



Peruvian Biodiversity: A Mini Review of Five Plants

Lock Olga^{1*} and Flores Diana²

¹Pontificia Universidad Catolica del Peru, Peru

²Consultant, Promperu, Peru

***Corresponding author:** Olga Lock, Universidad Catolica del Peru. Avda Universitaria 1801, Lima, Peru, Tel: +51 996470057, Email: olock@pucp.edu.pe

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Abstract

In this article, five different plant species from the Peruvian biodiversity are briefly revised. These plants are broadly used for traditional medicine purposes, as well as for cosmetic and edible purposes. They are not only commercialized in Peru, the country of their origin, but around the world. The plant species we are going to write about are *Uncaria tomentosa/U. guianensis* (uña de gato), *Lepidium meyenii* (maca), *Plukenetia volubilis* (sacha inchi) and *Smallanthus sonchifolius* (yacon).

Keywords: Functional Food; *Lepidium meyenii*; Peru; *Plukenetia volubilis*; *Smallanthus sonchifolius*; Traditional Medicine; *Uncaria tomentosa U. guianensis*

Introduction

There are 390,900 vegetable species in the world, from which around 32,000 have been reported for medical use. Less than 10% have been studied chemically and pharmacologically, and 25% of them will disappear around 2025 [1]. The World Conservation Monitoring Centre (WCMC) of the United Nations Environment Program has identified a total of 17 mega-diverse countries. Peru is one of them. It is estimated that Peru is home to approximately 25,000 plant species. Although it is indicated that the endemism in Peru is around 30%, this can be higher in some botanic families as we can observe in *Asteraceae*, *Cactaceae*, *Bromeliaceae*, *Gentianaceae*, *Lamiaceae*, *Piperaceae*, *Valerianaceae*, among others [2].

More than 4,500 species are used by the Peruvian inhabitants for several purposes: medical, edible, cosmetic, biocide, agroforest, industrial, constructing, among others [3]. From all of them, around 1,400 species are used for traditional medicine [4]. A detailed description of 774 species used for medicine can be found in Jose M, et al [5]. However, only a few have undergone phytochemical and pharmacological scientific investigation.

Medicinal plants are an important source of new drugs and leading molecules. Around 60% of the chemical entities that were worldly introduced as medicinal drugs from 1981 to 2000 have their origin in medicinal plants. Between 2001 and 2002 nearly 25% of the most sold drugs in the world were natural products or their derivatives. More than 60% of cancer medicine comes from natural sources like taxol, vinblastine, vincristine, among others [6]. In this article we are going to focus our attention on five plant species that have a wide current usage around the world. These species are *Uncaria tomentosa/U. guianensis* (known as uña de gato), *Lepidium meyenii* Walp (maca), *Plukenetia volubilis* L. (sacha inchi), and *Smallanthus sonchifolius* (Poepp. & Endl.) H. Rob. (yacon).

Uncaria tomentosa (Willd) DC/*Uncaria guianensis* (Aubl.) J.F. Gmel

In a SciFinder review made in March 2020, there were 433 publications on *Uncaria tomentosa*, sometimes compared to other *Uncaria* species. The first scientific publication on *Uncaria tomentosa* was in 1985, this study showed the presence of indole (MIAs) and oxindole (MOAs) alkaloids [7]. The first publication on *Uncaria guianensis* was

in 1999 with the isolation of quinovic acid and its glycosides [8]. The mentioned metabolites are the largest group found in *Uncarias* besides flavonoids. 85 more publications were found on the *Uncaria guianensis* topic. The *Uncaria* has been widely used in traditional medicines to treat wounds, ulcers, fever, headache, gastrointestinal diseases, and microbial infections [4].

In a paper published in 2017 [9], hundreds of patents from different countries are mentioned: patents for isolation, synthesis, and biosynthesis of the MOAs and MIAs, patents for pharmaceutical applications for preventing and treating heart diseases, for stimulating the immune system, for Alzheimer treatment, for Herpes simplex, for psychological and psychiatric treatment working as an anxiolytic and antidepressants, and for drug dependence treatment, among others.

***Lepidium meyenii* Walp**

Many of the uses of *Lepidium meyenii* Walp are due to the roots containing bioactive compounds. These are responsible for benefits to the human body which has caused a considerable increase in its consumption in the last 20 years worldwide. Maca is a root native to our Andean region, cultivated for at least 2000 years.

The secondary metabolites determined were glucosinolates, phenolics, alkaloids, glycoside, tannins, and saponins and later on the macamides and macaenes [4]. Some medicinal uses are in sexual dysfunction regulation, neuroprotective effects, action in memory enhancement, antidepressant, anticancer, antioxidant and anti-inflammatory activities, and skin protection. Glucosinolates and their degradation products, known for their fungicidal attributes, bactericidal properties, and nematocidal activity have recently attracted great interest and intense research for their chemoprotective action against some cancers [10-12]. Furthermore, the anti-fatigue activity was evaluated, the result indicated that low-dose maca polysaccharides group had a significant anti-fatigue activity which was known by traditional knowledge [13]. The patents are related to pharmaceutical compositions treatment of sexual dysfunction, climacteric, alopecia, acne treatment, dietary supplements, the therapeutics of maca ingredients, the relevant effects of maca substances in cosmetics and dermatological products [14], and different type of beverages and extracts [15].

***Plukenetia volubilis* L.**

It is an oleaginous Peruvian Amazonian plant, best known around the world with the name of “maní del inca” or “sacha inchi” due to its importance back in the Inkas times.

Its seeds are a good source of omega 3 (more than 48%), omega 6 (36%), and omega 9 (8%) and contain a better balance in unsaturated and saturated fatty acids than fish. Also, it contains a highly digestible protein that includes essential amino acids and fiber (suitable for celiacs). Among its benefits, it can help reduce irritable bowel problems since omegas are indispensable for keeping intestinal permeability and preventing the irritable colon, improve the biochemical profile related to cardiovascular risk. It has also anti-inflammatory properties due to its tocopherol content, mainly delta tocopherol. It is used in arthritis, rheumatism, osteoporosis, as well as gamma tocopherol. It is useful as natural cosmetics since it contributes to the protective effect of oxidative damage and is indicated for sensitive, dehydrated, and even for inflamed or irritated skin [15,16].

It is well considered in gastronomy as table oil (similar to olive oil) in the form of a food supplement or fried at low temperatures [17] as a therapeutic and nutritional alternative. Patents applied for include protein blends, skin barrier repair, hair health repair, and health drinks.

***Smallanthus sonchifolius* (Poepp. & Endl.) H. Rob.**

The cultivation of Yacon dates from the Pre-Inca age (Nazca, Paracas and Mochica cultures) so the historical use of this species is directly related to “traditional knowledge” [18]. Yacon is one of the edible tubers, it acts as a reservoir with great water and potassium content. It has polyphenolic compounds, derivatives of caffeic acid, antioxidant substances (chlorogenic acid, tryptophan, and various phytoalexins with fungicidal activity). Its main component is fructooligosaccharides of inulin (FOS) considered the dominant saccharide with low digestibility and low calory. Besides, yacon contributes to restoring the good and beneficial bacteria from the intestinal microflora. FOS does not raise the sugar level in blood and could be used as a sweetener for diabetic people [19]. Likewise, yacon leaves contain: Enhydrin, uvedalin, fluctuanin, polymatin B, sonchifolin (melampolide sesquiterpene) [20], and reduce the level of glucose in the blood [21]. In addition, tuber peels show considerable antioxidant activity and low sugar content [22]. Therefore, yacon tubers in general can be used for the food, cosmetic and pharmacological industries. In the food industry, it is sold as a syrup for sweetening purposes, and it is even used in liqueur making. Yacon is highly appreciated by obese people. It is considered as a multifunctional food [15].

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