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Ethnomedicinal plants used by traditional healers in North Cotabato, Mindanao, Philippines

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Abstract

Traditional medicines remained as the most affordable and easily accessible source of treatment in the primary health care system among diverse communities in the Philippines. However, comprehensive study conducted on the knowledge and practices of traditional healers' medicine in the island of Mindanao are few and poorly documented. Thus, a comprehensive assessment study with the aim of identifying and documenting the medicinal plants used by the traditional folk healers in North Cotabato, island of Mindanao was carried out. Purposive sampling method was used to select traditional medicinal practitioners of the study area. Semi-structured questionnaire, interview and focused group discussion were conducted to gather first hand ethnobotanical information on medicinal plants used for humans. A total of 63 species belonging to 61 genera in 37 families were recorded and identified by the tribal folk healers to treat several ailments such as fever, stomach ache, cough, urinary infections and diarrhea. Leaves were the most commonly used plant part and decoction was the most widely used method of preparation which was mostly administered internally. The documentation of this rich traditional ethno-medicinal knowledge has furnished us with novel information that not only will provide recognition of this undocumented knowledge but also could provide new avenues for pharmacological investigations to improve healthcare for a range of ailments.

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Introduction

Ethnobotany plays an important role in understanding the dynamic relationships between biological diversity, social, and cultural systems. Ethnobotanical approaches are significant in emphasizing locally important plant species, particularly for new crude drugs (Ahmad *et al.*, 2012). Based on research, using plants as medicine contain a wide range of substances that can be used to treat chronic as well as infectious diseases and are rich in secondary metabolites and essential oils of therapeutic importance (Ayyanar *et al.*, 2010). The important advantages claimed for therapeutic uses of medicinal plants in various ailments are their safety besides being economical, effective and their availability.

Despite many ethnomedicinal studies that were performed all over the world, a relative few documentations on medicinal plants have been done in the Philippines (Gruyal *et al.,* 2014).

In recent years, work on ethnobotanical knowledge in the Philippines has increased. However, despite all ethnobotanical studies performed across the country, ethnobotanical documentation in Mindanao are relatively few, some are focusing on well-known indigenous groups like the Pinatubo Negritoes, the Tasadays in Mindanao, the Itawes of Cagayan, the Ibaloi of Benguet province, the Kalanguya of Ifugao and the Subanens of Zamboanga del Sur (Balangcod, 2011; Balangcod and Balangcod, 2011; Morilla *et al.*, 2014). Furhermore, given the increasing pace of forest destruction and loss of traditional knowledge, it is likely that some unknown or poorly known plant species face extinction before their medicinal or other uses can be fully explored.

With further economic development in the Philippines, there is a rapid disappearance of traditional culture and natural resources. In order to preserve traditional medicinal knowledge, it is necessary that research on various plants with therapeutic value are carried out, and the knowledge related to their use should be documented in systematic studies (Borokini *et al.,* 2013).

The share of medicinal plants, the value of the associated indigenous knowledge and practices of the traditional healers in the province of North Cotabato, Philippines are expected to be high. However, there was no comprehensive study conducted on the knowledge and practices of traditional healers' medicine in the area. Thus, this study was undertaken to reveal and document the traditional medicinal plant knowledge and practices of traditional healers' medicine in the aforementioned area. Information gathered will serve as a basis for future pharmacological investigations and on the conservation of both medicinal plants and indigenous knowledge.

Materials and methods

Study area description

The province North Cotabato lies on the eastern part of Region XII and is strategically located in the central part of Mindanao.

It is bounded on the North by the Province of Bukidnon, on the northwest by Lanao del Sur, on the East by Davao City, on the Southeast by Davao del Sur, on the West by Maguindanao Province and on the southwest by Sultan Kudarat Province. The rich vast land resources of the Province stretch over an area of 656,590 hectares representing 36% of the regional land area (1,815,500 hectares) and ranks first in terms of land area among th

e four provinces of Region XII. This study was conducted in the municipalities of Upper President Roxas, Arakan, Magpet, and Matalam province of North Cotabato (Table 1; Figure 1).

These places were chosen as pilot sites because of the number of folk healers residing in the areas representing the tribal people of North Cotabato, Philippines that could provide data useful for design of proper data collection.

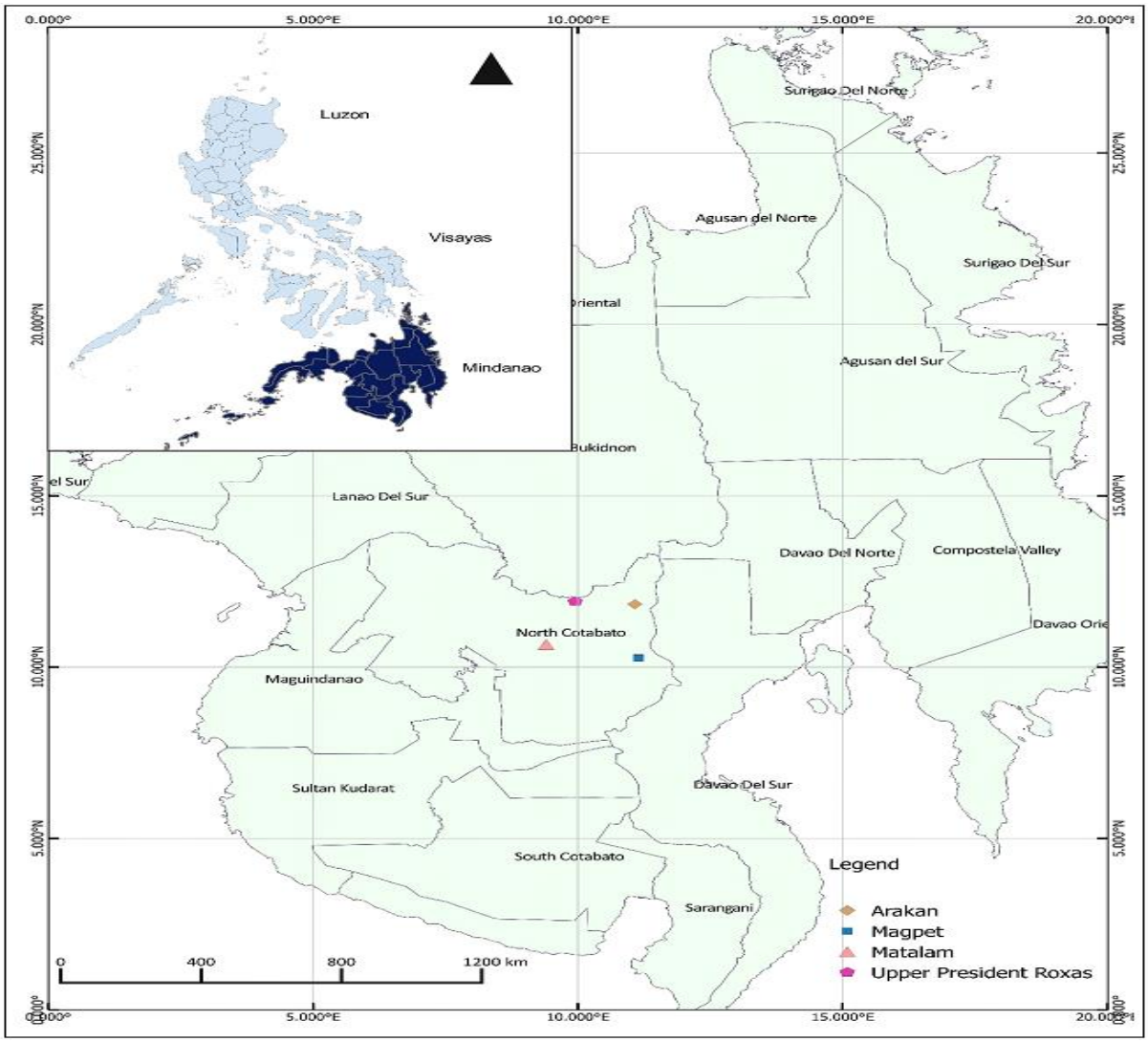

Fig. 1. Map showing the location of the four study sites.

Ethnobotanical data collection

A search of traditional healers in the selected municipalities of North Cotabato province was conducted with the prior permission of and referrals by the community leaders. Thus, twenty Key informants (experienced and willing healers) were purposely selected using information and recommendations of local officials, tribal administrators, knowledgeable elders and religious leaders as well as the local community as shown in Table 1. Researchers started their interaction with each prospective respondent by first explaining the aims and objectives of the project in order to solicit their consent and co-operation before any ethnobotanical data was gathered. During these discussions the researchers emphasized the immense value which each traditional healer's contribution could make to the compilation of a record of traditional knowledge of medicinal plants in the aforementioned area.

Semi structured interviews were prepared, and reliability pretested, field observation and group discussion were accomplished. The interviews and discussions were conducted in the local language, Bisaya, and translated in to English for reporting. Information collected includes local name of the traditional medicinal plant, diseases treated, parts used, and method of preparation and route of administration. Based on ethno botanical information provided by informants, specimens were collected, and identification was done in the field.

Results and discussion

The use of plants for traditional medicine is established, maintained and developed in all indigenous communities in the world. In the Philippines, the knowledge is intrinsic among indigenous groups and is inherited from their great ancestors by oral/verbal communication (Balangcod and Balangcod, 2011; Morilla *et al.*, 2014).

Table 1. Sampled municipalities and their relative location from Google earth.

Sampled municipalities	Approximate relative location		Number of informants selected
	Northing	Easting	
Arakan	7°22'15"N	125°11'01"E	5
Magpet	7°08'19"N	125°11'39"E	5
Matalam	7°11'52"N	124°56'07"E	5
Upper President Roxas	7°22'59"N	125°01'00"E	5

In this study, the relationship between the tribal people from the different community of North Cotabato and plants are demonstrated. A total of 63 species of medicinal plants used by the traditional healers were recorded. These species correspond to 61 genera in 37 families (Table 2).

Table 2. List of medicinal plants used by the folk healers in North Cotabato, Mindanao, Philippines.

Family/Species name	Local names	Plant parts used	Mode of preparation	Medicinal uses
Alliaceae				
Allium odorum L.	Chinese chives/ Kutchai	Leaves	Crushed and drink the extracted juice	Stomach ache
Amaryllidaceae				
Allium sativum L.	Garlic/ Bawang	Tuber	Sliced into pieces and applied directly	Toothache
Lycoris radiata (L'Hér.) Herb.	Hurricane lily/ Two lovers	Tuber	Extraction and apply directly	Pimples
Anacardiaceae				
Mangifera indica Linn	Mango/Mangga	Leaves	Decoction	Diarrhea
Annonaceae				
Annona muricata L.	Soursop/Guyabano	Leaves	Decoction	Hypertension
Anona reticulata L.	Anonas	Leaves	Poultice	Indigestion
Apiaceae				
Centella asiatica L.	Gotu kola/Takip kuhol	Leaves	Decoction, eaten directly	Anemia, Hypertension
Araceae				
Alocasia macrorrhizos (L.) G.Don	Giant Taro	Leaf Stalk	Extraction and apply directly	Bleeding Wounds
Arecaceae				
Cocus nucifera L.	Coconut/Niyog	Fruit (juice),	Drink directly every day, extraction of the endosperm	Kidney stones, constipation
Asparagaceae				
Sansevieria cylindrica Bojer	Bow string/Espada	Leaves	Extraction and apply directly to the affected area	Bleeding wounds
Asphodelaceae				
Aloe vera (L.) Burm.f.	Aloe Vera/ Sabila	Leaves	Poultice then apply directly all over the scalp.	Dandruff
Asteraceae				
Artemisia vulgaris L.	Mugwort/Damong Maria	Leaves	Extraction, infusion and then rubbed all over the body	Fever, Morning Sickness, Cough, Vomiting
Blumea balsamifera (L.) DC.	Ngai camphor/Sambong	Leaves	Decoction and applied directly all over the body	Fever, Cough
Chromolaena odorata (L.) R.M.King & H.Rob.	Siamweed/ Hagunoy	Leaves	Poultice, extraction and apply directly to the affected area, Decoction and applied directly all over the body	Fever, Bleeding Wounds, Cough
Chrysanthemum indicum L.	Indian chrysanthemum/ Rosas de papel	Leaves	Extraction and apply directly to the affected area	Bleeding wounds
Pseudelephantopus spicatus Rohr ex Gleason	Dogs-tongue/Dilang aso	Whole plant, Leaves	Decoction, extraction and apply directly to the affected area	Cough, Stomach ache, Bleeding wounds

Balsaminaceae				
Impatens balsamina L.	Touch me not balsam/ Kamantigui	Flowers Fruits	Extraction and apply as poultice directly to the wound. Extraction and apply directly on the affected area.	Dog, Snake bite Diarrhea
Basellaceae				
Basella rubra L.	Alugbati	Leaves	Poultice, extraction apply directly on the affected area.	Local swelling or Inflammation
Boraginaceae				
Carmona retusa (Vahl) Masam.	Wild Tea/ Tsaang-gubat	Leaves	Decoction, drink 2 glasses a day.	Stomach ache
Cactaceae				
Opuntia cochenillifera (L.) Mill.	Prickly pear/ Palad-palad	Leaves Stem	Poultice, apply directly on the affected area.	Fractures Sprain
Caesalpiniaceae				
Tamarindus indica L.	Tamarind/sampalok	Leaves	Decoction, and use as bath in the morning.	Cough
Caricaceae				
Carica papaya L.	Melon tree/ Papaya	Shoot	Extraction, and apply directly to the wound.	Bleeding wounds
Crassulaceae				
Bryophyllum pinnatum (Lam.) Oken	Life plant / Kataka-taka	Leaves	Poultice and apply directly on the affected area	Fever Toothache Mumps
Cucurbitaceae				
Cucurbita maxima Duchesne	Squash/ Kalabasa	Leaves	Extraction, apply directly on the affected area.	Dandruff
Momordica charantia L.	Bitter gourd/ Ampalaya	Leaves	Extraction, drink and rub all over the body.	Cough Spasm
Euphorbiaceae				
Croton tiglium L.	Croton Oil Plant / Tuba-tuba	Leaves Stem Bark	Extraction, apply directly to the affected area. Poultice immediately to the affected area.	Fever, Bleeding wound, Sprain, Beri-beri
Euphorbia hirta (L.) Millsp	Snake weed/ Gatas-gatas, Tawa-tawa	Stem Leaves Roots	Drink decoction Extraction, squeeze to the affected area.	Dengue Symptoms of Blindness
Manihot esculenta Crantz	Casava / Kamoteng kahoy	Flowers Fruits	Extraction, rub on the affected area, poutice.	Dog and Snake bite, Diarrhea
Fabaceae				
Cassia alata L.	Ringworm bush/ Akapulko	Leaves	Extraction, apply directly to the affected area.	Fungal infection
Cajanus cajan (L.) Millsp.	Pigeon pea/ Kadios	Leaves	Extraction	Diarrhea
Phaseolus lunatus L.	Lima bean/ Patani	Leaves	Extraction, squeeze and apply directly to the affected area.	Ringworm
Lamiaceae				
Clinopodium douglasii (Benth.) Kuntze	Yerba buena	Leaves	Extraction, apply directly to the affected area.	Bleeding wounds
Gmelina arborea Roxb.	Beechwood/Gmelina	Leaves	Poultice and rub all over the body	Fever
Plectranthus scutellarioides (L.) R.Br.	Painted nettle/ Mayana	Leaves	Extraction, Poultice	Cough, Bleeding wounds, Boil, Cough, Sprain
Plectranthus aaboinicus (Lour.) Spreng.	Oregano/Suganda	Leaves	Decoction, poultice, and extraction.	Cough, Sore eyes
Ocimum basilicum L.	Basil/ Sangig	Seed	Extraction and apply directly to the affected area.	Sore eyes
Premna odorata Blanco	Fragrant premna/ Alagaw	Leaves	Decoction, infusion	Cough
Vitex negundo L.	Chaste tree / Lagundi	Leaves	Decoction, extraction then apply directly to the affected area, poultice, infusion.	Fever Cough, Malaria

Mentha spicata L.	Spearmint	Leaves	Decoction	Stomach ache
Lauraceae				
Persea americana Mill.	Avocado	Leaves Seeds	Decoction, extraction then apply directly to the affected area.	Stomach ache Toothache
Liliaceae				
Allium cepa L.	Spring onions/ Sibuyas dahon	Leaves	Decoction	Stomach ache
Malvaceae				
Abelmoschus esculentus (L.) Moench	Ladies finger / Okra	Seeds	Decoction	Fever
Gossypium hirsutum L.	Cotton/ Gapas	Roots	Decoction	Hemorrhage
Sida acuta Burm.f.	Broom grass/ Sihigon	Leaves	Decoction	Stomach ache
Meliaceae				
Sandoricum koetjape (Burm.f.) Merr.	Cottonfruit/ Santol	Leaves	Decoction then use as bath.	*Cough*
Menispermaceae				
Tinospora crispa (L.) Hook.f. & Thomson	Heavenly alexir/ Makabuhay	Stem	Decoction	Stomach ache
Moringaceae				
Moringa oleifera Lam.	Horse radish tree/ Malunggay	Leaves	Extraction then apply directly to the wound.	Bleeding wounds
Musaceae				
Musa x paradisiaca L.	Banana/ saging	Matured fruits	Decoction	Diarrhea
Myrtaceae				
Psidium guajava L.	Guava/Bayabas	Leaves	Decoction	Stomach ache, Diarrhea
Oxalidaceae				
Averrhoa carambola L.	Star fruit/ Balimbing	Leaves	Decoction, cool down, use as cold compress.	Fever
Phyllanthaceae				
Phyllanthus acidus (L.) Skeels	Gooseberry/ Kamias	Leaves Fruits	Decoction then use as cold or hot compress. Poultice then apply durectly on the affected area.	Fever Mumps
Poaceae				
Cymbopogon citratus (DC.) Stapf	Lemon grass/ Tanglad	Leaves Roots	Decoction, extraction then rub on the forehead.	Fever Hypertension Diarrhea
Eleusine indica (L.) Gaertn.	Goosegrass/ Wiregrass	Leaves	Decoction, tie on the affected area.	Sprain Gas pain
Imperata cylindrica (L.) P.Beauv.	Cogon grass/ Cogon	Roots	Decoction	Diarrhea
Paspalum conjugatum Bergius	Carabao grass	Leaves Stem Roots	Decoction, drink and rub all over the body.	Cough Hemorrhage
Rutaceae				
Citrofortunella microcarpa (Bunge) Wijnands	Chinese orange/ Kalamansi	Fruits	Extraction	Cough
Sapotaceae				
Chrysophyllum cainito L.	Star apple/ Caimito	Leaves	Decoction	Diarrhea
Solanaceae				
Capsicum frutescens L.	Chili pepper/ Siling labuyo	Leaves	Extraction then apply directly all over the body.	Fever
Solanum lycopersicum L.	Tomato / Kamatis	Fruits	Extraction, heat and apply directly to the affected area.	Toothache Burns
Verbenaceae				
Lantana camara L.	Coronitas/ Baho-baho	Leaves Flower	Decoction	Cough

Zingiberaceae				
Curcurra longa L.	Turmeric/ Dulaw	Roots, Rhizomes	Extraction, infusion, poultice then apply directly to the affected area.	Arthritis
Kaempferia galanga L.	Resurrection lily/Dusol/ Gisol	Rhizome, Leaves	Extraction, use as poultice to the affected area.	Bleeding wounds, Mumps, Prickle
Zingiber officinale Rosc.	Ginger / Luya	Rhizomes	Extraction, apply directly to the affected area; Decoction, add lemon, and drink directly while warm.	Bleeding wounds, Cough

The highest number of species was represented by family Lamiaceae (eight species) followed by family Asteraceae (five species), Poaceae (four species), Euphorbiaceae, Fabaceae, Malvaceae, Zingiberaceae (three species), Amaryllidaceae, Annonaceae, Cucurbitaceae, Solanaceae (two species) and the rest of the plant families with a single species only. Based on the responses and personal observations, the common health problems are cuts/wounds and stomach ache ailments. As access to modern healthcare is limited, majority of the people in North Cotabato resort to traditional healthcare practices although some use both traditional and modern medicine.

Based on the responses and personal observation, the common health problems are respiratory diseases and stomach ailments. As access to modern healthcare is limited, majority of the Kalanguya still resort to traditional healthcare practices although some use both traditional and modern medicine.

The family of Lamiaceae, commonly known as the mint family, provided a large number of medicinal plant species in this study. This family is important for flavors, fragrance and medicinal purposes. A study on ethnobotany, pharmacology and phytochemistry of Lamiaceae showed that some species have been used in folk medicine as remedies in the treatment of several disorders (Yalçın *et al.*, 2007). Another significant family is Euphorbiaceae, which was also observed to have medicinal properties due to the presence of certain chemical constituents. In an investigation conducted in India, many of the species in Euphorbiaceae have been used by local population in traditional medicine as remedies against several diseases (Kumar and Chaturvedi, 2011).

The Department of Health or DOH in the Philippines has recommended the following ten (10) species of medicinal plants in its traditional health maintenance program namely: *Blumea balsamifera*, *Psidium guajava*, *Allium sativum*, *Momordica charantia*, *Vitex negundo*, *Cassia alata*, *Carmona retusa, Mentha sp., Quisqualis indica,* and *Peperomia pellucida* (Stuart, 2018). The pharmacological effects of these plants have been clinically proven to have medicinal values. Out of these ten medicinal plants recommended by the DOH, the eight species mentioned above were also reported in this study, and these plants were utilized by the traditional herbalists in North Cotabato, Philippines.

The common ailments in North Cotabato that are treated using the medicinal plants are stomach ache, cuts and wounds, fever, cough, diarrhea, toothache, hypertension and mumps. For immediate treatment of toothache, sliced tuber of garlic (*Allium sativum*) and juice from the extracted leaves of avocado (*Persea americana*) are used.

Leaves were further observed to be the most widely used plant part. Respondents also indicated the use of stem and flowers in the treatment. Other of the plant parts such as fruit, seeds, rhizome and tubers were rarely mentioned. According to Kumar and Chaturvedi (2011), leaves are the site of manufacture and storage of many chemical compounds through photosynthesis including alkaloids, tannins, coumarines, flavonoids, essential oils and inulins which are active component of most herbal preparation in high concentration. The use of the leaves also provides conservation for the plants compared to those remedies that require roots or whole plants in which the plant should be uprooted. Besides, leaves are the most abundant plant part that are easier to collect and can also be regenerated.

Moreover, the consumption of various leaf extracts ensures better preparation of active ingredients for medication (Focho *et al.*, 2011). Similar studies conducted reported that most of the common remedies were taken from the leaves which also include modified leaves and young shoot of the plants (Balangcod and Balangcod, 2011; Olowa *et al.*, 2012; Blasco *et al.*, 2014; Morilla *et al.*, 2014; Fiscal, 2017). Some of the plant parts are utilized to cure more than one ailment. For instance, the leaves of *Artemisia vulgaris* are used to cure fever, morning sickness, cough and vomiting. Other parts such as the rhizome of *Zingiber officinale* were used in treating bleeding wounds and cough. Different parts obtained from a plant species were also noted to treat various ailments. *Impatiens balsamina* for example is used as remedy against dog and snake bite as well as diarrhea by utilizing its flowers and fruits, respectively.

Basically, the method of preparation by the traditional healers of North Cotabato is with the use of the intact plant through pounding, crushing, decoction, heating, boiling, steaming, burning and drying. Both internal and external methods of administration were demonstrated in the present study. In most cases, the administration routes were external rather than internal differing significantly from practices (Giday and Ameni, 2003; Ragunathan and Solomon, 2009; Upadhyay, 2011).

The most common method is decoction or boiling, similar to the report of Rachid *et al.* (2012), Blasco *et al.* (2014) and Fiscal (2017). With the extensive use of decoctions, there is no written document on how these preparations were exactly prepared, leading to scrutinize how excessive amount of heat could possibly degrade bioactive phytochemical constituents, particularly the antioxidative polyphenolic substances which have several therapeutic uses. The use of poultices, emollients and rubefacients as topical preparations gave no information on hygienic considerations as most of the plant parts used herein are crushed. The leaves which are expected to contain most of plants' bioactive constituents are the most widely used in this survey.

Conclusion

The study has demonstrated that many plant species play an important role in local healing practices and that knowledge of traditional medicine is still utilized and plays a significant role in North Cotabato. The documentation of this rich traditional ethno-medicinal knowledge has furnished us with novel information that not only will provide recognition of this undocumented knowledge but also could provide new avenues for pharmacological investigations to improve healthcare for a range of ailments. However, the utilization of medicinal plants for variety of added values may result in additional pressures to these resources. Thus, this study calls for practical solutions like domestication, and *in-situ* conservation to reduce pressures on the medicinal plants.

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