CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE
Faculty of Tropical AgriSciences

Oil-bearing plants of the Amazon basin: ethnobotany and status of domestication

Bachelor thesis

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

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BACHELOR THESIS ASSIGNMENT

Tereza Hájková

Agriculture in Tropics and Subtropics

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Methodology

A qualitative systematic literature review will be performed using an electronic search of ISI Web of Knowledge and Scopus citation databases, and a manual search of appropriate journals, books and monographs. Initially, the list of plants previously reported to be used as an oilseeds or oil is reported to be exctracted or present in some particular plant parts will be created. Further searches will be carried out using the names of individual species with ecology and nutritive value. The study will cover plants used for their content of fixed, non-volatile oils/fats, therefore essential oil plants will be excluded.

The proposed extent of the thesis

30 pages

Keywords

Amazon, ethnobiology, nutrition, vegetable oil, underutilized species

Recommended information sources

Pesce C. 1985. Oil palms and other oilseeds of the Amazon. Studies in Economic Botany Nr. 2. Reference Publications Inc., Algonac, MI. 199 pp., ISBN 0-917256-28-X

Prance GT, Kallunki JA (eds). 1984. Ethnobotany in the Neotropics. Proceedings of Ethnobotany in the Neotropics Symposium, Society for Economic Botany, 13-14 June, 1983, Oxford, Ohio, USA. Advances in Economic Botany, Volume 1. 156 pp.

Wickens GE. 2001. Economic botany: principles and practices. Kluwer Academic Publishers, Dordrecht, Netherlands. 535 pp.

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I, Tereza Hájková, declare that this bacherol thesis entitled oil bearing plants of the Amazon basin: ethnobotany and status of domestication is my own work and all the sources have been quoted and acknowledged by means of complete references. As an author of the Bachelor thesis, I further declare that I did not infringe the copyrights of third parties in connection with its creation.

In Prague, 20. 4. 2018

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Tereza Hájková

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Abstract

Oil-rich plants were predominantly domesticated as sources of edible oil. These extracts most serve as the intake of microelements and vitamins for the human body but are also used in industry or as animal feed. Each plant has special mining and processing requirements. These oils are important in modern life, and most are derived from parent varieties. Ethnobotanic data was collected using abstract articles, primarily the ISI Web of Science and the Scopus database. The survey was applied to oilseeds that occurred in the Amazon region.

A total of 47 species of oil plants belonged to 16 botanical families that reported they were most nutritionally effective or had good quality oil but were less used by locals. Emphasis is also placed on plants which are toxic, and people should be careful in processing and eating. The oil plant was mainly from the family Arecaceae. The richest in oil content was *Caryocar coriaceum*, *Guilielma speciosa*, *Astrocaryum aculeatum*, *Oenocarpus bataua* and one of the most exported and used oils was *Cocos nucifera*. Industrial processing was mainly for making soap, household use was widely used as cooking oil, and in medicine, the healing effects of some oils were noted. Most oilseeds are also rich in nutritional elements such as vitamins and fatty acids (lauric acid, linoleic acid, linolenic acid, palmitic acid, myristic acid, stearic acid and oleic acid) which have a positive effect on human health. The field of study is rich in the diversity of oil plants and related native knowledge but still needs further research and study.

Therefore, it is important to document these plants as a source of human nutrition and thus to enrich some poor areas and it also appropriate to extend the cultivation of oil crops, but care must be taken to respect the ethnic groups living in the tropical rainforest to prevent farmers from cutting off rainforests to protect the biodiversity of the Amazon.

Keywords: Amazon, ethnobiology, nutrition, vegetable oil, underutilized species

Abstrakt

Rostliny, které jsou bohaté na olej byly převážně domestikovány jako zdroj jedlého oleje. Tyto výtažky slouží jako příjem mikroprvků a vitamínů pro lidské tělo, ale také se používají v průmyslu nebo jako krmivo pro zvířata. Každá tato rostlina má zvláštní požadavky na těžbu a zpracování. Tyto oleje jsou v moderním životě důležité a většina se odvozuje od mateřských odrůd. Etnobotanické údaje byly shromážděny pomocí abstraktních článků, především ISI Web of Science a databáze Scopus. Průzkum byl aplikován na olejnatá semena, která se vyskytovala v oblasti Amazonky.

Celkem 47 druhů olejnatých rostlin patřilo k 16 botanickým čeledím, které uváděly, že jsou nejúčinnější z hlediska výživy nebo měli kvalitní olej, ale byly méně využívány místními obyvateli. Důraz je kladen i na rostliny, které jsou toxické a lidé by měli být opatrní při zpracování a konzumaci těchto olejů. Olejnaté rostliny byly především z čeledi Arecaceae. Nejbohatší v obsahu oleje byly *Caryocar coriaceum*, *Guilielma speciosa*, *Astrocaryum aculeatum*, *Oenocarpus bataua* a jeden z nejvíce vyvážených a používaných olejů byl *Cocos nucifera*. Průmyslové zpracování bylo především na výrobu mýdla, v domácnostech se hojně využívalo jako olej na vaření a v medicíně byly zaznamenány léčivé učinky některých olejů. Většina olejnatých semen jsou také bohatá na nutriční prvky, jako jsou vitamíny a mastné kyseliny (kyselina laurová, kyselina linolová, kyselina linolenová, kyselina palmitová, kyselina myristová, kyselina stearová a kyselina olejová), které příznivě působí na lidské zdraví. Studijní oblast je bohatá na různorodost olejnatých rostlin a související znalosti domorodců, ale studie stále potřebuje další průzkum.

Proto je důležité zdokumentovat tyto rostliny jako zdroj lidské výživy a tím obohatit některé chudé oblasti a také je vhodné rozšířit kultivaci olejnatých plodin, ale je třeba respektovat etnické skupiny žijící v tropickém pralese, aby se zamezilo kácení deštných lesů zemědělci, a chránili tak biodiverzitu Amazonie.

Klíčová slova: Amazonie, ethnobiologie, výživa, rostlinný olej, nevyužitelný druh

Content

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1. Foreword

Since ancient times plants have been used for many different purposes shamans‘ rituals, medicines and also as spices and food. These plants include more than 200 plant species are being used in different human cultures all around the world for treating a health problem. One of the biggest and the most important dietary problems in developing countries is the lack of edible oil and fat. Botanists and agricultural specialists have been looking at the plant kingdom for new sources of fats and oils now for a long time recent research has led to the domestication of several new oil plants. The most promising regions for the search for oil crop plants is the Amazon basin in the world (Balick 1979).

Ethnobotanical studies on the properties of oil plants stem from the findings of Indian ethnicity in the tropical rainforest. These ethnicities distinguish the seeds between themselves already in the outer appearance or the quality of the oil they contain and how they are used. These seed-oils may be used as an edible oil or to produce soaps and cosmetics but also in medicine or as livestock feed. Of the total natural production of oilseeds in Amazon basin, only a very small proportion is utilized due to a lack of manpower to gather the fruits. The oilseeds are not set out to dry until some weeks after being gathered and the heat produced by internal chemical action while in storage causes deterioration and increased levels of free fatty acid. It is necessary to point out that a vegetable oil industry cannot expect to prosper for long if it must depend exclusive on oilseeds gathered from the wild. Only when the farmers of Pará begin to seriously cultivate oilseed plants of the region will the vegetable oil industry be able to reach its full potential (Pesce 1941).

In the literary research of this thesis, there is summarized several findings domesticated, semi-domesticated and wild species of oil plant which people cultivate or collect and then process as beneficial oil in Amazon region.

2. Introduction

2.1. Study area description

The Amazon basin is the part of South America flowed away by the Amazon river is a transitional region between tropical rainforest, subtropical savanna and agricultural land. It is located in nine states of Bolivia, Brazil, Peru, Ecuador, Colombia, Guyana, Venezuela, Suriname and French Guyana. The Amazon river basin is a beyond the borders, situated between approximately 50 °W and 80 °W longitude and 5 °N and 17 °S latitude. It has a total area of 6.15 million km^2, distributed between Brazil (63.9%), Peru (15.6%), the Plurinational State of Bolivia (11.7%), Ecuador (2.1%), the Bolivarian Republic of Venezuela (0.9%) and Guyana (0.2%).

The Amazon river basin is the most extensive and biggest rainforest in the world. The tropical rainforest has an area of 5.5 km^2 of which more than 60 %, around 3.6 million km^2 is located inside Brazil (Rodrigues 2008).

The basin has widely varying characteristics, with elevations ranging from sea level at the river’s mouth to an altitude of 6.500 m in the Andes (Braga et al. 2011). Most of the Amazon basin does not exceed an altitude of 250 m, and the main humid zones are located below an altitude of 100 m. The rainforest, known as the Amazon Rainforest or Amazonia, is not confined to the Amazon river basin but also extends into the Orinoco basin to the north and other small basins located between the mouths of the Orinoco and Amazon rivers to the northeast (GIWA 2004). The Amazon river basin contains the biggest biodiversity in the world. The geographical distribution of the Amazon is shown in Figure 1.

Figure 1. Map of the study area (adapted from Amazonwaters.org)

2.1.1. Climatic conditions in the Amazon region

The Amazon rainforest is characterized mainly by rain and heat. But more rain and heat and is providing the perfect environment for plants and wildlife. The climate of South America is divided into three climate zones. Most of the territory is in the tropical climate belt. The southern lies in the temperate climate belt and the northern part of the subtropical climate belt (Bičík 2005).

In the Amazon basin, tropical climate is predominantly moist and warm. The amount of seasonal precipitation ranges between 3.000 mm per year. The rainfall is not evenly distributed. In the Amazon region, the equatorial climate prevails. The high temperatures and rainfall throughout the year, maximum precipitation in January to March.

Subtropical climate it dominates in the south of Brazil and is characterized by milder temperatures with an annual average of around 18 °C. Here, in the south, the differences between winter and summer are increasing. Temperature variation over the entire basin is relatively small with annual mean temperature varying between 24 °C and 26 °C. The Ecuadorian Amazon is rainy, humid and warm. The rain becomes more frequent in March and continues through July. August through early December is more of a “fluctuation season,”that is, the precipitation are variable. This fluctuation makes it hard to classify this time of year as part of the rainy or less-rainy season. In Peruvian Amazon is rainy, warm and humid. May to October tends to be the cooler, less precipitated season. Rain does not change in Bolivian Amazon from November to March is heavy rainfall and the season with lighter rainfall April to September. Together there are a whole approximately 250 days of rainfall per year (GIWA 2004).

The area is strongly affected by climatic factors such as "El Niño" and "La Niña" that significantly alter rainfall in the basin taking place in the Pacific Ocean. "El Niño" is characterized by higher than normal temperatures in the Equatorial Pacific resulting in droughts, while "La Niña" is characterized by lower than normal temperatures resulting in floods (FAO 2015).

2.2. Properties of vegetable oils

Fats are essential nutrients. They contain both saturated and unsaturated fatty acids and should account for 30-35 % of our total recommended daily intake of energy. Vegetable oils are components they contain fatty acids and vitamins (A, D, E and K). Vitamin A is formed in the body by oxidative cleavage of carotenoids. Most vegetable oils are good sources of vitamin E, which has the properties of an anti-oxidant inhibiting autoxidation of polyunsaturated fatty acid. They have also several important functions in food preparation and processing, such as tenderizing, adding flavour during cooking and fryng and providing structure in bakery product. The oils contain from the point of view of nutrition esters, glycerol and fatty acid (Stauffer 1996). There are several fatty acid but in the major edible vegetable oils only few fatty acid predominante, mainly palmitic, oleic and linoleic acid. A major nutritional function of edible oils and fats in the supply is a energy, 38kJ per g oil. About half the normal (70 g) daily oil and fat intake is converted into energy. The remainder provides fatty acid for incorporation into phospholipids, which are synthesized in the body and form the main compotents of cell membranes and other bi-layer lipid structures in animals and humans (Graille et al. 1999). Althought most of the fatty acid, except linoleic acid, can be synthesized in the body, phospolipids synthesis is much more efficient when these are readily available in the dietary oils and fats in a composition of 32 % saturated, 45 % mono-unsaturated and 23 % polyunsaturated. Linoleic acid is an essential fatty acid, because complete absence in the diet will eventually lead to various deficiency symtoms (e.g. retarted growth and skin lesions). In contrast to animal fats, vegetable oils contain very little cholesterol. Cholesterols plays a role in the proper functioning of cell membranes and many hormones and derived from it. The high intake of saturated fatty acids is detrimental to our health because excessive consumption of these acids increases blood cholesterol and thus contributes to vascular disease or obesity. We should avoid coconut oil containing up to 94% of saturated fatty acids.

Some oils may contain antinutritional or toxic substances (e.g. erucic acid, glucosinolates or alkaloid ricin). Certain factors can be eliminated or reduced by heat and other pretreatments of the seeds (Salunkhe et al. 1992).

2.3. Previous Ethnobotanical studies

South America is home to the largest number of ethnic groups. The largest groups of Indians today are Tikuna Indians (20.000), Yanomami in the northwest Amazon (11.000) Guarani in central and southern Brazil (30.000) and Kayapo. These groups are especially nourished by manioc cultivation and collection (eg. palm chonta and pupunha, healing plants). The official language is Portuguese, which has a slightly different phonetics from European Portuguese, and in some parts, it is enriched by Indian and African expressions (Watson 2017).

The Amazonian plants are blessed with several oil-rich species, especially amongst the palms. There are about 200 plant species here (Balick 1979). Perhaps the most important of these oil-rich palms is *Oenocarpus bataua* Mart. The pulp of this fruit contains a yellowish oil that can be used as a food or in the soap industry. Its stem is solitary, erect, 10–25 m, rachis 3-7 m and the blossom is 1-2 m long and they are yellow. The *Oenocarpus- Jessenica* complex of the palm is one which appears to have great potential for future cultivation as an oil source. Such exports were primarily to the United States and Europe, where this oil served as an olive oil or as a product in cosmetics. As another very important species is *Attalea speciosa* Mart. Production of the palm amounts over 250.000 tons of kernel per year. This palm is common in northeastern Brazil in the states of Maranh**ã**o, Goiás and Piauí. In 1980 was this palm established to domesticate and begin to lay the ground-work for conversion of the industry from the collection of a wild source to a plantation crop (Balick 1979). *A. speciosa* (babasu)is one of the most beautiful robust and majestic palm with large oblong to conical fruit of the Brazilian palms who have the second largest fruit (the first is *Cocos nucifera* L. species). In the state of Amazonas, the babasu is very common. However, the sparse population of the state presents a labor-shortage problem as far as collection of the wild fruits is concerned. The industry has been called the largest oilseed industry in the world entirely dependent on the collection of a wild plant (Markley 1944). Appendix 1. shows the rugged *Attalea* palm .

The next significant species are from the genus *Astrocaryum*, *Acrocomia, Annona* and others. It is necessary to mention that several species *Astrocaryum* occur across the Amazon Basin mainly in the region Maranh**ã**o and south of Pará. These are found on relatively dry sites which are not inundated by the annual flooding of the river. For example, the plant for this genus *Astrocaryum vulgare* Mart. is called as Common tucuma has yellowish-green fruit (Appendix 1) and consists of an oily, somewhat dense mesocarp. Each year in the north of Brazil is processed 5.000-10.000 t of the kernel. The oil must be extracted with solvents because they are very hard. The kernel oil is partially solid at ambient temperatures in tropical climates, but completely solid in temperate climates. This oil is very similar to African palm oil, Elaeis guineesis (Balick 1979). Natives have for centuries been utilizing the oil which chemically resembles olive oil. This area is also rich in medicinal plants but also hallucinogenic plants that are used in shamanism (Schultes & Evans 1980).

3. Objectives

The aim of this study is ethnobotanical analysis of oil bearing plant species documented in Amazon basin and their recent status of domestication. Also the thesis will review the current research directions and will highlight the promissing underutilized and neglected species for future research and practical applications.

4. Methodology

A qualitative systematic literature survey was performed using an electronic search of ISI Web of Knowledge and Scopus citation databases for journal articles published until December 2017, and a manual search of appropriate journals, books and monographs. Relevant Economic Botany journal articles focussed on oil-bearing plant species or reporting such species in frame of ethnobotanical inventories were used as a basis for this study. Subsequently, the following combination of keywords (ethnobot* OR ethnoecol* OR ethnobiol*) AND "Amazon*' and 'oil* AND plants AND Amazon*' were used to search articles in ISI Web of Knowledge and Scopus citation databases. Further searches were carried out using the names of individual plant species with the 'domestication' and 'nutritive value'. The study cover plants used for their content of fixed, non-volatile oils/fats, therefore this study does not include essential oil plants. The correct spelling of full plant scientific names and their synonyms were verified using Tropicos-botanical information system of the Missouri Botanical Garden (http://www.tropicos.org/) and crosschecked in The Plant List (http://www.theplantlist.org/). Only the botanical species synonyms used in the literature surveyed were included to show current changes regarding the accepted names of the investigated species.

5. Results

5.1. Oil-bearing plant species diversity

A total of 47 plants were observed which contain oil that is used. The most abundant were species belonging to the family Arecaceae (25) especially palm species Astrocaryum spp. (4). Followed by family Euphorbiaceae (3), Caryocaraceae (3), Chrysobalanaceae (2), Cucurbitaceae (2), Caesalpiniaceae (2), Annonaceae (2), Meliaceae (2), Lamiaceae (1), Simaroubaceae (1), Asclepiadaceae (1), Fabaceae (1), Lecythidaceae (1), Anacardiaceae (1) Asteraceae (1). From 90 % was oil in the kernel or seeds, 8 % was in the fruit and 1 % in leaves.

5.2. Status of domestication

Domestication of the plant is understood the adoption of wild species by a human. The domestication process is traditionally presented as initially unconscious and only later targeted selection of seeds from the most suitable plants, eg. having the advantageous properties (germination improvement, changes in plant architecture, limitation of seed loss, changes in flowering time, elimination of toxic substances or pigmentation of seeds). The semi-domesticated plants are the ones that grow in the wild. Some human custody and harvesting for this oil-bearing plant, but they do not grow.

According to the research of the scientific articles these plants collected in the wild: *Licania rigida* Benth, *Euterpe precatoria* Mart., *Acrocomia totai* Mart., *Astrocaryum murumuru* Mart., *Astrocaryum aculeatum* G. Mey., *Attalea speciosa* Mart., *Manicaria saccifera* Gaertn, *Oenocarpus distichus* Mart., *Syagrus coronata* (Mart.) Becc., *Attalea maripa* (Aubl.) Mart., *Fevillea cordifolia* L., *Attalea spectabilis* Mart., *Copaifera reticulata* Ducke, *Iriartea deltoidea* Ruiz & Pav, *Copaifera* , *Oenocarpus bataua* Mart., *Caryocar coriaceum* Wittm., *Attalea colenda* (O.F.Cook) Balslev & A.J.Hend, *Madia Sativa* Molina, *Copernicia cerifera* (Aruda)Mart., *Morrenia odorata* (Hook. & Arn) Lindl., *Caryodendron orinocense* H. Karst., *Anacardium giganteum* Hancock ex Engl., *Chrysobalanus icaco* L., *Astrocaryum standleyanum* L.H. Bailey, *Astrocaryum chambira* Burret, *Swietenia mahagoni* (L.) Jacq., *Attalea phalerata* Mart.ex Spreng, *Bertholletia excelsa* Bonpl. and *Oenocarpus bacaba* Mart. Of 24% are species of the family Arecaceae.others were status domesticated or semi-domesticated (Figure 2).

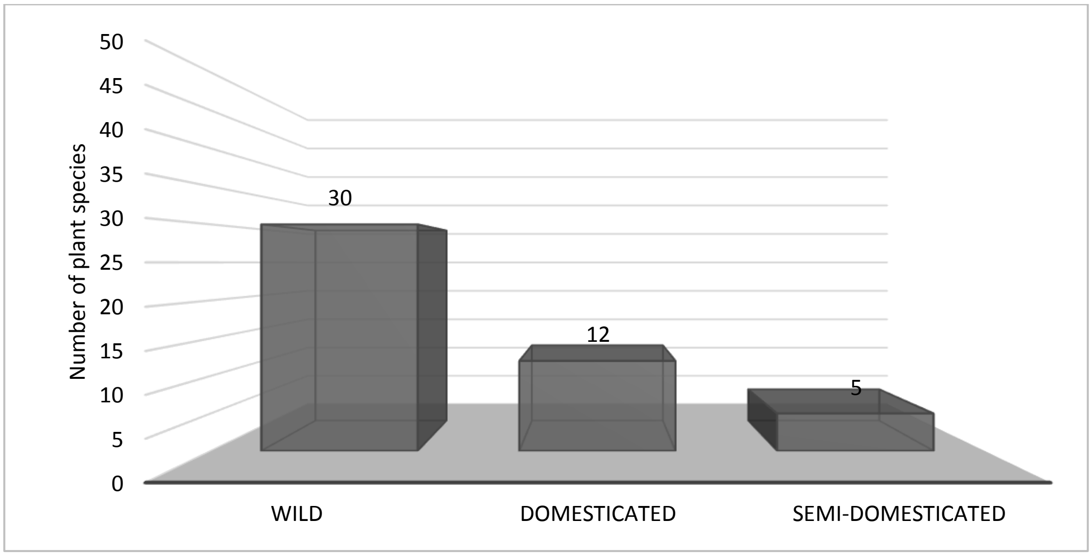

Figure 2. The status of domestication of the plants investigated

The following table 1 summarizes the results of the literature search. The table is given botanical name, family, vernacular name, growth habit, plant part used, geographical distribution, status of domestication, ethnic group, traditional food, oil content, fatty acid and micronutrients, non-food uses oil or fat and references.

Table 1. Oil bearing plants species of the Amazon basin

Botanical name	Botanical family	Vernacular name(s)*	Growth habit	Part used	DistributionΩ	Domestication status ♠	Ethnic group	Traditinonal food	Oil content (%)	Nutritive composition		Non-food uses	References ∞
Acrocomia aculeata (Jacq.) Lodd. ex Mart.	Arecaceae	Macaüba (ES), macaw palm(EN), coco de catarro(Brazil)	palm	endocarp, kernel	Southern Amazon	D		coyol wine	53-65 (kernel)		vitamin A	soap, biodiesel	[1]
Acrocomia totai Mart.	Arecaceae	Mbocaya, grou-grou (Brazil)	palm	mesocarp, kernel	Brazil	W		cooking oil	12—15 (mesocarp) 60.0 (kernel)	18 % oleic acid, 12 % lauric acid, linoleic acid 5.46%, linolenic acid 1.02%	Cu, Mn, Zn	soap, biodiesel	[1]
Anacardium giganteum Hancock ex Engl.	Anacardiaceae	Cauji(Brazil), oloi (Tiriyó Indians), cashew	tree	fruits	NE Brazil, Guyanas, Maranhão, Tumucumaque	W	Kurupukari, Tiriyó	cooking oil	50.0	7.6 %	vitamin A, C	varnish, treatment of coughs and dysentery	[2, 3]
Annona montana Macfad.	Annonaceae	araticum-acu(Brazil), mountain soursop(EN)	tree	mesocarp, fruit	Brazilian Cerrado and the Amazon Rainforest	SD	Amerindians	cooking oil	20-42	0.5 % linoleic acid	vitamin A, C		[4]
Annona muricata L.	Annonaceae	Durian blanda(EN), catuche(ES), curassaol(Brazil)	tree	mesocarp	Brazil	D	Amerindians		0.4	ascorbis acid (26 mg)	vitamin A, C	antispazmodikum	[5]

Table 2: Continued

Botanical name	Botanical family	Vernacular name(s)*	Growth habit	Part used	Distribution	Domestication status ♠	Ethnic group	Traditinonal food	Oil content (%)	Nutritive composition		Non-food uses	References ∞
Astrocaryum aculeatum G.Mey.	Arecaceae	Tucuma, Tucum, Chambira, (Brazil), star nut palm(EN)	palm	fruit, mesocarp	upper Amazon, Guyana, Mato Grosso in Brazil	W			75.0	36-40 %	vitamin A, quercetin	soap	[6]
Astrocaryum chambira Burret	Arecaceae	Chambira (Quichua), kumai (Achuar), kumai(Shuar), nyu kwa(Secoya), oneongkagi(Waorani)	palm	endosperm	Amazonian Ecuador (western parts of the Amazon basin)	W	Quichua, Achuar, Waorani, Shuar, Secoya		45-50	20-35 % oliec	vitamin A	the liquid endosperm is medicine the kidneys and liver	[7]
Astrocaryum murumuru Mart.	Arecaceae	Common murumuru (EN), Huicungo(ES), Huiririmi	palm	kernel	Brazil, Bolivia, Peru	W		butter(margarine)	30-50	lauric acid 40-50 %, myristic acid 28-33 %, palmitic acid 5-10 %, oleic acid 5-10 %, linoleic acid 1-5 %	vitamin A	cream, soap, shampoo, oils emulsions	[8]
Astrocaryum standleyanum L.H.Bailey	Arecaceae	Black palm(EN), Giiinul, Mocora(ES), Giierre(Urabá)	palm	mesocarp, endocarp	Colombia	W		cooking oil		palmitic, oleic acid		meal production for animals	[9]

Table 3: Continued

Botanical name	Botanical family	Vernacular name(s)*	Growth habit	Part used	Distribution Ω	Domestication status ♠	Ethnic group	Traditinonal food	Oil content (%)	Nutritive composition		Non-food uses	References ∞
Astrocaryum vulgare Mart.	Arecaceae	Common Tucuma (ES), Awarra (FR)	palm	mesocarp, kernel	Brazil, Maranhão	D		cooking oil, vinho de tucuma	47.50 (mesocarp), 32.50-43.50 (kernel)	44-53 % oleic, 30 % palmitic, 10 %linoleic	vitamin A	soap	[1]
Attalea colenda (O.F.Cook) Balslev & A.J.Hend	Arecaceae	Palma real(ES), chivila(SP)	palm	mesocarp	Ecuador	W		Manta oil	56.9	19.5 % lauric acid		soap	[10]
Attalea maripa (Aubl.) Mart. Synonym: *Maximiliana maripa*	Arecaceae	Inaja (Brazil), Naxáribo(Indians), aritaire (Ameridian)	palm	kernel, endosperm	NE and central Brazil	W	Guahibo Indians	oil drink, cooking oil	37.2	60-67 %	vitamin A		[1]
Attalea phalerata Mart. ex Spreng.	Arecaceae	motacu(ES), tumi (Tacana)	palm	endocarp, mesocarp	Brazil, Bolivia Amazon	W	Tacana		30-50	49-69.5 %		medicine	[11, 12]
Attalea spectabilis Mart.	Arecaceae	Curua palm(Brazil), Showy para palm(EN)	palm	kernel	Upper Amazon (Brazil-Pará)	W	Chocó	cooking oil, margarine	56-66	5.79 % oleic acid		soap, shaving cream, biofuel, lubricant	[13]
Attalea speciosa Mart. Synonym*: Orbignya speciosa* (Mart.) *Barb.Rodr*	Arecaceae	Babaqu, Babassu, Uauacu (ES)	palm	kernel, endocarp	Brazil (Maranhão)	W	Brazilian Indians, Apijané, Chocó	cooking oil, alcohol	63.5—65.5 (kernel)	1.98 % oleic, lauric acid 45 %	vitamin C	soap, cream, meal production, candles, cosmetic, medicine	[1, 5, 29]

Table 4: Continued

Botanical name	Botanical family	Vernacular name(s)*	Growth habit	Part used	Distribution Ω	Domestication status ♠	Ethnic group	Traditinonal food	Oil content (%)	Nutritive composition		Non-food uses	References ∞
Bactris gasipaes Kunth	Arecaceae	Pupunha (Brazil), peach palm(EN)	palm	fruit, mesocarp	NW Brazil, Venezuela, Ecuador, Bolivia	W	Sanema-Yanoama, Jivaros, uracarés	cooking oil	2.6-61.7	86.0 %	vitamin A, C	meal production for animals	[14, 15]
Bertholletia excelsa Bonpl.	Lecythidaceae	Brazil nuts (EN)	tree	endocarp (nuts)	Guianas, Brazil	W			36-45	75.0 %	vitamin B6, C, E	applied to burns	[16, 5]
Carapa guianensis Aubl.	Meliaceae	Andiroba (EN), requia (ES), Brazilian mahogany (EN)	tree	kernel	Amazon region	SD	Wayapi, Palikur, Créoles	margarine, carap and andiroba oil	22.0	9.0 % linoleic, 50.5 % oleic, 0.3 % linolenic	K, Mg, P	soap, shaving cream, antiifla-mmatory and antiarthriti c	[13]
Caryocar brasiliense A. St.-Hil.	Caryocaraceae	Pequi (Brazil), souari nut(EN)	tree	mesocarp, kernel	Brazil's central-west region (Cerrado)	D		vegetable oil	61.6	65.5 %	vitamin A, B1, B2, C	anti-inflammat ory effect, antioxi. properties, soap, cosmetic	[36]
Caryocar coriaceum Wittm.	Caryocaraceae	Souari trees (EN), Pequi(ES)	tree	epicarp, mesocarp	NE Brazil (Ceará and Pernambuco)	W		cooking oil	96.4	35.4 % pamlmitic, 60.6 % oleic, 1.80 % stearic	vitamin E, B	soaps, shampoos, lipsticks	[13]
Caryocar villosum (Aubl.) Pers..	Caryocaraceae	Piquia, ruamahi (Brazil)	tree	mesocarp, kernel	Maranhão in Brazil	SD	Chocó indians	butter, sago-drink	76.0	pamlmitic acid 33.50 %, Oleic acid 29.50 %	vitamin C		[17]

Table 5: Continued

Botanical name	Botanical family	Vernacular name(s)*	Growth habit	Part used	Distribution Ω	Domestication status ♠	Ethnic group	Traditinonal food	Oil content (%)	Nutritive composition		Non-food uses	References ∞
Caryodendron orinocense H.Karst.	Euphorbiaceceae	palo de nuez (Venezuela) Inchi (Colombia)	tree	kernel	Amazonia Ecuador, Colombia, Venezuela in the western Amazon basin	W		edible oil	30-35	linoleic acid 75.13-85 %	vitamin E	complaints and dermatitis, cosmetics	[18]
Cocos nucifera L.	Arecaceae	Coconut palm (EN) Palma de coco(ES)	palm	endocap kernel	Santos (State of Sa~o Paulo.)	SD	Chocó indians	cooking oil	70-75	40.0 % lauric acid	vitaminA C, E	soap, medicine, livestock feed	[13]
Colliguaya integerrima	Euphorbiaceceae	Coliguay, duraznillo (ES)	shrub	endocap		D			36.7	linoleic, 38.5 %; linolenic, 23.6 %; oleic, 18.7 %; palmitic, 10.6 %; eicosenoic, 6.3 %; stearic, 1.9 %, eicosadienoic, 0.4 %.		medicinal	[5]
Copaifera langsdorffii var. glabra (Vogel) Benth.	Caesalpinioideae	Copaifera (EN)	tree, shrub	kernel	E Brazilian Amazon	W						cosmetics, biodiesel	[19]
Copaifera reticulata Ducke	Caesalpinioideae	Cupayba (Indian)	tree	kernel	Bolivia, Brazil and Peru	W	Kaw, Tupi, Puinave, Makuna Yavizy	cough syrups	20-90			medicine (urinary tract, and skin diseases) anti-cancer, antirheumatic antiseptic, anti-bacteria	[20]

Table 6: Continued

Botanical name	Botanical family	Vernacular name(s)*	Growth habit	Part used	Distribution Ω	Domestication status ♠	Ethnic group	Traditinonal food	Oil content (%)	Nutritive composition		Non-food uses	References ∞
Copernicia cerifera (Arruda) Mart. Synonym*: Copernica prunifera* (Mill.) H.E.Moore	Arecaceae	Carnaúba(ES)	palm	leaves	NE Brazil	W				3-6 %		wax, cosmetic	[21]
Elaeis oleifera (Kunth) Cortés Synonym: *Elaeis melanococca* Mart.	Arecaceae	American Oil Palm (EN), Caiué, Dendé do pará(Brazil), Noli (Colombia)	palm	mesocarp, kernel	Colombia, Venezuela, Guyana to the central Amazon region	D		a butter substitute and cooking oil	46.96 mesocarp, 34.70 kernel	29.82 % oleic mesocarp, 0.55% oleic kernel	vitamin A	Soap	[1]
Euterpe precatoria Mart.	Arecaceae	Common Acaí o Amazonas (Brazil), yuyu chonta(Peru)	palm	mesocarp, fruit	Pará, Brazil, Colombia, Ecuador	W	Guahibo, Ese eja, Awajun	the palm heart is eaten raw or cooked, pahnito, fermented beverage	4.0	10.2 %	vitamin E		[13]
Fevillea cordifolia L.	Cucurbitaceae	Antidote Vine (EN)	vine	kernel	Amazonian Peru	W	Campa Indians	peanut oil-cooking oil	14.0	45 % lauric		eprosy and snakebite, medicine, candles	[22]
Glycine max (L.) Merr.	Fabaceae	Soybean (EN)	annual herb	endocarp	Brazil	D		soybean oils	18-20	33.6 % oleic, 51.8 % linoleic, 6.8 % palmitic, 4.4 % stearic, 2,3 %lin.		soap, meal production for animals, wax	[23]

Table 7: Continued

Botanical name	Botanical family	Vernacular name(s)*	Growth habit	Part used	Distribution Ω	Domestication status♠	Ethnic group	Traditinonal food	Oil content (%)	Nutritive composition		Non-food uses	References ∞
Guilielma speciosa Mart.	Arecaceae	Chontaduro (ES), Pupunha	palm	mesocarp	Pará, Amazonas	SD	Chocó	chicha or fermented drink from the mesocarp(beer)	85.0	36.8-43.7 % palmitic, 9.3-11.7 % palmitoleic, 42.7 % oleic, 1.3-15.0 % linoleic	vitamin A, C, Ca, P, Fe Carotenoids	soap	[17]
Chrysobalanus icaco L.	Chrysobalanaceae	Fat pork (EN), icaco (ES)	shrub tree	endocarp	Brazil	W	Kurupukari					medicine (diarrhoe,) candle	[24]
Iriartea deltoidea Ruiz & Pav. Synonym: *Iriartea gigantea* H.Wendl.	Arecaceae	Bombona(ES)	palm	endocarp	Western Amazonian basin	W		cooking as vegetable		12 % oleic			[13]
Lagenaria vulgaris Ser.	Cucurbitaceae	Calabash, bottle gourd (EN)	vine	endocarp	Colombia	D		horchata(drink)	50.0				[25]
Licania rigida Benth.	Chrysobalanaceae	Oiticica (ES)	tree	endocarp	NE Brazil	W		oiticica oil	60.0			lamp fuel, medicine, soap	[26]

Table 8: Continued

Botanical name	Botanical family	Vernacular name(s)*	Growth habit	Part used	Distribution Ω	Domestication status ♠	Ethnic group	Traditinonal food	Oil content (%)	Nutritive composition		Non-food uses	References ∞
Madia Sativa Molina	Asteraceae	Tarweed (EN)	annual herb	kernel		W		mazamorras(mash)	40.0			medicine (gout, sciatica, rheumatic) soap	[27]
Manicaria saccifera Gaertn.	Arecaceae	Guagara and Timiche(Colombia), Turury	palm	fruit	Amazon (Colombia, NW Brazil)	W	Warao Indians	drink sago	57.7 (fruit)				[1]
Mauritia flexuosa L.	Arecaceae	Miriti (Brazil), Aguaje (Peru)	palm	mesocarp, kernel	Pará, western Amazonia, Maranhão	D	Guahibo Indians	fermented drink(inojo)	4.68 (kernel)	18.9 % palmitic, 75.7 % oleic, 2.1 % linoleic, 1.3 % stearic	vitamin C	cosmetic	[1]
Morrenia odorata (Hook. & Arn.) Lindl.	Asclepiadaceae	Latexplant, strangler vine(EN), Doca, tasi(ES)	liana	endocarp	Brazil (Gran Chaco)	W					vitamin C	galactagogue (medicin)	[28]

Table 9: Continued

Botanical name	Botanical family	Vernacular name(s)*	Growth habit	Part used	Distribution Ω	Domestication status ♠	Ethnic group	Traditinonal food	Oil content (%)	Nutritive composition		Non-food uses	References ∞
Oenocarpus bataua Mart. Synonym*: Jessenia bataua*	Arecaceae	Macuri (Tacana), Majo(ES), Koanani(Yanomama), Komaíhe(Witoto), patauá, Bacaba açu, bacaba-de-leque (Brazil)	palm	mesocarp, kernel	Western and central Amazon valley, Peru	W, SD	Chocó, Bora(Peru)	salad oil, drink taken for snakebite drink- useful addition to the diet of the region, cooking oil	25-30 (kernel)	13.2-2.1 % palmitic, 0.6-0.2 % palmitoleic, 3.6 % stearic, 77.7 % oleic, 2.7 % linoleic, 0.6 % linolenic	vitamin A, C, D	anaesthetics, hair loss, meal production for animals(pulp), wax, medicine tuberculosis	[1, 5, 12]
Oenocarpus bataua Mart. Synonym*: Jessenia polycarpa*	Arecaceae	Patawa, Sehe (ES)	palm					yucuta-drink	75.0	palmitic acid 11-20 %, oleic acid 70 %	vit. E	soap and comestics industries	[17]
Oenocarpus distichus Mart.	Arecaceae	Bacaba açu, Bacaba-de-leque, Yandy, Bacaba de oleo(Brazil)	palm	mesocarp, kernel, fruit	NW Amazon (Pará, Maranhão)	W		resembles olive oil, bacaba wine	17-25 (kernel), 10 (fruit)	1.6 %palmitic, 1.6 % palmitoleic, 2.5 %sterir, 36.8 % oleic, 27.7 % linoleic, 1.6 % linolenic	vitamin E		[1, 5]

Table 10: Continued

Botanical name	Botanical family	Vernacular name(s)*	Growth habit	Part used	Distribution	Domestication status ♠	Ethnic group	Traditinonal food	Oil content (%)	Nutritive composition		Non-food uses	References ∞
Ricinus communis L.	Euphorbiaceceae	Castor bean, castor oil plants(EN)	tree	pericarp	Brazil	D		raw oil	40-60			lacquers, waxes, candles, crayons, cosmetic	[30]
Salvia hispanica L.	Lamiaceae	Chia(EN)	annual herb	endocarp		D		Torquemada (drink)	25-30	55.0 %	Ca, Fe, Mg, P, Zn	cosmetics, varnishes, paints	[31]
Simarouba glauca	Simaroubaceae	Aceituno(ES) paradise-tree(EN)	tree	kernel, endocarp		D			75.0	55-65 %		soap, detergents, lubricants, varnishes, cosmetics, pharmaceutical	[32]
Swietenia mahagoni (L.) Jacq.	Meliaceae	Mahogan (EN)	tree	kernel	Peruvian Amazon	W			60-70		N, P, K, Ca, Mg, Al, Mn, vitamin P	medicine (anticancer, antiflammatory, antidiabetic)	[33]
Syagrus coronata (Mart.) Becc.	Arecaceae	Licuri, Ouricury, Nicuri a Ururucri (ES)	palm	kernel, endocarp	Brazil	W			50-70	70.28 %, oleic,0.85 % lauric, 17.65 % palmitic, 3.15 % stearic, 2.44 % palmitoleic	Cu, Mn, ZN	wax, soap	[34]

* ES = Spanish language, EN = English language, **Ω** NE = Northeastern, NW = Northwest, E = eastern, ♠ D = domesticated, W = wild, SD = semidomesticated

∞ [1] Balick, MJ. 1979. Economic Botany. **33**(4): 361-376; [2] Johnston, M. a A. Colquhoun, 1996. Economic Botany. **50**: 182; [3] Morton JF, Venning FD. 1970. Economic Botany **26**: 245-254; [4] Egydio, A.P.M. & Santos.2011. D.Y.A.C. Economic Botany **65**(3): 329; [5] Clement CR. 1989. A Center of Crop Genetic Diversity in Western Amazonia. BioScience **9**: 624-631; [6] Vossen. 2002. Vegetable oil and fats. Prosea **14**; [7] Jensen, O.H. & Balslev, H.1995. Econ Botany **49** (3): 309; [8] Pesce C. Oil palm and other oil seeds of the Amazon; [9] Pedersen, H.B.1994. Econ Bot.**48**: 310; [10] Blicher-Mathiesen, U. & H.Balslev. 1990. Economic Botany **44**: 360; [11] Mónica, M.R., Borchsenius, F. & B.-

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5.3. Multifunctional species

In abundant quantities, oil was used not only as a food but also in industry, medicine, animal feed, during treatment of snake bite, biofuel candle making. I have found that among the widespread crops bolong: *A. aculeata* , *A. totai*, *A. murumuru*, *A. standleyanum*, *A. vulgare*, *A. spectabilis*, *B. gasipaes*, *C. guianensis*, *C. brasiliense*, *C. coriaceum*, *C. orinocense*, *C. nucifera* , *C. reticulata*, *E. oleifera* , *G. max*, *G. speciosa*, *M. flexuosa*, *O. bacaba*, *O. bataua*, *A. speciosa*, *M. Sativa*, *F. cordifolia* , *R. communis* and *L. rigida* specific uses are shown in Tables 1.

In Figure 3 we can see which uses oil utilization was the most represented of the crops mentioned.

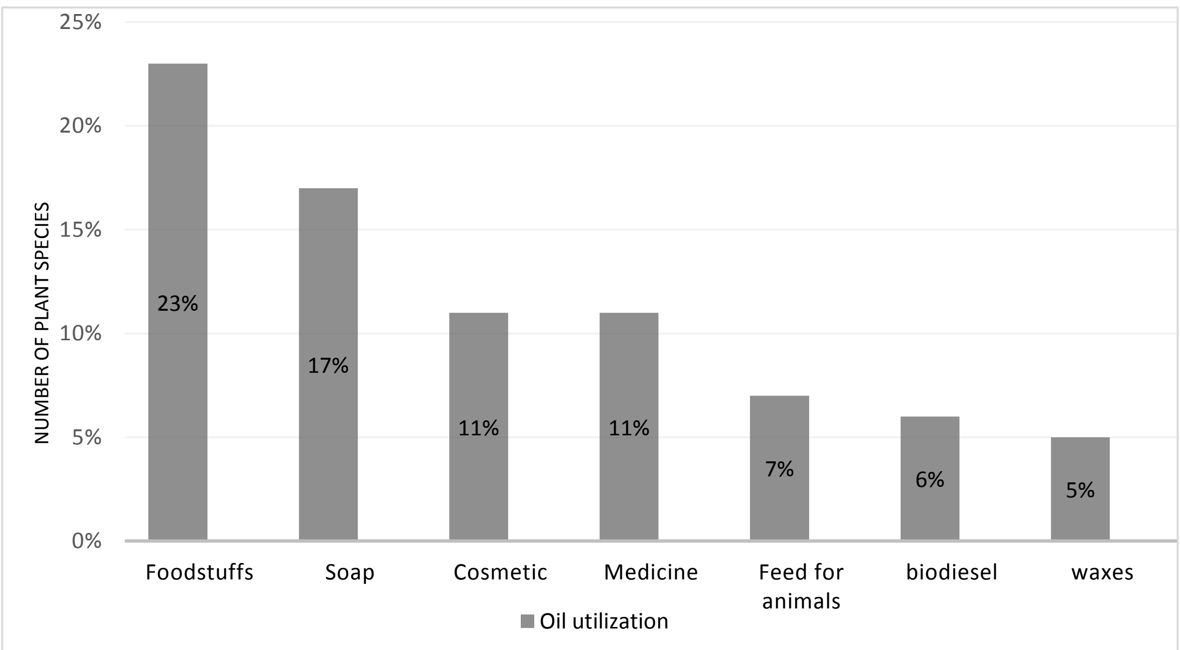

Figure 3. Spectrum of oil use

6. Discussion

6.1. Underutilized plant species

The least oily contained the plant *A. muricata* (0.4 %) and *E. precatoria* (4 % from dry fruit). *A. muricata* comes from northern and central America. This species is toxic because contains annonacin in the seed. This neurotoxin is known to cause degenerative brain disease (Burkill 1966). This domesticated tree is used as antispazmodikum but unfortunately no closer use of this plant is known. According to Davis et al. (2002) the oil of this plant is useful in the painting industry. However, new studies have shown that it is suitable for treating digestive and hepatic disorders (Heredia-Diaz et al. 2018). This fact confirmed dos Santos (2011) and finds that they are also considered as potential sources for biodiesel production and *A. montana* reveal high amounts of oleic and linoleic acids in their seed oils, important fatty acids for food and cosmetic industries.

Distribution *E. precatoria* includes the entire Amazon Basin and can be found in large numbers in the wild. Guhaibo Indians dried palm heart and consumed either raw or cooked, but also produce a fermented beverage. However, these species are underutilized, and standard information related to nutritional properties is rare (Pinto et al. 2005). But according to Bussmann and Zambrana (2012) found that her oil was treating diarrhoea and can provide up 42 % of the diet. It is grown in large plantations but older residents only use it as a building material.

Patafio (1963) spoke about *B. gasipaes* as of the plant domesticated Amerindians at the time neotropics. The oil exploration has been under way in the 1950 but unfortunately was not recognized until the 1970 s, the research was again revived at the University of Costa Rica (Urpi & Clement 1987). In fruit mesocarp is content 23 % oil. It used for starch production rather than oil production because it is less demanding. Traditionally, pejibaye has not been considered as an oil crop, both because the research was initiated where the plant yielded little oil and because the high places the fruit commanded precluded its use for oil since 1977, however, INPA's staff have searched for high oil levels. Clement et al. (2014) compares oil versus starch and finds that if the palm grows wild in nature, it contains more oil, but if it is domesticated, it contains more starch.The 61.7 % dry-weight oil level reported by Arkcoll and Aguiar (1984) makes pejibaye promising for oil production, and it may turn out to be a better economic option than most other American oil palms, such as *O. bataua* and *Astrocaryum* spp. The raw fruit contains oxalate crystals-alkaloid “pupunharine” and must be cooked before use. According to new research, at least 30 minutes. The importance of these and a report of an alkaloid are as yet unknown. Carneiro et al. (2017) conducted research from tucuma oil and found that this oil behaves like an antigenic substance that produces positive substances as a protector of cell DNA damage.

F. cordifolia is another less exploited crop from the family Cucurbitaceae in Amazonian Peru. This liana is rich in oil but its content is notknown. We found that Campa Indians they have used its oil produce candles for hundreds of years but the species was not identified and the report seems to have been generally overlooked according to Lindley and Moore (1870). This information has been confirmed by research into stearic acid that is present in the seed. Of course, the relatively high concentration of high molecular weight fatty acids in that species might be expected to correlate with purgative properties and reduced value as an edible oil.

6.2. Usage and processing of certain species

According to records Sousa et al. (2013) we found most of the oil is contained in the plant *C. coriaceum* this species is very important for the local population. The biological and nutritional properties of pequi oil are dependent on its composition, which can change according to the oil source (pulp or kernel). This tree grows wild in northeastern Brazil and its oil is most represented in mesocarp (96.4 %). It is mainly used in the kitchen and it is consumed as traditional dish pequizada (Oliveira et al. 2008) but also for making soaps, shampoos and lipsticks (5.3 % production of cosmetic). According to Faria-Machado et al. (2015) contains from 30-66 % oil of pulp but mainly 60 % of oil acid, is interesting for food, oleochemical uses and cosmetic and 35 % palmitic acid which makes it suitable for margarine and the *Caryocar* is rich on natural antioxidant (Guedes et al. 2017). Both fatty acids can affect physical stability of the oil in tropical regions. As far as domestication Tucker et al.

(1988) it speaks of the plant as wild but according to new result it was found that is *C. coriaceum* is in the early stage of the domestication proces (Sousa et al. 2018).

The second is the most represented was palm *G. speciosa* the extract from mesocarp is up to 85 % oily. Unfortunately, this useful palm tree is cultivated only to a limited extent even though the demand for fruit is too great. The ethnics from the Pará region of Amazon collect these fruits and then process them for a fermented beverage they call “chicha”. This beverage mimics beer and contains vitamin A and C but also is rich in calcium, phosphorus and iron (Pesce 1985). Prado et al. (2010) talk about oil pupunha as a rare oil rich in carotenoids but from an economic point of view, oil is sold at a ridiculous price, so it can not compete with the oils that are press in the process. It could be improved if it were invested in cultivation and biotechnology.

The next is also a substantial species is *A. speciosa* which grows wild mainly Maranhão in Brazil. In the kernel is 63.5-65.5 %. A significant amount of kernel is used as a subsistence food in these very poor regions. The oil is processed industrially to produce soap or used as an edible oil. A small amount is occasionally exported when world prices for lauric are high, but usually, the internal Brazilian price is supported by restricting Laurie oil imports, to protect collectors. Yield from wild groves is only 1.5-2.5 tons. Numerous attempts have been made to produce alcohol (Hartley 1977). According to recent findings, oil could be used to treat malignant prostate hypertrophy, primarily as a postoperative treatment, where it acts less aggressively and alternatively than synthetic drugs. It has been shown to treat leukaemia and oil can also be added to a drug that treats, for example, cancer. These effects are manifested above all by their antioxidant activity (Sousa et al. 2015).

As was mentioned in research Arkcoll (1988) is important *A. aculeatum* their oil is containing in mesocarp and fruit in an amount 75 % and 30-50 % lauric oil. It is rich in vitamin A. Unfortunately, there is no mention of use as edible oil or traditional food, only the production of soap is mentioned. Sousa et al. (2015) investigated the effects of oil on the toxicity of pest control and found it to have a consistency where it can kill pests that are undesirable in product storage suggesting that this protection should be introduced in integrated programs.

C. nucifera is very well known palm containing in the kernel 70-75 % oil. Economically speaking, is the most important member of the palm family and ranks among one of the world's principal sources of food or for both the natives of the tropics and people of the heavily populated temperate regions. Coconut oil tends to cool in the cold and melt again when heated or at room temperature, therefore, it has a lot of uses for example as floating candles, fuel oil in lamps, in cosmetics or in food. According to Moore (1948), this palm is the most economically represented. It has a range of animal oil and the demand for it is great. It also supports the trade war between the tropical and mild regions. This oil is not nutritionally slim because it contains saturated fatty acids which, in larger quantities, contribute to increasing the cholesterol level and this increases the risk of heart disease. This fact is underpinned by chromatographic analysis, when it really feels that it is rich in saturated fatty acids, which does not contribute too much to our body and therefore it is good to use it in cosmetics rather than in the nutritional aspect (Martini 2018).

The most famous palm is *O. bataua* of the family Arecaceae which grows abundantly in the western and central Amazon in flooded areas. Balick et al. (1981) contends in his research that Guahibo Indians used this oil include a remedy for tuberculosis, cough, asthma and other respiratory problems or as cooking, edible oil and hair tonic. He describes his processing. First the fruits rest for a day to encourage ripening. The next day, the fruits are cooked, and the hot pulp is placed in a basket known for "sebucdn". The oil is pressed under heavy pressure. Unlike Pesce et al. (1985) describing Chocó and Bora Indians which used this plant as vegetable oil, salad oil or drink taken for snakebite. Is different processing which is rather easy at first the fruit is left to soak for about an hour in a little hot water to loosen the pulp (mesocarp and exocarp) enough for it to separate easily when pounded and scraped across a sieve. Water is added, and the creamy brown emulsion drunk after filtering or decanting off and mixing with sugar and sometimes cassava flour. An important palm is its related *O. bataua* which is depicted in table 1. In this species, domestication is necessary because local residents are collecting this plant excessively in the wild (Balick 1979). Both scientists agreed that oil is like olive oil. Cerda et al. (2001) they watched the Amazon Indians focusing on worms. The Indians collected worms from a damaged or felled palm and consumed as whey or served roasted. Thanks to the wild tree, substances found to be beneficial to the human body were found in the worm, mainly vitamins A, E, minerals and a major source of protein. In addition, it serves as a source of monetary income for the Indians.

Processing was different for diferent species. At the palm are 4 steps required to obtain palm oil. The first is sterilization, the second maceration, the third extraction and clarification. This process, however, is only used in industrial processing where the seeds are press. According to Balick (1979) research local natives processed the kernels manual or with a branch into a tub or canoe, adding water and skimming off the oil as it rose to the top. Our finding in line with Balick (1979) the natives extracted oil in the past. They bake the kernels in the oven and pounding them in hollow logs. The resulting mash is boiled in pots with water, and the oil is collected as it rises to the top. The rest is fed to the animals. This method is using up to the present.

For the andiroba (*Carapa guianensis*) seeds was until 1913, in fact, the industrial processing of vegetable oils in Pará was limited to extracting oil from using a simple procedure learned from the native peoples. We agreed with Pesce (1941) that the best quality oils are extracted by modern industrial techniques than the seeds processed by the natives because the oil extract is 100 percent.

6.3. Antinutritional properities

I found that species *L. vulgaris* also from the family Cucurbitaceae has one of the longest and most interesting stories of domestication, the oldest findings of cultural forms from the Asia and America Contests are about 10.000 years old; it appears to have been domesticated twice, first in Asia and later, 4.000 years ago, in Africa. It is demonstrated that the Paleoliths brought cultural Lagenaria to America (Vobořil 2012). Calabash seed contains 45 % oil. Local people prepare a beverage named “horchata”. However, the plant and its parts are poisonous, in humans there is poisoning when ingestion of more fruit juice, the cattle die after ingestion of several kilograms of the green matter. This phenomenon causes cucurbitacin which it is toxic at high concentration (Jack et al. 1971).

A wildtree *C. orinocense* found in Amazonian Ecuador, Colombia and Venezuela is rich in oil (30-35 %) of the kernel and contain Vitamin E in the form of tocopherol the excess of which is relatively non-toxic. Is used only at complaints dermatitis and in cosmetics other uses have not yet been known but the production is relatively high between 20 and 300 kg per individual per year (Feil 1997). According to Guerrini et al. (2014) could be used as an oil supplement because contain an antioxidant.

Great attention should be paid to *R. communis* as know as castor bean or castor oil which grows wild primarily in Brazil. Its seeds contain a lot of oil (40-60 %) but also contain dangerous toxic alkaloid ricin and allergenic protein. Ricin is extracted from castor beans, which are processed through out the world. The toxin is part of the waste "mash" produced when castor oil is made. It can cause harm if inhaled. A tiny quantity can be lethal, but the amount needed to kill depends on the route of administration. A combination of pulmonary, liver, renal and immunological failure can lead to death, though people can recover from exposure (Jones 1957). Security experts say ricin-roughly 1.000 times more toxic than cyanide-could be used in a bio-terror attack. Genetics try to genetically modify cinnamon to prevent the synthesis of ricin and thus die to the farmer when harvesting and processing the plant for oil. New researches have been carried out to remove toxic ricin, and it has been found that if we want to silence genes encoding ricin in the endosperm, we must genetically modify this plant to provide farmers and industrial workers with protection from toxic poisoning (Sousa et al. 2017).

The last toxic from examined species is *C. integerrima*. That shrub contains 36.7 % oil. The genus has been reported as cyanogenic. The species is a toxic only to sheep, cattle and horses (Ravetta et al. 1991).

Furthermore, the neurotoxin mentioned in *A. muricata* have already been mentioned in the previous chapter.

7. Conclusion

The main objectives of this study were to document the domestication of oil plants and the non-use of certain species that were mentioned to contain oil and occurring in the Amazon region. Among other things, I have dealt with the use of oils and the toxicity of certain species which we need to pay special attention to. I have found that some plants are multifunctional, and their oil can be used in many directions, for example as edible oil but also as a supplement in cosmetics or in pharmacies. According to the results, the area rich in the diversity of oil plants and the use of ethnicity still needs more research and study to allow some species to be used as an edible oil to mitigate nutritional problems in developing countries.

I found that the *C. coriaceum* species is most oily but that it has not been domesticated to date, so it grows only wild in nature. Of course, according to new studies, was found that it is at an early stage of the domestication process and this species could have a great effect on its economic potential. *E. precatoria* grew most in the wild, but it is also grown in large plantations and it was found that can provide up to 42% of the diet, but residents, unfortunately, use it only in the construction industry because they are not informed about the use of oil. Therefore, I would suggest that the plant be more spoken and that further studies on edible oil have been carried out. I would think about the domestication of *Bactris gasipaes* because it was found that if domesticated its fruits would contain more starch than oil versus wild but if this could prove to be a good economic choice than most American oils. These plants together with *A. muricata* and *F. cordifolia* would recommend further research on the use of oils. In the case of *R. communis*, it was found that if the genetically modified one did not have to die the farmer in the harvest and the processing. If this happens the problem could always be eliminated, and the farmers could be grateful.

I finally found out that most oils are used to treat or prevent serious illnesses such as cancer or dermatitis and tuberculosis but also that they act anti-inflammatory.

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Appendix 1.

Figure 1. *Attalea speciosa* palm (author Zbyněk Polesný)

Figure 2. *Astrocaryum* sp. fruits (author Zbyněk Polesný)