

Ethnomedicinal Uses of *tawatawa* (*Euphorbia hirta* Linn.) in Selected Communities in the Philippines: a Non-invasive Ethnographic Survey Using Pictures for Plant Identification

Hilton Y. Lam,^{1,2} Marco Nemesio E. Montaña,³ Isidro C. Sia,⁴ Francisco M. Heralde III⁵ and Lotgarda Tayao¹

¹*Institute of Health Policy and Development Studies, National Institutes of Health, University of the Philippines Manila*

²*Institute of Clinical Epidemiology, National Institutes of Health, University of the Philippines Manila*

³*Marine Science Institute, College of Science, University of the Philippines Diliman*

⁴*Department of Pharmacology and Toxicology, College of Medicine, University of the Philippines Manila*

⁵*Department of Biochemistry and Molecular Biology, College of Medicine, University of the Philippines Manila*

ABSTRACT

Background. There is a growing interest in the use of *Euphorbia hirta* Linn. as herbal remedy for dengue, supposedly based on folkloric practice. However, there has been no ethnobotanical documentation of such use in the Philippines. Because of this, the medical community cautions the public against the sole use of *E. hirta* in treating dengue.

General Objective. To describe the ethnomedicinal uses of *Euphorbia hirta* Linn. in selected communities in the Philippines.

Specific Objectives. (1) To identify the vernacular names of the plant; (2) to identify the earliest known use of the plant against dengue infection and for other indications; (3) to document the methods of preparation and administration, side effects, and contraindications of use.

Methods. Cross-sectional descriptive design using the snowball sampling of interviewer-guided key informants for the ethnobotanical interview.

Limitations. The results of this study may be limited by its convenient sampling design and the use of plant pictures with different magnifications.

Results and Conclusion. Majority of the respondents were female (93%), 41-60 years old (39%), had high school education (43%), and resided in Quezon City (31%). The plant is locally known as *tawatawa*, *butobutonesan*, *malagatas*, and *mangagaw*. It has been used to treat fever in the Philippines as early as 1948. Its use as a treatment for dengue started only in the 1980s. The plant is either squeezed, crushed, or boiled, and is administered topically or orally. The only reported side-effect is increased urinary frequency.

Recommendations. It is recommended that more comprehensive and large scale studies be conducted, including: (1) identification of folkloric uses of *E. hirta* for the treatment of other diseases; (2) determination of different concentrations of extract (crude or semicrude) using the various reported preparations for optimal outcomes for the different reported medicinal uses.

Key Words: *Euphorbia hirta*, ethnomedicine, Philippines, *tawatawa*

Corresponding author: Hilton Y. Lam, MHA, PhD
Institute of Health Policy and Development Studies
National Institutes of Health
University of the Philippines Manila
E-mail: hiltonyulam@gmail.com

INTRODUCTION

Euphorbia hirta is a small meso-xerophytic annual herb that belongs to the family Euphorbiaceae, also known as the Spurge family, which is the sixth largest family of flowering plants, accounting for almost one sixth of all known flowering plants, and consisting of approximately 8,900 genera.¹ It has a hairy stem that is much-branched from the base. These ascending branches may be simple or forked, slender, with a reddish or purplish color, where broad leaves emanate. It grows up to 30–40 centimeters in height. Its short and oblong shaped leaves grow in opposition to each other. The edges of the leaves are serrated and they usually exhibit a purple mark in the center. The plant displays purple flowers which are small and clustered. The inflorescence is cyathophorous and the flower is unisexual.² The cyathium is clustered in dense, crowded cymes wherein the involucre are stalked, and cup-shaped. Each involucre contains one female flower surrounded by many male flowers, with no perianth. The plant has milky latex in all its parts.¹ It thrives in open wastelands, grasslands, pathways, and roadsides.

Currently, in the Philippines, there is a growing interest in *E. hirta*, particularly its claimed effect on increasing the platelet count of dengue patients.^{3,4,5} Because this has not yet been scientifically proven, the medical community is cautioning the public against the sole use of *E. hirta* in treating dengue.^{6,7,8} The general objective of this study was to document the traditional medicinal uses of *E. hirta* in selected communities across the country.

The Philippine Department of Health, through the Philippine Food and Drug Administrative Order No. 184, s. 2004,⁹ “Guidelines on the Registration of Traditionally-Used Herbal Products”, which specifies that local plant materials can be licensed for use as medicine as long as there is documented “traditional experience of long usage which should be at least five (5) or more decades as documented in medical, historical and ethnological literature,” provided there is an “absence of unsuspected potential for systematic toxicity, carcinogenicity, and teratogenicity,” and there is “no valid report of adverse drug reaction on the use of the plant material as determined by the BFAD”, “no valid report of abuse or dependence,” and “contains no chemically defined therapeutically active substances.” Specifically, this study (1) identified the vernacular names of the plant; (2) documented the reported earliest known use of the plant against dengue infection; and (3) recorded the methods of preparation and administration, side effects, and contraindications of use.

REVIEW OF LITERATURE

E. hirta has been reported in several parts of the world as a herbal remedy for febrile illnesses particularly dengue, malaria, and typhoid fever. The aqueous extracts have been shown to strongly reduce the release of prostaglandins I₂, E₂, and D₂¹⁰ and have antipyretic

properties.¹¹ Its antimalarial use has also been documented in the Democratic Republic of Congo.¹² Further studies elucidated that the methanolic extracts of the plants yielded antiplasmodium flavonolglycosides.¹³ Studies revealed the widespread use of the plant for dengue.^{14,15,16} There are no studies yet to show its effect on haemoglobin but it exerts an inhibitory effect on platelet aggregation¹⁰ and significantly reduces the plaque-forming capacity of the dengue virus serotypes 1 and 2.¹⁶ It is also used to treat sore eyes, cough, diabetes, gastritis, and diarrhea as previously documented in the Cordilleras^{15,16} and in other areas like India,^{17,18,19,20,21} Africa,^{22,23} Fiji,²⁴ Cameroon,²⁵ Spain,²⁶ and Bangladesh.²⁷ Its use in diabetes is supported by the improvement in blood glucose levels of albino mice with streptozocin-induced diabetes after treatment with its aqueous extracts.²⁸ The antispasmodic effect and decrease in gastrointestinal motility²⁹ supports its use for digestive disorders.

The parts of the plant that are commonly used are the leaves, roots, and stem. The route of administration is either topical or oral. The methods of preparation include crushing or macerating the leaves, squeezing to obtain the latex, or boiling the leaves, stems, and/or roots depending on the illness it is used for. There are no known contraindications for its use and the only known side effect of this plant is increase in urinary frequency or diuresis. Johnson et al³⁰ concluded that it increases urine output in the same way as acetazolamide.

MATERIALS AND METHODS

This was a cross-sectional descriptive study utilizing the convenience sampling design with the snowball technique to identify key informants in communities known to be users of *tawatawa* as herbal medicine. Convenience sampling of respondents from the following communities which are known to include residents who are users of *E. hirta*: a coastal and farming Aeta community in Quezon province, a farming community in Pangasinan, a farming community in Agusan del Norte, an urban community in Cebu City, and an urban community in Quezon City. Respondents were selected based on two inclusion criteria of (1) adult member of the selected communities in the Philippines, and (2) knowledgeable about the use of *E. hirta* in the treatment of illnesses.

An interview guide was used for information collection. No plants were collected. Translation of the interview guide to Filipino was done by a health social scientist and the back-translation was done by a public health practitioner. A photograph of *E. hirta* was included in the interview guide to ensure the correct identification of the plant. The accuracy and precision of identification of the *E. hirta* was ensured by showing to the informants vivid pictures of similar looking plants particularly *Euphorbia lasiocarpa*, *Euphorbia polygonifolia*, and *Euphorbia supine*. These plants belong to the same genus and they maybe mistaken for *Euphorbia hirta*. Field researchers were trained on the proper conduct of the interview.



Figure 1. Euphorbiaceae species whose photographs were included in the interview tool to test respondent's ability to identify *E. hirta* correctly.

Protection of privacy and confidentiality of research information including data protection plan was ensured in this study. The informants were protected with anonymity plan. There were no direct benefits of the study to the informants. An informed consent was sought before commencing the interview.

RESULTS

Demographic Profile of Respondents

A total of 31 respondents participated. Two were excluded for their inability to distinguish the plant from the other similar looking plants provided photographically.

Majority (93%) of the respondents were female. The age range was 22- 74 years old. Twenty-seven percent belonged in the 20 to 40 year old categories, 49% in the 41 to 60 year old categories, and the remaining 24% were within 61 year old and above category. Of the respondents, 21% had elementary education, 43% had high school

Table 1. Respondents Description

Demographics	Categories	Number
Respondent	Total	31 (100%)
	Correctly identified <i>E. hirta</i> from photographs	29 (93%)

Table 2. Included respondents descriptions (N=29)

Demographics	Categories	Number
Sex	Female	27 (93%)
	Male	2 (7%)
Age range	19 to 30 y.o.	5 (17%)
	31 to 40 y.o.	3 (10%)
	41 to 50 y.o.	8 (28%)
	51 to 60 y.o.	6 (21%)
	61 y.o. and above	7 (24%)
Highest level of educational attainment	Elementary school	6 (21%)
	High school	13 (43%)
	University	10 (36%)
Residence	Quezon Province	7 (24%)
	Pangasinan Province	2 (7%)
	Agusan del Norte Province	4 (14%)
	Cebu City	9 (31%)
	No answer provided	7 (24%)

education, and 36% had college education. Twenty-four percent of the respondents were from a coastal and farming Aeta community in Quezon province, 24% were from a farming community in Pangasinan, 7% were from a farming community in Agusan del Norte, 14% were from an urban community in Cebu City, and the remaining 31% were from an urban community in Quezon City.

Medicinal Uses of *Euphorbia hirta*

The 29 included respondents reported 37 instances of medicinal use of *E. hirta*.

E. hirta is known to the respondents as *tawatawa*, *butobutonesan*, *malagatas*, and *mangagaw*. Table 3 shows that the first known reported medicinal use of the plant by the study participants was in 1948, and it was used for treating fever.

The earliest reported use of *E. hirta* was in the 1940s (for fever), then in the 1980s (for dengue fever, other fevers, and conjunctivitis), and then in the 2000s (for diabetes and typhoid fever).

It was used specifically for dengue starting only in the 1980s. This is probably because dengue as a disease was not in the public mind until the 1980s.

This study is able to document at least four preparations of *E. hirta*, as reported by study participants. These preparations are: (1) decoction for dengue, malaria, and typhoid fever; (2) direct application of sap for conjunctivitis; (3) decoction in combination with other herbs (i.e. *banaba* and *balete*) for diabetes; and (4) juice extraction of fresh macerated plants for gastritis and diarrhea. The procedures for these preparations are outlined in Table 4.

Table 3. Earliest reported medicinal use of *E. hirta* in the Philippines by study participants

Illness	Number of participants who reported usage	Earliest reported use
Fever	8 (21%)	1948
Dengue	17 (46%)	1980
Malaria	6 (16%)	1980
Conjunctivitis	4 (11%)	1980
Diabetes	1 (3%)	2012
Typhoid Fever	1 (3%)	2003

Table 4. Reported preparations of *E. hirta* for medicinal purposes, and their side effects

Indication	Preparation	Side effects
Decoction for treating dengue, malaria, fever, and typhoid fever	<p>A. <i>Using whole plant:</i> Remove the roots. Wash in water. Boil in 3-5 cups of water for 5 minutes. Let cool before drinking. Give 1-2 cups per day for 2-3 days. Stop administration once any side effect is noted.</p> <p>B. <i>Using leaves only:</i> Take a handful of leaves. Wash in water. Boil in 1c up of water for 3 minutes or until the concoction becomes blackish-green. Let cool before drinking.</p> <p>C. <i>Using roots only:</i> Take the roots, wash thoroughly. Boil in water. Let cool before drinking.</p>	Frequent urination Warm urine Heavy sweating
Direct application of sap for conjunctivitis	Take the stem of the plant and wash thoroughly. Squeeze the latex directly into the affected eye once a day for 3 days.	None reported
Decoction in combination with other herbs for diabetes	Boil the whole plant together with banaba and baete leaves. Let cool. Drink.	None reported
Juice extraction of macerated plants for gastritis and diarrhea	Take a handful of leaves. Wash thoroughly and crush/macerate in a clean container. Extract the juice. Give to patient 2x a week on full stomach.	None reported

DISCUSSION

The results of the ethnobotanical survey yielded folkloric uses and reported year of use that are quite consistent with the published literature. Except for cough, gastritis, and diarrhea, the reported folkloric uses of *E. hirta* have been consistent with published literature. Following the path and rigor as applied to *V. negundo* (lagundi), and *B. balsamifera* (sambong), it seems that *E. hirta* may be considered a candidate for mainstreaming as a traditional medicine.

Limitations

The results of this ethnobotanical survey maybe limited by convenient sampling design. Further, while the survey was interviewer guided, the pictures used in the survey tool were not of uniform magnification, which may have led to confusion on the part of the respondents. The study's result maybe used as a baseline for future more comprehensive studies.

CONCLUSION

Euphorbia hirta, locally known as tawatawa, butobutonesan, malagatas, gatasgatasan, and mangagaw, has been used in the Philippines as early as 1948 for treating fever. Since the 1980s, it has also been used for sore eyes, cough, diabetes, dengue, malaria, gastritis, and diarrhea. There are no documented contraindications for use and the only known side effect is increase in urinary frequency. Based on the sampling of this study, therefore, at the current time, according to DOH AO 184 s2004, *E. hirta* may qualify to be registered with the Food and Drug Administration as a traditionally-used herbal product for fever. However, this

study has not found sufficient length of time of traditional use for the treatment of conjunctivitis, cough, diabetes, and dengue, as well as malaria, gastritis, and diarrhea.

Recommendation for future studies

It is recommended that more comprehensive and large scale studies be conducted, including: (1) identification of folkloric uses of *E. hirta* for the treatment of other diseases and (2) determination of different concentrations of extract (crude or semicrude) using the various reported preparations for optimal outcomes for the different reported herbal uses.

Statement of Authorship

All authors have approved the final version submitted.

Author Disclosure

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