

## Original Article

**Mount Malinao (Albay, Philippines) Revisited: Diversity and Ethnomedicinal Studies**

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**Abstract**

**Introduction:** This study provides information as to the diversity of plants in Mt. Malinao (Albay, Philippines) and their ethnomedicinal values.

**Methods:** Plants were collected by random sampling from three vegetation types, identified and measured for diversity indices. The use reports and dosage preparations of medicinal plants sampled were confirmed by interview of local residents and forest guides.

**Results:** The montane secondary dipterocarp forest gave the greatest plant diversity but recorded the lowest tree statistics. Ethnomedicinal survey of the 70 plants collected have been qualified by generating information such as use values, fidelity levels, informant consensus factor and the modes by which dosage forms are prepared from these plants for use in various ailments.

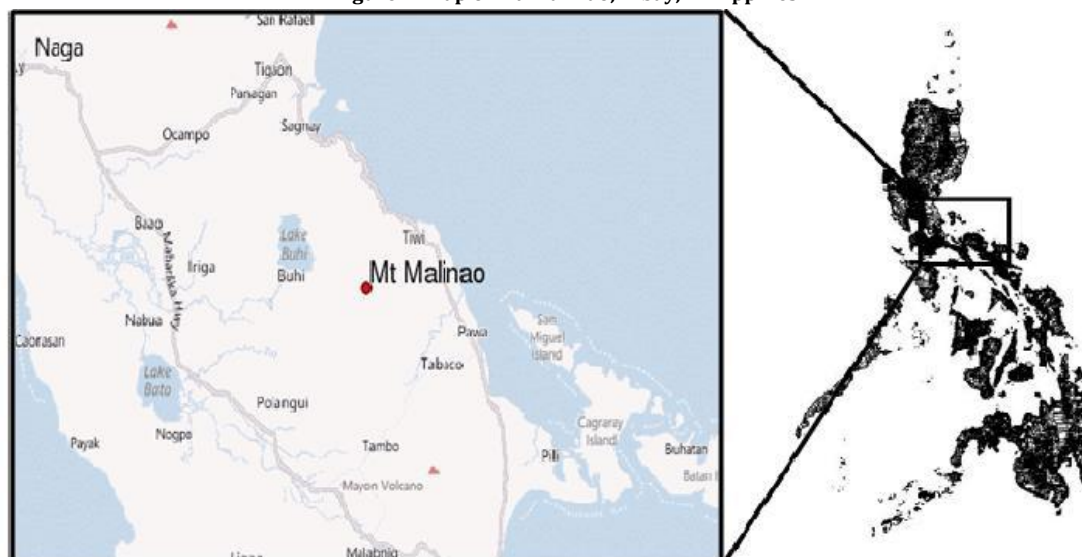
**Conclusion:** This study gave important data on medicinal plants in Mt. Malinao which includes diversity, ethnomedicinal uses and dosage preparations.

**1. Introduction**

A previous survey by de Guzman et al[1] in 2014 of plants in Mt. Malinao (Figure 1) showed abundance of plants belonging to the Melastomataceae, Apocynaceae, Rubiaceae, Moraceae and Euphorbiaceae families, with 37 endemic species, 3 poisonous plants, and 9 newly-introduced plants. This survey, however, did not report the diversity and conservation status of these plants. No ethnomedicinal account was made on the dosage preparation of

plants with medicinal values and their applications in various ailments. This study is a continuation of the previous plant assessment, providing facts on the comparative diversities of plants in 3 vegetative areas, identifies endangered or threatened species found therein, tally and classify and qualify all use reports of medicinal plants, including the extemporaneous compounding of different dosage forms that are indicated for various local diseases.

**Figure 1: Map of Mt. Malinao, Albay, Philippines**



## 2. Materials and Methods

The survey was conducted in April of 2014. Plant collection was done by random sampling in 3 vegetative types - the lower agro-ecosystem (0 - 50 masl), the rocky ascending and descending pathway (51 - 300 masl) and the secondary montane dipterocarp forest (301 - 800 masl). The specimens in the field were pressed in newspapers and treated with denatured alcohol. In the laboratory, the specimens were soaked in 100 mL of 95% ethanol-phenol (60:40) and subsequently oven-dried [2]. Dried specimens were mounted in herbarium sheets with official labels. Herbarium specimens and photographs of the plants in their natural habitats were submitted to the curators of the University of Santo Tomas Herbarium and Philippine National Herbarium for identification.

Twenty-one locals and forest guides of Barangay Tagoytoy in the municipality of Tabaco at the foot of Mt. Malinao identified

common and vernacular names of some plants which upon consultation with the medicinal plant atlas of Quisumbing [3] (1978) generated information as to their scientific names and families. Female informants with at least highschool education were preferred because of their high knowledge on the self-care use of medicinal plants which may have been passed on to them from previous generations. Using self-structured questionnaires, the locals were interviewed on the anecdotal therapeutic uses of these plants and the modes by which dosage preparations are compounded for application in various illnesses.

## 3.0. Results and Discussions

### 3.1. Plant Diversity

Table 1 shows the plant diversity indices, tree abundance and tree statistics in 3 vegetation types of Mt. Malinao.

**Table 1: Plant Diversity and Tree Dimensions in Mt. Malinao**

Vegetation Type	Diversity Indices			Mean Tree Dimensions		
	Shannon	Dominance	Simpson	Abundance	Height	Diameter
Agro-ecosystem	3.18	0.27	0.1	62.00%	6.4 ± 0.2 m	60 ± 2.4 cms.
Rocky Pathway	1.91	0.19	0.05	15.20%	6.2 ± 0.3m	54 ± 3.1 cms.
Dipterocarp Forest	4.67	0.35	0.17	20.10%	5.7 ± 0.2 m	63 ± 3.0 cms.

The plants collected were not evenly distributed among the 3 vegetation types in terms of abundance and, thus, a low correspondence was obtained between species richness and any of the 3 diversity indices ( $r < 0.5$ ). Furthermore, there are no comparable differences among the 3 vegetation types in terms of tree height and tree diameter ( $p < 0.01$ ). Nevertheless, there is a good linearity among the 3 diversity indices when plotted ( $r > 0.912$ ). It is, therefore, possible that a large number of species are common to each vegetation type. Plant diversity is important when ethnobotanical studies are done simultaneously since it may influence the use values of certain plants for certain illnesses, disease categories or multiple indications for multiple diseases

### 3.2. Ethnobotanical Study

Table 2 lists 5 out of the 70 plants collected that gave the highest use values (UV). The UV of a plant measures its relative importance locally. There is a high UV value when there are many use reports for a single plant regardless of the diseases treated. Most plants listed in Table 3 are already common, indigenous and pantropical in distribution and have already been extensively studied for their therapeutic properties which explains for their high UV's. There is a good correspondence ( $r > 0.90$ ) between the number of use reports and use values indicating that the more diseases a plant is indicated, the broader is its therapeutic usefulness to the community.

**Table 2: Plant Collections with the Highest Use Values**

Use Value	Scientific Name	No. of Use Reports	Plant Part Used	Main Illness Treated
0.49	<i>Carmona retusa</i> Vahl.	11	Leaves	Diarrhea
0.38	<i>Vernonia cinerea</i> Less.	9	Whole plant	Fever
0.31	<i>Capsicum frutescens</i> L.	7	Berries	Rheumatism
0.21	<i>Gmelina arborea</i> Roxb.	6	Bark	Diabetes
0.19	<i>Voacanga globosa</i> Merr.	4	Leaves	Tuberculosis

Table 3 summarizes the statistics for the 5 disease categories with the highest frequency of use reports and number of species for which they are indicated for. Practically all of the 70 plants collected were identified by the locals as having medicinal properties. Every time a plant is used to any extent in each disease category, it was considered to be 1 use report. Incidentally, gastrointestinal and hepatobiliary diseases obtained an informant consensus factor (ICF) and fidelity level (FL) values of 1.0 and

100.0%, respectively. High FL values, as in the case of *Carmona retusa* Vahl. which is known for its anti-diarrheal properties, are obtained for plants which are the most preferred species for a particular disease whereas low FL's are obtained for plants that are indicated for several diseases such as *Ficus nota* (Blancoi) Merr. Also, higher FL values are obtained for plants that have low frequency of use reports.

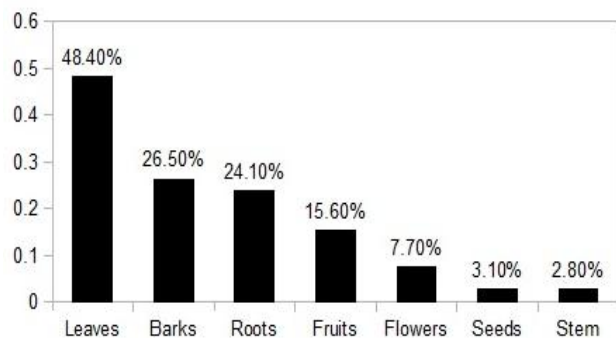
**Table 3: Disease Categories with Informant Consensus Factor (ICF) and Fidelity Levels (FL)**

Disease Category	Most Frequently Used Plants	No. of Use Reports	No. of Species	ICF	% FL
Gastrointestinal	<i>Carmona retusa</i> Vahl.	5	11	1	100.00%
Pulmonary	<i>Borreria hispida</i> K. Schum.	7	9	0.82	77.60%
Cardio-metabolic	<i>Gmelina arborea</i> Roxb.	12	13	0.71	55.30%
OB-Gynecological and Genito-Urinary	<i>Borreria hispida</i> K. Schum.	15	13	0.42	33.20%
Eyes, Ears, Nose, Throat, Skin Diseases	<i>Ficus nota</i> (Blancoi) Merr.	19	20	0.19	21.10%

The ICF value, on the other hand, determines the agreement between informants over which plants should be used for each category of disease. A high ICF of 1.0 for gastro-intestinal and hepatobiliary diseases indicates a very high agreement among the informants on the 5 use reports of the 11 plant species indicated.

The following plants collected are considered "official" in the Philippine National Drug Formulary [4]: *Carmona retusa* L. for diarrhea and *Vernonia cinerea* Less. for wound infections. Their "official" status signifies that they are considered cornerstones in herbal therapy as their development into drug products are justified by rigorous safety and efficacy clinical studies. Figure 2 shows the proportions by which plant parts are used for medicinal purposes.

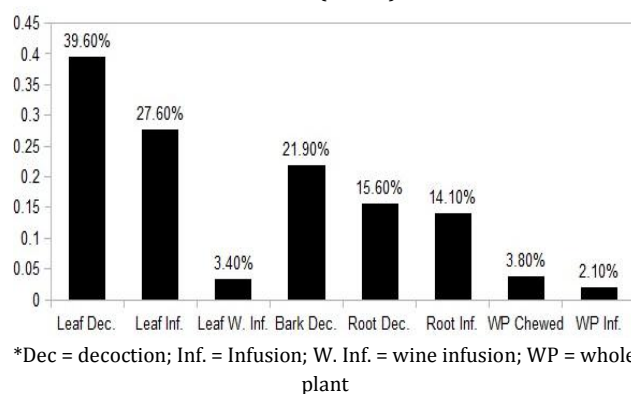
**Figure 2: Proportion of Plant Parts Used for Medicinal Purposes (N = 70)**



In herbal medicine development, it is practical to use the leaves, roots and barks as the biosynthesis of bioactive secondary metabolites occur in these plant parts, depending on the climate, soil quality, water supply and nutrients. The drawback with the use of leaves is due to the extraction of chlorophylls, fats and pigments which add to the crudeness of extracts and, thus, interfere with their pharmacological effects [5]. Some plants have more than 1 part used as in the case of *Ervatamia divaricata* Roem. & Schult. for which the leaves, barks and flowers are prepared in various dosage forms for different ailments.

Out of the 70 medicinal plants collected, 47 plants (67.1%) are used orally, 22 plants (31.4%) are used externally or topically and 21 plants (30%) are administered both internally and externally. Figure 3 gives the proportions by which internal preparations are compounded.

**Figure 3: Proportions of Internal Preparations of Medicinal Plants (N = 68)**

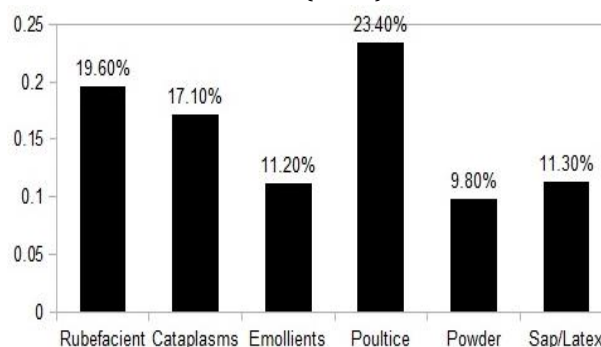


In most cases, the leaves, barks and roots were used to a high extent. The respondents mentioned the use of decoction for several plants but did not have the idea that the use of excessive heat during boiling can degrade bioactive substances present in these plants and, thus, attenuate their therapeutic effects. Nevertheless, the informants attested to the efficacy of decoctions. In some plants such as *Vernonia cinerea* Less., several preparations (i.e., infusions and

decoctions) of the leaves, roots and barks are used.

Figure 4 gives the proportions by which external preparations are compounded. No mention was made on how poultices, cataplasms, emollients and rubefacents were specifically prepared although the issue of cleaning and hygiene in their compounding is of utmost importance, particularly if the application sites are infected.

**Figure 4: Proportions of External Preparations of Medicinal Plants (N = 43)**



In most cases, these external preparations are applied to bruises, wounds, arthritis, ulcers, sore throat, headache, diarrhea, stomach ache and other inflammatory conditions. Like most other plants from the Euphorbiaceae family[6], the sap and latex of *Endospermum peltatum* Merr. and *Breynia rhamnoides* Muell-Arg. are applied locally as antiseptics due to their antibacterial properties.

#### 4. Conclusions

This ethnobotanical survey of plants in Mt. Malinao showed that practically all the 70 plants collected have medicinal values. The number of use reports for each of these plants generated data such as informant consensus factor, fidelity levels and use values. These dimensions identified which disease categories are the majority of the 70 plants indicated for or which plants have the highest frequency of use reports. The study also gave information as to the proportion of plant parts used and their extemporaneous compounding into various dosage forms.

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