SURVEY OF PLANTS CONTAINING ESSENTIAL OILS IN THE PERUVIAN AMAZON SURROUNDING LOS AMIGOS RESEARCH STATION

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INTRODUCTION

Historically, research has been conducted in almost all of the rainforests of the world. Much of this research has focused on identifying plant and animal species and characterizing the many ecosystems that exist in these isolated forest regions (Gentry 1988). Little work has been done on the chemical diversity of rainforests. Research in this area has focused on medicinal extracts or bioactive compounds that can be isolated from various species of plants. These compounds, many of them aromatic in nature, are collectively termed essential oils. Essential oils, however, should not be limited economically by their bioactive capabilities. Economically and socially essential oils represent a unique opportunity for the local peoples living in close proximity to the rainforests. Many of these plants could be sold to varying industries as well as local markets; a good example of this is the abundant use of the trees in the Lecythidaceae (Brazil nut) family. Revenue generated from these sales would have an immediate impact on the quality of many aspects of local community life. It could provide much needed money for education and building supplies. The question remains, however, are there enough plants in the rainforests with essential oils to support this kind of local industry. Using crude screening methods, the objectives of this study are to begin to quantify and identify the many species of plants containing essential oils in the low-land forests of the district of Madre de Dios, specifically those areas surrounding the Los Amigos Research Center.

METHODS

Plants were collected along the trails surrounding the Los Amigos Research Center. based on their aromatic nature. Due to the isolation of the research station crude methods were used to discriminate between plants containing essential oils and those that do not. Leaves from suspected families were harvested and macerated by hand, then placed near the nose to determine if they had an odor. Secondly, the bark and or stems of the suspected families were cut and examined in a similar manner as described above for aromatic qualities. Those species exhibiting aromatic qualities were harvested and brought back to the research station where they were identified, all to family, many to genus and a few to the species level (Table 1). After identification the specimens were pressed and dried using the standard technique and the

resources available at the station. Identification was aided by Gentry's "A Field Guide to Woody Plants of Northwest South America" (Gentry 1993) and the help of John Janovec, Pierre Maceda, and Euridice Honorio. On one occasion Amelia, a local medicine woman, accompanied me and directed the collection of specific specimens thought to have medicinal qualities by the indigenous peoples.

RESULTS

All specimens were collected between January 11, 2003 and the 14, 2003. Table 1 quantifies all specimens collected around Los Amigos Research Center, listing them by date collected and identifying them to the best of my ability. Specimens in Table 2 were collected under the direction of a local medicine woman, who identified them as having medicinal uses. The plants general uses are described in the observations portion of the table for each of these specimens.

DISCUSSION

A total of twenty-three plant families and two fern species were identified in this survey. Annonaceae, Monimiaceae, Lauraceae, and Piperaceae families represent the largest number of species collected. This comes as little surprise as odor is a known characteristic of the above mentioned families (Gentry 1993). The specimens that were noted to have a slight odor are not considered to have a characteristic odor. The slight odor detected could be due to liver warts on the leaves. Better testing methods should be used to determine if this is in fact what is happening. A few species recorded in the data contained sap or latex and did not emit an odor. These species were included because sap and latex can contain terpenes and other chemicals that have been known to exhibit bioactive characteristics. In addition it has been documented that latex from certain species has been used by indigenous peoples for many things.

CONCLUSION

Conclusive evidence about plants with essential oils cannot be gained from a general survey that utilized crude testing techniques. However, a survey such as the one outlined in this experiment does proved preliminary evidence that many of the plants in the rainforest can be utilized for their aromatic qualities. The nature of these aromatic qualities can provide a vast amount of information as well as a wealth of opportunities for the local communities. The compounds themselves can serve to help scientists better understand the taxonomic and evolutionary relationships between the many plant families and genera. Furthermore, the building blocks of these chemicals must come

from the external environment, thus some of these plants could serve as indicator species. Such species could possibly provide information about the general health of a give rainforest community as well as the level of succession in the area. Better understanding the production of these chemical compounds along with their benefit to the plant that produces them could help expand our knowledge of plant-animal, plant-insect, and plant-environment interactions.

For the local communities of the rainforest the essential oils from plants could provide unique economic opportunities. Essential oils are utilized by perfume companies and fragrance manufacturers. Similarly, plants have often been used medicinally and the rainforest represents a virtually untapped resource for all of these industries. The cultivation or harvesting of plants containing essential oils
could become viable income for many communities surrounding the rainforest areas. As well as selling the plants to these companies, simple crude extracts from these plants could be sold to tourists or local markets for their aromatic and or therapeutic properties. The harvest and cultivation would provide many local peoples with jobs and a source of income. Money gathered from the sale or harvesting of these plants can also be used to directly benefit the local communities. It can be directed toward schools, housing and general transportation.

Initial studies have provided evidence that there are numerous species of plants containing essential oils in the forests around Los Amigos Research Center. The next logical step in this investigation would be to involve the local governments and local communities to begin working on cooperative relationships with Peruvian and International prospecting companies. Such companies could provide the capital and resources necessary to begin taking advantage of the essential oils in the local forests. Better screening equipment and techniques are needed to provide a more conclusive list of plants containing essential oils and to begin characterizing the chemicals found in the essential oils. Most important is the development of laboratory space close to the forests in order that the samples can be analyzed rapidly after collection. Essential oils represent a virtually endless resource for the local peoples of Madre de Dios and other areas surrounding tropical forests. Research in this area should not be overlooked; instead it should be embraced by both the local peoples and government (Figure 1).

Aguajales of the Los Amigos Watershed are areas of the low forest that are dominated by one species of palm, *Mauritia flexuosa*. These areas are used by the local peoples for the edible fruit form the palm species. To harvest the fruits they are cutting down the female palms, which will eventually lead to the local extinction of this palm species. Work is currently being done to

identify other species in this area that could be used by the local peoples. These species represent sustainable non-timber resources. Preliminary studies have identified plant species with essential oils that could be utilized in this manner. The species, which are common in the aguajals of the Madre de Dios River, contain representatives from the families Chloranthaceae (*Hedyosmum* sp) , Monimiaceae (*Siparuna* sp) and Orchidiaceae families (*Vanilla* sp). These aguajals also represent an untapped resource for the local peoples of the areas surrounding the low land forests of the Los Amigos Watershed and should also be given careful consideration when evaluating the potential economical value of the forests resources.

Table 1: Plants containing essential oils collected from forest surrounding Los Amigos Research Center

Number	Family	Genus	Species	Location	Observations/ Notes	Date
1	Lauraceae	*Indet.*	*sp. 1*	Plataforma	odor	1/11/2003
2	Monimiaceae	*Siparuna*	*sp. 1*	Plataforma	odor	1/11/2003
3	Annonaceae	*Indet.*	*?*	Plataforma	odor	1/11/2003
4	Annonaceae	*Duguetia*	*?*	Plataforma	odor	1/11/2003
5	Myristicaceae	*Iryanthera*	*laevis*	Plataforma	odor	1/11/2003
6	Lauraceae	*Ocotea*	*sp. 2*	Plataforma	odor	1/11/2003
7	Lauraceae	*Ocotea*	*sp. 4*	Plataforma	odor	1/11/2003
8	Myristicaceae	*Iryanthera*	*jaruensis*	Plataforma	odor	1/11/2003
9	Melastomataceae	*Mouriri*	*?*	Plataforma	odor	1/11/2003
10	Lauraceae	*Ocotea*	*sp. 3*	Plataforma	odor	1/11/2003
11	Moraceae	*Naucleopsis*	*sp. 1*	Plataforma	odor	1/11/2003
12	Myristicaceae	*Virola*	*sebifera*	Plataforma	odor; collected bark	1/11/2003
13	Burseraceae	*Protium*	*sp. 1*	Plataforma	odor	1/11/2003
14	Lauraceae	*Ocotea*	*sp. 3*	Plataforma	odor	1/11/2003
15	Burseraceae	*Protium*	*sp. 2*	Plataforma	highly aromatic	1/11/2003
16	Annonaceae	*Guatteria*	*sp. 1*	Plataforma	odor	1/11/2003
17	Annonaceae	*Guatteria*	*sp. 2*	Plataforma	odor	1/11/2003
18	Annonaceae	*Xylpoia*	*sp. 1*	Plataforma	odor	1/11/2003
19	Sapotaceae	*Poutenia*	*sp. 1*	Plataforma	latex	1/11/2003
20	Mytaceae	*Eugenia*	*?*	Plataforma	odor	1/11/2003
21	Annonaceae	*Anona*	*?*	Plataforma	odor	1/11/2003
22	Moraceae	*Naucleopsis*	*sp. 2*	Plataforma	odor	1/11/2003
23	Monimiaceae	*Siparuna*	*decipiens*	Plataforma	odor	1/11/2003
24	Piperaceae	*Peperomia*	*sp. 1*	Plataforma	odor	1/11/2003
25	Annonaceae	*Xylpoia*	*sp. 2*	Plataforma	odor	1/11/2003
26	Gesneriaceae	*Besleria*	*?*	Plataforma	slight odor	1/11/2003
27	Monimiaceae	*Indet.*	*?*	Plataforma	odor	1/11/2003
28	Euphorbiaceae	*Alchornea*	*?*	Plataforma	sap	1/11/2003
29	Annonaceae	*Rollinea*	*sp. 2*	Plataforma	odor	1/11/2003
30	Zingiberaceae	*Renealmia*	*ceruna*	Plataforma	leaves have spicy aroma	1/11/2003
31	Monimiaceae	*Siparuna*	*sp. 2*	Plataforma	odor	1/11/2003
32	Burseraceae	*Protium*	*sp. 1*	Plataforma	odor	1/11/2003
33	Euphorbiaceae	*Indet.*	*?*	Plataforma	sap	1/11/2003
34	Monimiaceae	*Siparuna*	*sp. 2*	Plataforma	odor	1/11/2003
35	Annonaceae	*Rollinea*	*mucosa*	Plataforma	odor	1/11/2003
36	Piperaceae	*Piper*	*sp. 1*	Plataforma	odor	1/11/2003
37	Marantaceae	*Ischnosiphon*	*sp. 1*	Colpa Renan	odor	1/14/2003
38	Melastomataceae	*Miconia*	*?*	Colpa Renan	slight odor	1/14/2003
39	Monimiaceae	*Mollinedia*	*?*	Colpa Renan	odor	1/14/2003
40	Solanaceae	*Indet.*	*?*	Colpa Renan	foul odor	1/14/2003
41	Rubiaceae	*Psychotra*	*?*	Colpa Renan	slight odor	1/14/2003
42	Bignoniaceae	*Indet.*	*?*	Colpa Renan	latex	1/14/2003
43	Caryocaraceae	*Anthodiscos*	*?*	Colpa Renan	odor	1/14/2003
44	Marantaceae	*Ischnosiphon*	*sp. 2*	Colpa Renan	odor	1/14/2003
45	Piperaceae	*Peperomia*	*sp. 2*	Colpa Renan	odor	1/14/2003
46	Bignoniaceae	*Indet.*	*?*	Colpa Renan	sap	1/14/2003

Number	Family	Genus	Species	Location	Observations/ Notes	Date
1	Piperaceae	*Piper*	*sp. 2*	Carretera	for cold, headache, and flu	1/12/2003
2	Costaceae	*Costus*	*?*	Carretera	for fever (drink or shower)	1/12/2003
3	Pteridophyta?	*Indet.*	*sp. 1*	Carretera	for kidney stones	1/12/2003
4	Malvaceae	*Sida*	*?*	Carretera	Uterine heal	1/12/2003
5	Acanthaceae	*Justicia*	*?*	Carretera	Purging the stomach and intestine	1/12/2003
6	Pteridophyta?	*Indet.*	*sp. 2*	Quebrada	for kidneys	1/12/2003
7	Vitaceae	*Indet.*	*?*	Quebrada	Water for anxiety and stress	1/12/2003
8	Urticaceae	*Urera*	*baccifera*	Quebrada	for dysentery and hemmorage	1/12/2003

Table 2: Plants collected at the Los Amigos Research Center

Family	Genus	Species	Total
Annonaceae	Anona	?	1
	Duguetia	?	1
	Guatteria	sp. 1	1
		sp. 2	1
	Rollinea	mucosa	1
		sp. 2	1
	Xylpoia	sp. 1	1
		sp. 2	1
	Indet.	?	1
Annonaceae Total			9
Burseraceae	Protium	sp. 1	2
		sp. 2	1
Burseraceae Total			3
Euphorbiaceae	Alchornea	?	1
	Indet.	?	1
Euphorbiaceae Total			2
Gesneriaceae	Besleria	?	1
Gesneriaceae Total			1
Lauraceae	Ocotea	sp. 2	1
		sp. 3	2
		sp. 4	1
	Indet.	sp. 1	1
Lauraceae Total			5
Melastomataceae	Miconia	?	1
	Mouriri	?	1
Melastomataceae Total			2
Monimiaceae	Mollinedia	?	1
	Siparuna	decipiens	1
		sp. 1	1
		sp. 2	2
	Indet.	?	1
Monimiaceae Total			6
Moraceae	Naucleopsis	sp. 1	1
		sp. 2	1
Moraceae Total			2
Myristicaceae	Iryanthera	jaruensis	1
		laevis	1
	Virola	sebifera	1
Myristicaceae Total			3
Mytaceae	Eugenia	?	1
Mytaceae Total			1
Piperaceae	Piper	sp. 1	1
	Peperomia	sp. 1	1
		sp. 2	1
Piperaceae Total			3
Rubiaceae	Psychotra	?	1

Rubiaceae Total			1
Sapotaceae	Poutenia	sp. 1	1
	Pouteria	sp. 2	1
Sapotaceae Total			2
Solanaceae	Indet.	?	1
Solanaceae Total			1
Zingiberaceae	Renealmia	ceruna	1
Zingiberaceae Total			1
Marantaceae	Ischnosiphon	sp. 1	1
		sp. 2	1
Marantaceae Total			2
Bignoniaceae	Indet.	?	2
Bignoniaceae Total			2
Caryocaraceae	Anthodiscos	?	1
Caryocaraceae Total			1

Table 3: Comprehensive list of species from representative families

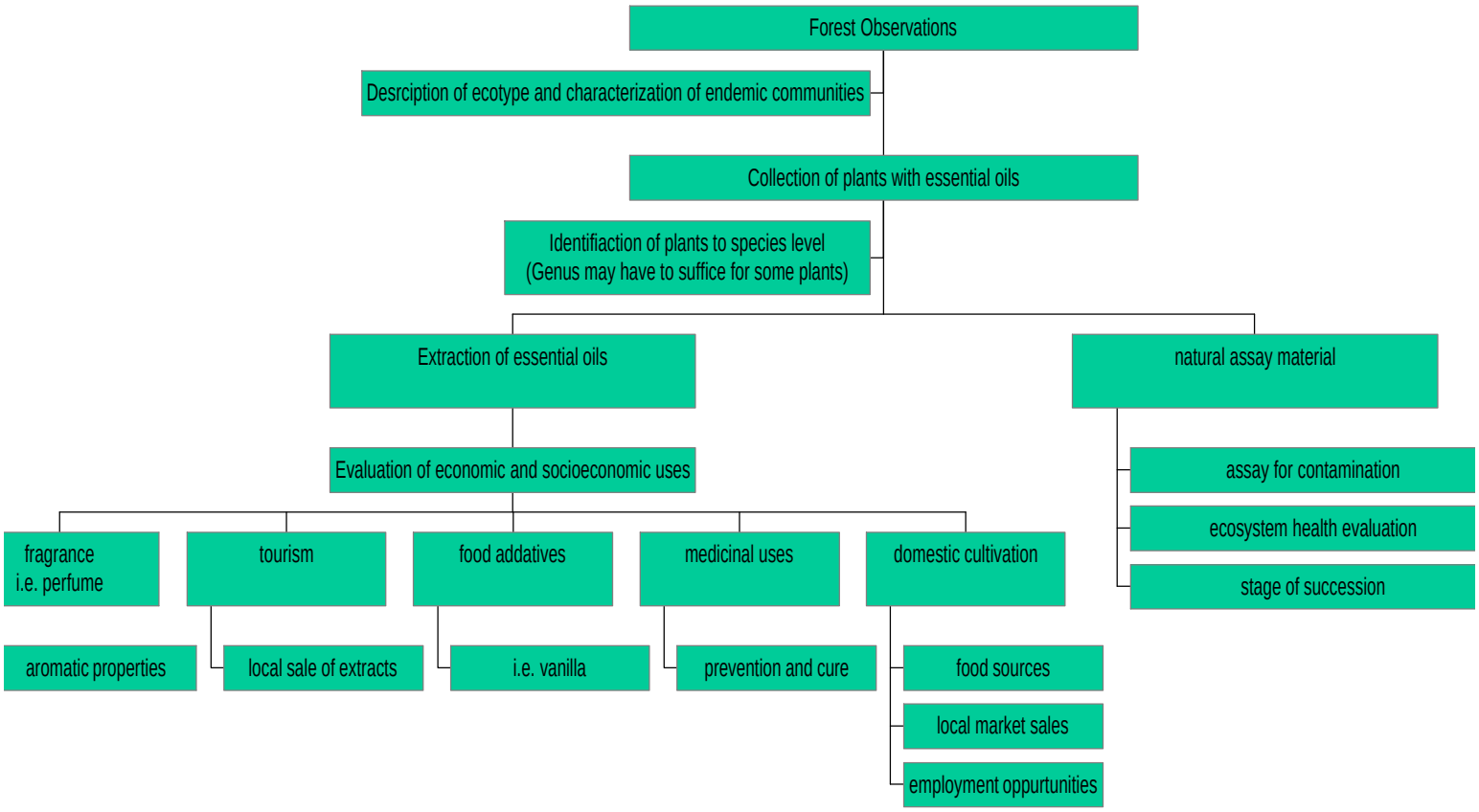

Figure 1. Possible uses for essential oil extracts from forest plants

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Northwest South America. University of Chicago Press, Chicago; 1993.

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