MOL2NET, **2021**, 6, ISSN: 2624-5078
http://sciforum.net/conference/mol2net-07. MODECO-06: Molec. Diversity, Energy, & Ecosystems Congress, Porto, Portugal-Paris, France-EPA, Ohio, USA, 2021. Sciforum-053162

MOL2NET, International Conference Series on Multidisciplinary Sciences
06. MODECO-05: Molec. Diversity & Ecosystems, Puyo, Ecuador-Porto, Portugal-Paris, France, EPA, USA, 2020

Some Amazonian plants of ancestral use beneficial for health and nutrition.

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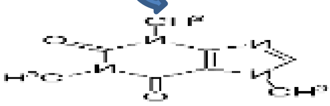
Graphical Abstract

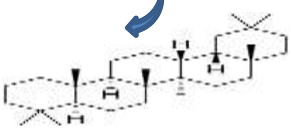
Amazonian cultivation systems (chacras)

Ilex guayusa (Guayusa) and other plants

Active ingredients

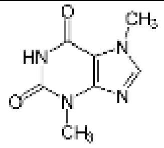


Caffeine (Radice and Vidari, 2007)



Triterpenes (Fernández et al. 2020)

Abstract.
Some Amazonian plants, beneficial to health, from Kichwa communities far from the colonized sector are described and laboratory results on antioxidants are presented. The methodology used was based on documentary searches and laboratory results as part of the functional food project, UEA. In the region, 107 species are reported in associated and rotating cultivation systems called chacras and up to 886 food, medicinal, ritual, flavoring, cosmetic and toxic uses of flora species known in the tropical rainforest, western Amazon, considered one of the most biodiverse areas of the planet; home of indigenous peoples with ancestral knowledge about medicinal and food plants, which deserve further laboratory verification. This work presents results of analysis of polyphenolic and antioxidant activity of *Maytenus macrocarpa* (Chuchuhuazo), *Theobroma cacao* (Cocoa), *Ilex guayusa* (Guayusa), *Musa acuminata* AA (Baby banana), as well as the evaluation of phenolic compound contents in powders of *Psidium guajava* (Guava), *Tagetes filifolia* Lag (Wild anise), *Allium ursinum* (Wild garlic), seeds of *Plukenetia volubilis* (Sacha inchi) and tubers of *Colocasia esculenta* (Chinese potato) and their effect as phytobiotic additive, universities in the Amazonian territory should increase the exploration of sources of



Theobromine (Ortiz et al., 2019)

Health improvement

secondary metabolites for the pharmaceutical, cosmetic and functional food sectors, in order to promote strategies to improve social and economic conditions, such as ventures based on local resources, strengthening food security and combating child malnutrition.

Key words: Antioxidants, UEA results, beneficial species.

Introduction

World Health Organization estimates, more than 80% of the world's population, especially in developing countries, uses traditional herbal treatments for their primary health care needs. However, in many countries, traditional knowledge on the use of medicinal and food plants has been largely lost; moreover, their availability has been reduced by the degradation of natural environments, especially in the tropical region. Therefore, ethnobotanical research can help to prevent the loss of such knowledge and simultaneously protect biodiversity (Bermudez et al. 2005).

The Amazonian jungle has approximately 30,000 plant species, many of which are food and medicinal (Rivas et al. 2010). For example, Kuhnlein (2006) states that the traditional food systems of indigenous peoples contain a wealth of information on unique food species that can be used for human nutrition. While there is great diversity in the cultural ecosystems used by indigenous peoples throughout history, and great variety in the plant and animal species used as food and natural medicines, the current trend is to replace the use of many of these foods with industrialized derivative products that circulate through market networks (Rivas et al. 2010).

The Ecuadorian Amazon Region (RAE) represents one of the most biodiverse areas of the planet and is a source of secondary metabolites for the pharmaceutical sector, cosmetics and functional foods (Radice et al. 2017).

As an aim, it proposes to describe some Amazonian plants, beneficial to health, from Kichwa communities far from the colonized sector, as well as to present some laboratory results on antioxidants in these plants.

Materials and Methods

Amazonian plants: Participant observation, surveys to community families and focus groups of indigenous peoples in Pastaza, also shared through experiences, events, congresses, assemblies and workshops in rural communities and indigenous organizations representative of the locality in Pastaza, Ecuadorian.

The main promising species susceptible to value addition and associated with diversified crops and functional food and the ancestral use of Amazonian agrobiodiversity are shown.

For laboratory studies the species were collected at CEIPA (Research and Postgraduate Center). They were identified by botanical specialist Dr. David Neill, Amazonian Herbarium of Ecuador (ECUAMZ).

The plant material was washed with potable water and prepared according to the methodology of Azwanida (2015).

The extracts of the five selected plants were obtained using the Ultrasound Assisted Extraction-UAE method (Branson Ultrasonics, USA). For the extraction, an ethanol water mixture was used in a 9:1 ratio, with a ratio of 400 mL of solvent per 50 g of pulverized sample.
To determine the content of total phenolic compounds, the technique of Proestos and Varzakas (2017) was used. Antioxidant activity was determined by two methods: FRAP (Ferric ion reducing antioxidant power) and ABTS (2,2-azinobis(3-ethylbenzthiazoline)-6-sulfonic acid) method was based on the ability of an antioxidant to stabilize the ABTS colored cation radical (Re et al. 1999).

Results and Discussion

Table 1 shows food plants with functional, medicinal, flavoring, cosmetic, ritual and toxic value selected from communities in the Ecuadorian Amazon region. The indigenous peoples and rural communities have a tradition of food sufficiency based on their relationship with nature, their own cultivable resources in biodiverse farms and those of stationary collection in the jungle.

Table 1. Food plants with functional, medicinal, flavoring, cosmetic, ritual and toxic value selected in the communities studied

Comun name	Scientific name	Ancestrals uses
	Food plants	
Achiote	*Bixa Orellana*	Food coloring. Use in burns
Uvilla	*Puorouma tomentosa*	Fruit, canned food
Chontaduro	*Bactris gasipaes*	Fruit for human consumption; qualities for making oil and soaps, animal feed
Plátano “orito”	*Musa acuminata* AA	Nutritional value
Papa china	*Colocasia esculenta*	Nutritional value
	Medicinal plants	
Chuchuhuazo	*Maytenus macrocarpa*	Rheumatism
Uña de gato	*Uncaria tormentosa*	Antioxidant
Guayusa	*Ilex guayusa*	Antioxidant
Guayaba	*Psidium guajava*	Antioxidant
Cacao	*Theobroma cacao*	Antioxidant
Sacha inchi	*Plukenetia volubilis*	Omega 3
	Plantas saborisantes	
Anís silvestre	*Tagetes filifolia Lag*	Flavoring
Ajo silvestre.	*Allium ursinum*	Flavoring
Ají	*Capsicum sp*	Spicy seasoning. Antimicrobial
Canela Ishpingo	*Ocotea quixos*	Spicy seasoning
María panga	*Piper peltatum*	Flavoring seasoning: Use in pain

Cosmetic plants		
Shiwa	*Oenocarpus bataua*	Hair care oil
Wituk	*Genipa americana*	Natural coloring
Ritual plants		
Ayahuasca	*Banisteriopsis caapi*	Contact with the spiritual world, by shamans
Copal	*Protium fimbriatum*	Highly aromatic lighter's wax
Wayra panga	*Siparuna thecaphora*	Cleaning in the spiritual world by shamaes
Toxic plants		
Barbasco	*Lonchocarpus utilis*	Toxic to fish

Source: Research by Dr. Ruth Arias.

There is no quality of life without territory; the characteristics of the territory provide goods and services to the people that inhabit them, services that can be considered greater and more complex at equatorial latitude for some ecosystems (Hamilton et al. 2016).

A current food development is mainly focused on the consumer; it takes into consideration the transformations that food, nutrients and bioactive substances have on the human body and their effect on health and well-being (Bhaskaran et al. 2002).

Today, food is more complex and must meet increasingly demanding environmental, safety, quality and presentation requirements, among others. From this perspective, the focus of the development of the functional food industry must necessarily shift to the consumer in order to respond to his or her motivations, emotions, tastes and concerns for a healthy life. This empowerment of the 21st century consumer has reversed the traditional supply-side approach to food to one conceived from the demand side and its link to consumer health (Landstrom et al. 2007). Already in the 1980s, many medical researchers, biochemists and nutritionists had begun to recognize the benefits provided by the consumption of some substances of plant origin, mainly through a contribution of bioactive substances in food (Valenzuela et al. 2014). In parallel, from the perspective of the 21st century consumer, there is a strict correlation between food and health; new trends point to an inclusive approach towards indigenous communities, deferential of their cosmovision and based on a process of mutual learning, community empowerment and limited access to ancestral knowledge (Sidali et al. 2016). Table 1 shows some plants with ancestral uses for health benefits.

Amazonian indigenous peoples are not all linked to the market, many do not have access to roads and uncontacted peoples persist for whom the republic constitutionally provided for the existence of intangible zones; but food practices change depending on contact with the local and national economy, employment and resource availability.

Table 2 shows the results of the content of total phenolic compounds in some Amazonian plants. The highest levels are observed in guava leaves, wild garlic foliage, chuchuhuazo and cocoa. With the exception of wild garlic foliage, the polyphenol contents are higher than the Chilean red wine taken as a reference.

Table 2. Content of total phenolic compounds in $mg.mL^{-1}$

Raw Materials	Polyphenols	SD±
Guava leaf	35.32	0.19
Wild anise foliage	7.92	0.14
Wild garlic foliage	11.73	0.60
Baby banana fruit	1.03	0.12
Chinese potato tuber	1.88	1.31
Sacha inchi seeds	1.88	0.09
Chuchuhuazo	19.90	0.340
Cocoa	24.44	0.570
Guayusa	1.288	0.006
Red wine	8.983	0.040

Source: Research by Manuel Pérez, Willan Caicedo, Luis Bravo, Matteo Radice, Reinier Abreu.

Table 3 shows the antioxidant activity (ABTS and FRAP) in powders of Amazonian plants high in polyphenolic content in $mg.mL^{-1}$. In all cases the antioxidant activity is related to the polyphenolic activity, guava leaves and cocoa seeds are higher in these antoxidant activities (Perez et al. 2017, Caicedo et al. 2018).

Table 3. Antioxidant activity, powders of different Amazonian plants high in polyphenols in $mg.mL^{-1}$

Raw Materials	ABTS	SD±	FRAP	SD±	ABTS	SD±
Guava leaf	35.32	0.19	15.451	0.366	543.763	5.532
Wild anise foliage	11.73	0.60	7.780	0.467	97.034	2.345
Chuchuhuazo	19.90	0.340	8,540	0.383	108,376	3.234
Cocoa	24.44	0.570	10.239	0.468	324,540	4.567
Red wine	12.98	0.040	7,776	0.143	106.934	3.765

Source: Research by Manuel Pérez, Willan Caicedo, Luis Bravo, Matteo Radice, Reinier Abreu.

Conclusions

The ancestral knowledge of the peoples of the jungle can be enhanced for their own benefit, in alliance with universities, through the research of foods with functional properties, such as antioxidants, dietary fiber, prebiotic and probiotic biopreparations, being the agrobiodiverse system in farms the way of reproduction of these useful species.

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