



Ethnomedicinal plants of the *Dumagat* community of Paraiso, Culat, Casiguran, Aurora, Philippines

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Abstract

Of the Philippines' 130 distinct and diverse ethnic groups, the *Dumagats* of Casiguran, Aurora hosts a rich culture of traditional medicine that utilizes taxonomically diverse ethnobotanicals. This paper highlights the *Dumagats*' utilization of ethnobotanicals as medicine. *Dumagat* families served as informants and were interviewed for their use of the ethnobotanicals. The data collected were quantified by calculating the use value and informant consensus factor. A total of 58 ethnobotanicals used for medicinal purposes were listed and classified under 34 families. Leaves are the commonly used plant part. Ethnomedicinal plants were often decocted and taken orally. *Centella asiatica* L., *Pinanga* sp., *Mikania cordata* (Burm.f.) B.L. Rob., *Pterocarpus indicus* Willd., *Psidium guajava* L., *Phyllanthus urinaria* L., and *Imperata cylindrica* (L.) Raeusch are the most used medicinal plants in the community with a use value of 1. The disease category with the highest FIC value was injury and poisons of external causes and diseases of the respiratory system with a value of 0.85. High FIC values were observed which suggests further research to validate the medicinal uses of these plants.

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Introduction

The Philippines is characterized by a rich diversity both in cultural, indigenous communities and natural resources. The country hosts more than 16,223 species of plants of which a third is considered endemic. A number of these plant species are used by diverse indigenous communities for medicinal purposes entailing a broader scope for healing. The knowledge and traditional use of plants as medicine by the indigenous people are conventionally inherited from ancestors through oral tradition (Olowa *et al.*, 2012). Among these are the *Dumagats*. The *Dumagat* is a Philippine indigenous group that inhabits the coast of Pacific Ocean and the hinterlands of the Sierra Madre Mountains in the eastern part of Luzon Island, Philippines (Sia *et al.*, 1998). In earlier times, they were semi-nomadic people, searching for food and build temporary houses until the natural resources around them are already consumed. The *Dumagats* resemble other Negrito groups such as the *Aetas* of Pinatubo, *Ati* of Panay Island and the *Manobos* of Davao and North Cotabato provinces. However, the *Dumagats* have bigger built and are taller than the *Ati* and *Aeta* groups (Blumentritt, 1980; Eranista, 1994). The *Dumagats* are divided into three subgroups based on language: *Tagibulos*, *Kabulowan*, and *Idemala*. Most of the *Dumagats* belongs to the *Tagibulos* subgroup found along the shores of Aurora, Quezon and mountains of Bulacan and Rizal.

Ethnobotanical surveys in the Philippines are often conducted on mountainous areas as this serves a home for both the indigenous people and diverse group of plants that they utilize as traditional medicine. This utilization is an ideal example of the traditional use of plant resources by local communities for treatments of various diseases and considered significant in paving the development of present medicines. However, the use of traditional medicine is in danger of extinction as many traditional healers do not keep written notes and fail to pass the knowledge orally to the succeeding generations. Throughout the ages and in different parts of the world, plants have notably played a major role in treating human diseases (Thirumalai *et al.*,

2009) and the use of herbal medicine as an alternative to conventional medicine is also becoming popular all over the world. Albeit, modernization brought by western practices in the medical field has also resulted to the continuous replacement of traditional practices (Ong *et al.*, 2011). Also, as modernization progresses, medicinal plants have become threatened because of habitat destruction due to industrialization and climate change. This presents a crucial role for ethnobotanical surveys to bring about discovery of untapped ethnobotanicals for scientific validation and drug development. Thus, this paper highlights the ethnobotanical diversity, preserved knowledge and the rich culture of traditional medicine of the *Dumagats* of Paraiso, Casiguran, Aurora.

Materials and methods

The ethnobotanical survey was conducted in Sitio Paraiso, Barangay Culat, Casiguran, Aurora. The area was surveyed for the presence of ethnobotanicals and the data was collected through a semi-structured interview of 9 *Dumagat* informant-families who are knowledgeable on medicinal plants. Key informants were identified through the tribal chieftain. The semi-structured interview was composed of questions on medicinal plants, its utilization as a traditional medicine, the diseases treated by the plants, the parts that are used, how the parts are prepared and the frequency and direction of use of these plants. Samples of plants with mature parts (leaves, stems, flowers, roots, and fruits) were collected for taxonomic identification. Two samples of the plant were immersed in alcohol and were placed in a collection bag with a unique collection number. The plant was placed in newspapers, pressed on a plant presser until it has dried out and was placed in herbarium sheets (30 × 42 cm). The herbarium was labeled with the following information: date of collection, collector's name, place of collection, scientific name, common name, and description. The habitat and specimen were photographed in-situ. Voucher specimens were verified and authenticated by a taxonomist and deposited at the Department of Biological Sciences, College of Science, Central Luzon State University, Philippines.

The information on the medicinal plants based on the interview was tabulated.

The Informant Consensus Factor (ICF) was computed using the formula: $ICF = (Nur - Nt) / Nur - 1$: where Nur is the number of use reports in each category and Nt is the number of species used for a particular category by all informants (Ragragio *et al.*, 2013). The maximum value attained using this Formula, 1, means that the informants completely agree that the

particular species cited could cure a particular ailment.

Results and discussion

Nine family respondents, composed of the chieftain, knowledgeable elders and members of the community who are utilizing the ethnobotanicals, participated in the conduct of the survey. A total of fifty-eight (58) plants were recorded and collected from various areas in the mountain and within the *Dumagats'* residence.

Table 1. List of Ethnomedicinal Plants used by the *Dumagat* Community of Paraiso, Culat, Casiguran, Aurora.

Family	Scientific name	Local name	Usage of plant	Plant parts used	Mode of preparation and administration
Amaryllidaceae	<i>Allium cepa</i> var. <i>aggregatum</i> G. Don	Sibuyas Tagalog	Fever, cough	Leaves and Stem	Decoction; taken orally
Annonaceae	<i>Polyalthia longifolia</i> (Sonn.) Benth. & Hook. f.	Uya	Charm	Roots	Skinned and used as charm
	<i>Anaxagorea luzonensis</i> A. Gray	Apsot	Relapse after giving birth	Leaves	Decoction; taken orally
Apiaceae	<i>Centella asiatica</i> L.	Mahabanwaw/ Takip-Kuhol	Cough, colds, stomach ache, diarrhea, urinary tract infection (UTI)	Leaves	Decoction; taken orally
Apocynaceae	<i>Alstonia scholaris</i> (L.) R. Br.	Manakit	Fever, headache, malaria	Bark	Decoction; taken orally
Araceae	<i>Aglaonema simplex</i> (Blume) Blume	Tagabalid	Sprain, inflammation	Leaves	Leaves are applied with oil and heated directly on flame; Poultice
	<i>Philodendron giganteum</i> Schott	Salangubang/Payaw Payaw	Stomach gas	Stem	Decoction (mixed with abutra/labtang and kamote roots); taken orally
	<i>Rhaphidophora korthalsii</i> Schott.	Takup-Takup	Boils, muscle spasm	Leaves	Heated directly on flame and used as poultice
Araliaceae	<i>Schefflera heptaphylla</i> (L.) Frodin	Bagnet	Relapse after giving birth	Leaves	Decoction; taken orally
Arecaceae	<i>Calamus manillensis</i> (Mart.) H.A. Wendl.	Bisal	Toothache, stomach gas	Roots	Roots are covered with leaves, directly heated on flame, mixed with salt; inserted in the tooth holes
	<i>Pinanga</i> sp.	Butag	Wound, stomach ache, fever	Fruit	Chewed and is mixed with lime; dermal application
Asteraceae	<i>Ageratum conyzoides</i> L.	Payokpok	<i>Taon</i> , wound, cough, fever	Leaves	Leaves are extracted by hand; dermal application
	<i>Artemisia vulgaris</i> L.	Damong Maria	Dysmenorrhea, amenorrhea, stomach ache	Leaves	Decoction; taken orally first in the morning
	<i>Blumea balsamifera</i> (L.) DC.	Sambong	<i>Pasma</i> , muscle spasm, body pain	Leaves, Roots	Leaves: decoction; taken orally or smoked, Roots: Decoction; smoked
	<i>Chrysanthemum indicum</i> var. <i>edule</i> (Kitam) Kitam.	Mansanilla	Fever, cough, stomach gas	Leaves	Decoction; taken orally
	<i>Elephantopus mollis</i> Kunth.	Tabatabako	<i>Taon</i> , wound	Leaves	Pounded and rolled in a leaf, heated directly on flame, mixed with salt and used as poultice
	<i>Mikania cordata</i> (Burm.f.) B.L.Rob.	Bercrop	Wound, cough	Leaves	Heated directly on flame to extract; dermal application
	<i>Tagetes erecta</i> L.	Amarillo	<i>Taon</i> , stomach gas	Leaves	Heated directly on flame; extract is taken orally
Bromeliaceae	<i>Ananas comosus</i> (L.) Merr.	Pinya	Boils	Leaves (young)	Pounded and heated directly on flame, wrapped in leaves and used as poultice
Cannaceae	<i>Canna indica</i> L.	Kuneg	Skin redness	Roots	Pounded; Poultice
Commelinaceae	<i>Tradescantia spathacea</i> Sw.	Atsibar	Vomiting of blood	Leaves	Decoction; taken orally
Cyperaceae	<i>Cyperus</i> sp.	Mutha	Stomach gas	Roots	Chewed; poultice
Dipterocarpaceae	<i>Hopea</i> sp.	Butnol	Wound	Leaves	Pounded and applied dermally
	<i>Parashorea malaanonan</i> (Blanco) Merr.	Pampabait	Charm	Roots	Skinned and used as a charm
Euphorbiaceae	<i>Codiaeum luzonicum</i> Merr.	Putat	Relapse after giving birth	Bark	Decoction/ soak in alcoholic drink for three days; taken orally
	<i>Euphorbia hirta</i> L.	Tawa –Tawa	Fever, asthma	Leaves	Leaves are sundried, rolled in a paper and is smoked on the affected part
	<i>Macaranga tanarius</i> (L.) Müell.Arg.	Bilante	Relapse after giving birth, hip pain	Bark	Decoction; taken orally
	<i>Pedilanthus tithymaloides</i> L.	-	Snake bite	Whole plant	Pounded and mixed with salt, heated

Fabaceae	<i>Arachis hypogaea</i> L.	Mani-manian	Mouth ulcer, toothache	Leaves	directly on flame and used as poultice Pounded, mixed with salt and covered by banana leaves. Heated directly on flame and extract is gargled.
	<i>Mimosa pudica</i> L.	Makahiya	Amenorrhea	Roots	Decoction; taken orally
	<i>Pterocarpus indicus</i> Willd.	Narra	Dysentery, mouth ulcer, stomach ache	Leaves, Bark	Leaves: Poultice. Bark: decoction; taken orally, Sap; applied dermally
Lamiaceae	<i>Origanum vulgare</i> L.	Oregano	Malaria	Leaves	Decoction; taken orally
Lauraceae	<i>Beilschmiedia</i> sp.	Bantigi	Strengthening of bones, disinfection of a newly cut navel in babies	Leaves, Bark	Leaves are heated directly on flame and used as poultice; Bark is mixed with chewed leaves and applied externally
Lythraceae	<i>Lagerstroemia speciosa</i> (L.) Pers.	Banaba	Kidney disease	Leaves	Decoction; taken orally
Malvaceae	<i>Hibiscus rosasinensis</i> L.	Gumamela	Boils	Flower	Pounded and applied to the outer area of the boil
Melastomataceae	<i>Astronia</i> sp.	Tulang	Stomach ache, cough	Roots	Decoction; taken orally
Menispermaceae	<i>Anamirta cocculus</i> (L.) Wight and Arn.	Abutra/ Labtang	Stomach ache	Roots	Decoction; taken orally (can be mixed with alcohol)
Moringaceae	<i>Moringa oleifera</i> Lam.	Malunggay	Toothache, wound	Bark	Mixed with lime; gargled
Myrtaceae	<i>Psidium guajava</i> L.	Bayabas	Stomach ache, wound, diarrhea	Leaves, bark, roots	Leaves: decoction; taken orally or used for bathing. Bark: decoction; taken orally Roots: Pounded; extract is taken orally with kalamansi root extract
Phyllanthaceae	<i>Phyllanthus urinaria</i> L.	Taltalikod	<i>Taonor subi-subi</i> , possessed by ghosts	Leaves	Pounded leaves; taken orally
Piperaceae	<i>Piper betle</i> L.	Ngayabngab	Fever, influenza	Roots, leaves	Decoction; mixed with bath water
	<i>Piper cordatilumbum</i> Quisimb.	Litlit	Cough, colds, fever, stomach ache	Leaves	Leaves are mixed with coconut oil; dermal application
	<i>Piper nigrum</i> L.	Diwat/ Sikday	Athlete's foot	Leaves	Heated directly on flame to extract; dermal application
Poaceae	<i>Cymbopogon citratus</i> (DC.) Stapf	Tanglad	<i>Pasma</i> , measles	Whole plant	Decoction; taken orally, used as bath and smoked
	<i>Imperata cylindrica</i> (L.) Raeusch	Cogon	UTI, skin itchiness	Roots	Decoction; taken orally
	<i>Paspalum conjugatum</i> P.J. Bergius.	Carabao grass	Diabetes, miscarriages	Whole plant	Decoction; taken orally
Rubiaceae	<i>Morinda citrifolia</i> L.	Bungaw Bungaw/ Lewlew	Body pain, hernia, headache	Leaves, roots	The leaves are oiled and heated directly on flame; used dermally as poultice. Roots were pounded and mixed with salt; used as poultice
Rutaceae	<i>Citrus microcarpa</i> Bunge	Kalamansi	Cough, colds, stomach ache	Leaves(young), fruits, roots	Leaves: decoction; taken orally. Fruit extract is taken orally as juice and is applied dermally
Selaginellaceae	<i>Selaginella cupressina</i> Spring	Pako-Pako	Diarrhea	Leaves	Poultice
Simaroubaceae	<i>Manungala pendula</i> Blanco	Manunggal	Stomach ache, vomiting, diarrhea	Fruit	Decoction; taken orally
Solanaceae	<i>Capsicum annuum</i> var. <i>annuum</i> L.	Siling Labuyo	Stomach ache	Leaves	Pounded and extract is taken orally
Urticaceae	<i>Prochris laevigata</i> Miq.	Pangloko	Charm	Roots	Skinned and used as charm
Zingiberaceae	<i>Curcuma longa</i> L.	Kamahilan	Gastritis	Stem	Chewed and released on the affected part
	<i>Zingiber officinale</i> Roscoe	Luya	Stomach ache, Rheumatoid arthritis, muscle spasm	Stem	Decoction; taken orally
	<i>Kaempferia galanga</i> L.	Dusol	Boils	Leaves (young)	Pounded; applied dermally
Other scientifically unidentified plants	Species 1	Anggo	Muscle spasm	Bark	Decoction; taken orally
	Species 2	Atikahang	Cough	Leaves	Pounded and extract is taken orally
	Species 3	-	toothache	Roots	Decoction; gargled

The recorded taxa were classified under 34 families representing 53 genera and 55 species. Fifty-three of the fifty-eight ethnobotanicals were documented *in-situ*, five ethnobotanicals were not documented because of the unavailability of the plant in the study area and three of the plants were not identified due to insufficient parts when collected and which are only known through their local *Dumagats* name. The dominant family was Asteraceae having the highest number of representative species followed by Euphorbiaceae. Leaves are the most utilized plant

part (56.90%), followed by the roots (27.57%), bark (13.79 %), stem (6.90%), and fruits (5.17%).

There are certain diseases that are treated using the whole plant and this accounts for 5.17% of the total plant species identified in this study. Decoction was the most cited ethnobotanical preparation followed by pounding, flaming, other mode of preparation such as soaking the plant part in a hot water, extracting by hand, oiling the plant part, sun drying and mixing with salt, and chewing.

Table 2. Ethnomedicinal plants used in different diseases.

Category	Plants
Respiratory	<i>Allium cepa</i> var. <i>aggregatum</i> G. Don, <i>Centella asiatica</i> L., <i>Ageratum conyzoides</i> L., <i>Chrysanthemum indicum</i> var. <i>edule</i> (Kitam.) Kitam., <i>Mikania cordata</i> (Burm.f.) B.L.Rob., <i>Euphorbia hirta</i> L., <i>Astronia</i> sp., <i>Piper betle</i> L., <i>Piper cordatilumbum</i> Quisimb., <i>Citrus microcarpa</i> Bunge, "Atikahang"
Wounds and bites	<i>Alstonia scholaris</i> (L.) R. Br., <i>Aglaonema simplex</i> (Blume) Blume, <i>Blumea balsamifera</i> (L.) DC., <i>Macaranga tanarius</i> (L.) Müell.Arg., <i>Morinda citrifolia</i> L., <i>Curcuma longa</i> L., <i>Zingiber officinale</i> Roscoe, <i>Pedilanthus tithymaloides</i> L., <i>Rhaphidophora korthalsii</i> Schott., <i>Pinanga</i> sp., <i>Ageratum conyzoides</i> L., <i>Elephantopus mollis</i> Kunth., <i>Mikania cordata</i> (Burm.f.) B.L.Rob., <i>Ananas comosus</i> (L.) Merr., <i>Hopea</i> sp., <i>Beilschmiedia</i> sp., <i>Hibiscus rosasinensis</i> L., <i>Moringa oleifera</i> Lam., <i>Psidium guajava</i> L., <i>Piper nigrum</i> L., <i>Kaempferia galanga</i> L.
Gastro-intestinal	<i>Centella asiatica</i> L., <i>Philodendron giganteum</i> Schott., <i>Calamus manillensis</i> (Mart.) H.A. Wendl., <i>Pinanga</i> sp., <i>Artemisia vulgaris</i> L., <i>Chrysanthemum indicum</i> var. <i>edule</i> (Kitam.) Kitam., <i>Tagetes erecta</i> L., <i>Cyperus</i> sp., <i>Pterocarpus indicus</i> Willd., <i>Astronia</i> sp., <i>Anamirta cocculus</i> (L.) Wight and Arn., <i>Psidium guajava</i> L., <i>Piper cordatilumbum</i> Quisimb., <i>Citrus microcarpa</i> Bunge, <i>Selaginella cupressina</i> Spring, <i>Manungala pendula</i> Blanco, <i>Capsicum annum</i> var. <i>annuum</i> L., <i>Curcuma longa</i> L., <i>Zingiber officinale</i> Roscoe, <i>Calamus manillensis</i> (Mart.) H.A. Wendl., <i>Arachis hypogaea</i> L., <i>Pterocarpus indicus</i> Willd., <i>Moringa oleifera</i> Lam.
Obstetrics-gynecology	<i>Anaxagorea luzonensis</i> A. Gray, <i>Schefflera heptaphylla</i> (L.) Frodin, <i>Artemisia vulgaris</i> L., <i>Codiaeum luzonicum</i> Merr., <i>Macaranga tanarius</i> (L.) Müell.Arg., <i>Mimosa pudica</i> L., <i>Paspalum conjugatum</i> P.J. Bergius., <i>Morinda citrifolia</i> L., <i>Centella asiatica</i> L., <i>Lagerstroemia speciosa</i> (L.) Pers., <i>Imperata cylindrica</i> (L.) Raeusch
Musculo-skeletal	<i>Aglaonema simplex</i> (Blume) Blume, <i>Rhaphidophora korthalsii</i> Schott., <i>Blumea balsamifera</i> (L.) DC., <i>Beilschmiedia</i> sp., <i>Alstonia scholaris</i> (L.) R. Br., <i>Macaranga tanarius</i> (L.) Müell.Arg., <i>Morinda citrifolia</i> L., <i>Curcuma longa</i> L., <i>Zingiber officinale</i> Roscoe, "Anggo"
Nervous	<i>Alstonia scholaris</i> (L.) R. Br., <i>Pinanga</i> sp., <i>Ageratum conyzoides</i> L., <i>Chrysanthemum indicum</i> var. <i>edule</i> (Kitam.) Kitam., <i>Euphorbia hirta</i> L., <i>Piper betle</i> L., <i>Piper cordatilumbum</i> Quisimb.
Dermatological	<i>Canna indica</i> L., <i>Imperata cylindrica</i> (L.) Raeusch
Infectious and parasitic disease	<i>Alstonia scholaris</i> (L.) R. Br. (malaria), <i>Origanum vulgare</i> L. (malaria), <i>Cymbopogon citratus</i> (DC.) Stapf (measles)
Endocrine, nutritional and metabolic diseases	<i>Paspalum conjugatum</i> P.J. Bergius.

The plants are grouped under disease categories (Table 2). The diseases and ailments treated using these ethnomedicinal plants are categorized into different areas: respiratory, wounds and bites, gastro-intestinal, obstetrics-gynecology, musculo-skeletal, nervous, dermatological, infectious and parasitic diseases, and endocrine, nutritional and metabolic diseases. Majority of these plants are taken orally or applied externally (Table 1).

Medicinal plants are mostly used for gastro-intestinal diseases (23 plants), treatment of wounds and bites (21), obstetrics-gynecology (11), and respiratory problems (10).

Informed Consensus Factor (ICF)

The ICF value (0 – 1.0) determines the agreement between informants over which plants should be used for each category of disease (Raterta *et al.*, 2014; Uddini and Hasan, 2014). The ICF values are presented in Table 3. The highest value of 0.85 was obtained for two categories: respiratory and wounds and bites. *C. asiatica* and *Pinanga* sp. are the most commonly used plants for each category. The study showed that plants are valued by the community for their medicinal properties. Most of the plants used are easily accessible with a few species collected from the forest. Most of the plants recorded in the study are already known as plants with medicinal values

especially in areas with limited access to healthcare and medicine (Valle Jr. *et al.*, 2015, Balberona *et al.*, 2018). Among the recorded plants, *C. asiatica*, *Pinanga* sp., *M. cordata*, *P. indicus*, *P. guajava*, *P. urinaria*, and *I. cylindrica* are the most used plants, none of which had been extensively studied for their phytochemical properties. Ethnobotanicals in the area are taxonomically diverse. Most of the plants

utilized by the *Dumagats* are accessible as most of these plants are common weeds or are already planted as ornamentals around the community.

A few of the plants are found in the forest. High ICF values were observed on majority of the plants which suggests further research to validate the medicinal uses of these plants.

Table 3. Disease categories with Informant Consensus Factor.

Category	Disease	Use citation	Plant taxa used	ICF	Plant most used
Respiratory	Common colds, asthma, cough, influenza	60	10	0.85	<i>C. asiatica</i>
Wounds and bites	Wound, sprain, bites	53	9	0.85	<i>Pinanga</i> sp.
Gastro-intestinal	Stomach ache, diarrhea, stomach gas, gastritis, toothache, mouth ulcer	112	22	0.81	<i>P. guajava</i>
					<i>P. indicus</i>
					<i>Astronia</i> sp.
Obstetrics-gynecology	Kidney problems, Urinary Tract Infection (UTI)	12	3	0.81	<i>I. cylindrica</i>
Musculo-skeletal	Rheumatoid arthritis, body pain, inflammation, <i>pasma</i> , muscle spasm, hip pain, hernia	36	8	0.8	<i>A. simplex</i>
Nervous	Headache, Fever	40	9	0.79	<i>Pinanga</i> sp.
Dermatological	Skin redness, boils, itchiness	23	6	0.77	<i>I. cylindrica</i>
Infectious and parasitic disease	Measles, Athlete's foot, malaria,	12	4	0.73	<i>P. nigrum</i>
Endocrine, nutritional and metabolic diseases	Diabetes	1	1	0	<i>P. conjugatum</i>

These plants should be prioritized for further bioassay and toxicity studies as it could help in the discovery of new compounds that is potential in treating diseases with no known cure.

Conclusion

This paper documented the medicinal plants utilized by the *Dumagats* of Sitio Paraiso, Barangay Culat, Casiguran, Aurora, Philippines. The survey revealed a rich diversity of traditional medicinal plants utilized for a variety of ailments. The ethnomedicinal plants are readily available within the area. This paper emphasized the rich traditional medicinal knowledge of the ethnic community. Further scientific evaluations are recommended to validate their medicinal uses and to screen their pharmacological potential.

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