             | Whole plant,                  | 1. Oral                              | RBU/PL303, VFCHL17,      |
|                     |                                               |                                                  | fresh or dried                | 2. Topical                           | ISA91                   |
| Species                              | Use                                                                 | Uses                                                                 | Reference(s)                          |
|--------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------|
| Mentha spicata L.                    | Whole plant, fresh                                                  | Oral Aphrodisiac                                                     | RBU/PL308, EHCHL74, RBU/PL267, JUL572, |
|                                      |                                                                    |                                                                     | VFCHL3, JUL520, GER15, GER134, JUL520  |
| Ocimum basilicum L.                  | Whole plant, fresh                                                  | Oral 1. To promote dialation of the uterus, 2. After birth          | JUL554, EHCHL48, VFCHL13, RBU/PL284,   |
|                                      |                                                                    |                                                                     | TRUVan/Erica8, GER191                  |
| Origanum majorana L.                 | Leaves and Stems, fresh                                            | Oral Menstruation                                                     | EHCHL88, JUL519, RBU/PL317, GER165    |
| Origanum vulgare L.                  | Leaves and Stems, fresh                                            | Oral Menstrual cramps, Menstruation, Lower stomach cramps related to | JUL5205, GER114                        |
|                                       |                                                                    | PMS                                                                  |                                       |
| Rosmarinus officinalis L.            | Leaves, fresh or dried                                             | Oral Hair loss                                                        | RBU/PL329, ISA78, TRUBH11, EHCHL3,     |
|                                       |                                                                    |                                                                     | JUL527, VFCHL2, ISAA05                 |
| Salvia discolor H.B.K.               | Stems, fresh                                                       | 1. Preventing infections related to birth, 2. Preventing infections   | ISA93, ISA151(93a), ISAA25             |
|                                       |                                                                    | related to birth                                                     |                                       |
| Salvia officinalis L.                | Whole plant, fresh or dried                                        | Oral Control and regulate menstrual cycle                            | JUL5241                               |
| Satureja pulchella (H.B.K) Biquet    | Leaves, fresh or dried                                             | Oral Menstrual delay                                                  | GER148, JUL543                        |
| Persea americana Mill.               | Seeds, fresh                                                        | Oral Contraceptive, Sterilization for women only                     | JUL5211, GER18                        |
| Linum sativum L.                     | Seeds, dried                                                        | Oral Inflammation of the prostate                                    | EHCHL1599                             |
| Linum usitatissimum L.               | Seeds, dried                                                        | Oral Inflammation of the prostate                                    | JUL5185, GER139                       |
| Buddleja utilis Kraenzl.             | Flowers, fresh or dried                                            | Oral Menstruation, Inflammation of the womb, Ovarian cysts, Inflammation of uterus |                           |
| Tristerix longibracteatus (Des.)     | Whole plant, dried                                                 | Oral Vaginal discharge (white or yellow)                             | JUL5296, GER74                        |
| Cuphea strigulosa H.B.K.             | Leaves and Stems, fresh                                            | Oral Discharges                                                      | GER104, EHCHL35, VFCHL34, JUL533, ISA51, |
|                                      |                                                                    |                                                                     | RBU/PL259, EHCHL43, JUL559, ISA53, GER147 |
| Malva sylvestris L.                  | Leaves and Stems, fresh                                            | Oral Vaginal cleansing                                               | VFCHL49, EHCHL29                      |
| Abuta grandiflora (Mart.) Sand.      | Root and Stems, fresh or dried                                      | Oral Contraceptive                                                   | JUL588, RBU/PL312                     |
| Bromus rubescens Taubert             | Wood and Bark, fresh or dried                                       | 1. Fertility, Sexual potency                                         | JUL5209, ISA49, EHCHL64, RBU/PL311,   |
|                                      |                                                                    |                                                                     | GER86, EHCHL62                        |
| Myristica fragrans L.                | Seeds, dried                                                        | Oral Fertility, Sexual potency                                       | RBU/PL385, EHCHL155, JUL5292, GER197  |
| Mirabilis jalapa L.                  | Root, fresh                                                         | Oral Prostate                                                        | JUL5116, GER185                       |
OLACACEAE

| Species                        | Parts Used         | Mode of Administration | Uses                                      | Reference Numbers |
|-------------------------------|--------------------|------------------------|-------------------------------------------|-------------------|
| *Heisteria acuminata*         | Bark, fresh or dried | Oral                  | Sexual potency                            | RBU/PL287, JULS138, GER164 |
| (H. & B.) Engler              |                    |                        |                                            |                   |
| *Ximenia americana*           | Limoncillo         | Oral                  | Menstrual regulation                      | JULS184           |
| L.                                |                    |                        |                                            |                   |

OXALIDACEAE

| Species                        | Parts Used         | Mode of Administration | Uses                                      | Reference Numbers |
|-------------------------------|--------------------|------------------------|-------------------------------------------|-------------------|
| *Oxalis tuberosa*              | Oca Rosada         | Oral                  | Sexual potency                            | JULS203           |
| Molina                        |                    |                        |                                            |                   |

PASSIFLORACEAE

| Species                        | Parts Used         | Mode of Administration | Uses                                      | Reference Numbers |
|-------------------------------|--------------------|------------------------|-------------------------------------------|-------------------|
| *Passiflora quadrangularis*    | Hojas de Tumbo     | Oral                  | Menstrual pain                            | EHCHL135          |
| L.                                |                    |                        |                                            |                   |
| *Passiflora* sp.                | Chulgan            | Oral                  | Promoting vaginal dilation during childbirth. | JULS279           |
|                                | Leaves and Stems, dried |                        |                                            |                   |

PLANTAGINACEAE

| Species                        | Parts Used         | Mode of Administration | Uses                                      | Reference Numbers |
|-------------------------------|--------------------|------------------------|-------------------------------------------|-------------------|
| *Plantago major*               | Llantén            | Topical               | Vaginal cleansing                         | VFCHL50, EHCHL11, TRUVan/Erica13 |
| L.                                |                    |                        |                                            |                   |
| *Plantago sericea* R. & P. lanuginosa* | Papilla Blanca     | Oral                  | Vaginal discharge                         | JULS207           |
| Grieseb.                       | Whole plant, fresh or dried |                        |                                            |                   |
| *Plantago sericea* R. & P. subsp. sericans* | Paja Blanca        | Oral                  | Ovarian pain, Inflammation of the ovaries, Inflammation of the womb | RBU/PL335, EHCHL96 |
| (Röger) Rahn                  | Stems, fresh or dried |                        |                                            |                   |

POACEAE

| Species                        | Parts Used         | Mode of Administration | Uses                                      | Reference Numbers |
|-------------------------------|--------------------|------------------------|-------------------------------------------|-------------------|
| *Cynodon dactylon* (L.) Persoon | Grama Dulce       | Oral                  | Cysts of the ovary, Cysts of the uterus, Uterus, Fibroids, Uterus prolapse | ISA61, JULS73, ISA106, GER151 |
|                                | Stems, dried       |                        |                                            |                   |
| *Saccharum officinarum* L.     | Azucar de Caña, Caña de Azucar, Caña Dulce | 1. Fresh sugar 2. Stems, fresh | 1. Aphrodisiac 2. Inflammation of the prostate | VFCHL4, JULS123, GER208 |
|                                | 1. Oral 2. Oral    |                        |                                            |                   |
| *Triticum sativum* L.          | Trigo              | Topical               | Vaginal infection, Vaginal discharge      | GER182            |
|                                | Seeds, dried       |                        |                                            |                   |

POLYGONACEAE

| Species                        | Parts Used         | Mode of Administration | Uses                                      | Reference Numbers |
|-------------------------------|--------------------|------------------------|-------------------------------------------|-------------------|
| *Rumex crispus* L.             | Aceilga, Lengua de Vaca, Hojas de Mala Hierba | Whole plant, fresh 1. Oral 2. Topical | 1. Infection of the uterus 2. Inflammation (internal woman parts), Vaginal inflammation | JULS70, EHCHL173  |
|                                |                    |                        |                                            |                   |

POLYPODIACEAE

| Species                        | Parts Used         | Mode of Administration | Uses                                      | Reference Numbers |
|-------------------------------|--------------------|------------------------|-------------------------------------------|-------------------|
| *Polypodium crassifolium* L.   | Lengua de Ciero, Calaguala | Stems, fresh | Prostate                                   | EHCHL71, TRUBH38, RBU/PL331, RBU/PL332, JULS52, JULS503 |
|                                |                    |                        |                                            |                   |

PORTULACACEAE

| Species                        | Parts Used         | Mode of Administration | Uses                                      | Reference Numbers |
|-------------------------------|--------------------|------------------------|-------------------------------------------|-------------------|
| *Portulaca villosa* H.B.K.     | Verdolaga          | Topical               | Hair loss                                 | GER171            |
|                                | Root and Stems, fresh |                        |                                            |                   |

PROTEACEAE

| Species                        | Parts Used         | Mode of Administration | Uses                                      | Reference Numbers |
|-------------------------------|--------------------|------------------------|-------------------------------------------|-------------------|
| *Oreocalis grandiflora* (Lam.) R.Br. | Rumianche, Bunbun, Huaminga | Leaves and Stems, fresh or dried | Inflammation of the ovaries, Inflammation of uterus | EHCHL127, JULS31, ISA28, ISA70 |
|                                |                    |                        |                                            |                   |

RANUNCULACEAE

| Species                        | Parts Used         | Mode of Administration | Uses                                      | Reference Numbers |
|-------------------------------|--------------------|------------------------|-------------------------------------------|-------------------|
| *Laccopetalum giganteum* (Wedd.) Ulbrich | Huamariipa, Pacra, Flor de Guarmany | Leaves, fresh or dried | Fertilization (Heat Ovaries)               | VFCHL53, RBU/PL321, EHCHL42, JULS284, GER162 |
|                                |                    |                        |                                            |                   |

ROSACEAE

| Species                        | Parts Used         | Mode of Administration | Uses                                      | Reference Numbers |
|-------------------------------|--------------------|------------------------|-------------------------------------------|-------------------|
| *Sanguisorba minor* Scop.      | Pimpinela, Flor de Ovea | Whole plant, fresh | Menstrual regulation                      | EHCHL117, TRUBH35, RBU/PL262, ISA57, JULS25, ISA147(103a), VFCHL20, GER170 |
|                                |                    |                        |                                            |                   |

RUBIACEAE

| Species                        | Parts Used         | Mode of Administration | Uses                                      | Reference Numbers |
|-------------------------------|--------------------|------------------------|-------------------------------------------|-------------------|
| *Cinchona officinalis* L.     | Cascarilla, Quinuago | Bark, dried      | Fertility, Sexual potency                 | RBU/PL314, JULS127, ISA19, GER167 |
|                                |                    |                        |                                            |                   |

Additional information:

- Table 3: Species encountered and used in Northern Peru for reproductive problems (Continued)
- Bussmann and Glenn, *Journal of Ethnobiology and Ethnomedicine* 2010, 6:30
- http://www.ethnobiomed.com/content/6/1/30
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afflictions, and some have been investigated for their efficacy with positive results. An often-limiting factor to these investigations is lack of comprehensive ethnobotanical data to help choose plant candidates for potency/efficacy tests. Since the plant parts utilized in preparation of the remedies are reported in this survey, it serves as an indication of species that may need further ecological assessment on their regeneration status.

The results of this study show that both indigenous and introduced species are used for the treatment of reproductive system problems. The information gained on frequently used traditional remedies might give some leads for future targets for further analysis in order to develop new drugs. However, more detailed scientific studies are desperately needed to evaluate the efficacy and safety of the remedies employed traditionally.

Declaration of competing interests
The authors declare that they have no competing interests.

Authors’ contributions
RB collected/identified plant material analysis of the data as well as writing the manuscript. AG conducted fieldwork, data analysis and manuscript composition. Both authors have read and approved the final manuscript.

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