

Ethno Medicinal Plant Identification and Utilization in Ayoke Island, Cantilan Surigao del Sur, Philippines

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ABSTRACT

The objective of the present study was to document and preserve ethnomedicinal knowledge used to treat different human ailments by the residents of Sitio Ayoke. Fieldwork was conducted between September to October 2020 using semistructured questionnaires. Data were collected from 50 residents as informants through a questionnaire survey. Residents in the study area use 35 plant species mostly herbs (50%) for ethnomedicinal and other purposes. The highest F_{IC} values (0.84) were obtained each for muscle pain followed by cough and colds (0.81) and diarrhea (0.80). The results showed a high dependency of local inhabitants on medicinal plants in meeting their primary health care needs. Moreover, traditional knowledge has been restricted to elder people. Protection measures should be taken to conserve precious multipurpose species that are facing overexploitation. Medicinal plants treating major ailments in the area may be subjected to phytochemical and pharmacological investigations for the identification of bioactive compounds.

a. Background information about the research project

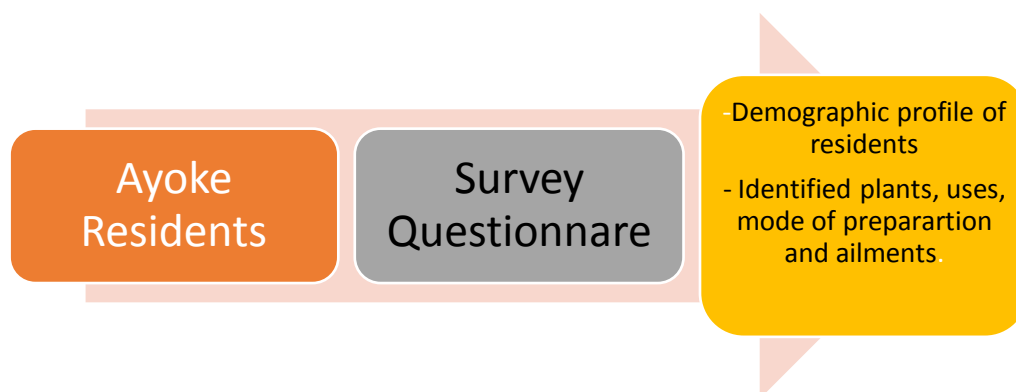
Plant resources have remained an integral part of human society throughout history. World Health Organization (WHO) estimated that about 80% of the developing world's population uses

traditional herbal medicines. In developing countries, traditional medicines provide a cheap and alternative source for primary health care due to the lack of modern health facilities, their effectiveness, cultural priorities, and choices. The folk knowledge on traditional herbal remedies usually transfers from one generation to another generation through oral or verbal communication. People from rural areas have minimum access to health care services, which is one of the main reasons for the utilization of traditional herbal medicines as their culture.

b. Issues that the project wishes to address

One of the barangays in Cantilan is Ayoke, an island far from the town in which their main livelihoods are fishing, copra-making and at the same time the barangay is far from the health facilities. Moreover, the old age residents being the main bearer of the ethnomedicinal knowledge are gradually heading towards extinction since they pass away, and the younger generation is not interested in taking it. It has been observed that herbal practitioners have sufficient traditional knowledge, but mostly, they are reluctant to disclose it to other community members. Hence, the current study was planned with the objectives to record the medicinal plants and their traditional usage.

c. **Conceptual Framework**



d. **Significance of the study**

The ethnomedicinal knowledge of the Ayokanhon particularly the old age community members being the main bearer of this expertise were documented in terms of the plant used, mode of preparation and the ailments to be treated.

e. **Objectives of the study**

The study aimed to:

1. Established a demographic profiling of the residents using herbal plants.
2. Identity all herbal plants used by the residents.
3. Document the uses, mode of preparation and ailments treated.

III. REVIEW OF LITERATURE

Medicinal plants have important contributions to the healthcare system of local communities as the main source of medicine for the majority of the rural population [1]. About 60% of the world population and 80% of the population of developing countries rely on traditional medicine. According to Bhat et al. [2], more than 4.5 billion people in the developing world rely on medicinal plants as components of their healthcare. The highest popularity of medicinal plants in rural areas is due to the high cost of allopathic drugs and side effects [3].

Documentation of the medicinal use of plants through ethnobotanical studies enables the development of contemporary drugs and treatments as well as for plant conservation [4, 5]. Many ethnobotanical studies around the world, including

in Indonesia, report the use of herbal plants for the healing process, which has been in use for several generations in their respective societies [6, 7]. Though the cultural diversity in Indonesia contributes to the extensive this traditional knowledge [8], access to this is limited. Traditional knowledge is usually passed on orally and often person-specific [9]. Therefore, the knowledge is often owned by tribal leaders, village heads, elders, heads of kampung (small village), or traditional healers in the community or tribe [10].

IV. METHODOLOGY/MATERIALS AND METHODS

4.1 Study Area

The present study was carried out in Sitio Ayoke (Figure 1). Ayoke Island is a Marine Protected Area Sitio Ayoke, Brgy General Island, Cantilan, Surigao del Sur. Cantilan is located in the northeastern part of Mindanao; bounded on the north by the Pacific Ocean; located on 9° 11' - 9° 26' latitudes and 125° 39' - 126° 04' longitudes. Ayoke will be reached in 45 min to 1 hr by boat. Around 100 households and almost 600 people heavily rely on coconut farming and fishing in its 2,022 hectares of almost 42,000 hectares of municipal waters. Ayoke lacks modern health facilities; hence, they are more dependent upon natural resources especially plants for their healthcare and to compensate for their low income as well.



Figure 1. Map of the study area.

4.2. Data Collection

Fieldwork was carried out between September to October 2020. A total of 50 informants were selected based on information provided by the local administrator and elder people of the study area. The informants were native-born or had been living in the study area for a long time. Before data collection, a group meeting was held with the help of the purok president to explain to the informants the objectives of the present study and guarantee that their knowledge would be a great contribution in conserving the indigenous knowledge of the area. Before the survey, a semi-structured questionnaire was designed and pretested with five informants to find out its suitability for the present study and later modified according to the response of the resident. The revised questionnaire was used for gathering data from individual informants about the medicinal plants of the study area. The questionnaire contained no strict questions and informants were allowed to speak spontaneously and without pressure. Our final purpose was to obtain the complete list of medicinal plants used and/or known by each respondent. All interviews were carried out in the local language (Surigaonon) of the study area. Questionnaires designed to the informants about medicinal plants' knowledge were mainly focused on the local name of a particular medicinal plant, types of ailments treated, mode and method of preparation, parts of the plants used, mode of administration, and usable duration regarding each medicine. Standard taxonomical procedures were used in gathering plant specimens, which were pressed, dried, identified, and deposited in the herbarium at the Mindanao University of Science and Technology (MUST)

and the student herbarium at the Institute of Biological Sciences, University of the Philippines Diliman. Photographs of every specimen were taken during the survey. Plant identification was carried by referring to various works of literature such as [11-12].

4.3 Data Analysis

4.3.1 Informant Consensus Factor (F_{IC})

Descriptive statistics were used to examine and summarize the ethnobotanical data. Based on the information obtained from the informants, the ailments reported were grouped into a total of 11 categories. The F_{IC} results could be useful in prioritizing medicinal plants for further scientific validation of plants and plant products [13,14], as pharmacologically effective remedies are expected from plants with higher F_{IC} values [15]. The informant consensus factor (F_{IC}) was calculated to estimate user variability of medicinal plants [16,17]. F_{IC} values range from 0.00 to 1.00. High F_{IC} values are obtained when only one or a few plant species are reported to be used by a high proportion of informants to treat a particular ailment, whereas low F_{IC} values indicate that informants disagree over which plant to use [16]. High F_{IC} values can thus be used to pinpoint particularly interesting species for the search of bioactive compounds [17]. F_{IC} is calculated using the following formula:

$$F_{IC} = \frac{N_{ur} - N_t}{N_{ur} - 1}$$

where N_{ur} is the number of individual plant use reports for a particular illness category and N_t is the total number of species used by all informants for this illness category.

V. RESULTS AND DISCUSSION

Among the 50 informants, 7(14%) were male and 43 (86%) were female. The largest proportion of the respondents was of the elderly, above 50 years old (Table 1). The majority of females (86%) were housewives while 12% of males were fishermen followed by 2% surfer. It was observed during the research study that women were more concentrated as compared to the men of

this area. The study indicates that the aged people of the area have traditional knowledge about more numbers of medicinal plants as compared to younger people which might be due to their least interest. Hussain et al. [32] in South Waziristan and Parveen et al. [33] in the Thar Desert of India have also reported that people older than 35 years of age are more knowledgeable than the young ones on medicinal plants and their uses.

Table 1
Gender, age group, status and occupation of the interviewed people in Sitio Ayoke.

	Total	Percentage
Gender		
Male	7	14%
Female	43	86%
Age groups		
21-29	1	2%
30-39	3	6%
40-49	16	32%
50-59	18	36%
60-69	7	14%
70-79	3	6%
80-89	2	4%
Status		
Married	42	84%
Single	2	4%
Separated	1	2%
Widow	5	10%
Occupation		
Housewife	43	86%
Fisherman	6	12%
Surfer	1	2%

Table 2.
Ethnomedicine plant used in Sitio Ayoke

Series No.	Scientific Name	Family	Local Name	Habit	Plant part used	Preparation	Mode of application	Ailment treated
1	<i>Pseudelephantopus (Juss.) Rohr</i>	Asteraceae	Kukogbanog	herbs	Leaves, roots, stem	Boil with water	Drink three times a day	For cough and fever
2.	<i>Urena lobata var. americana (L.f.) Gürke</i>	Malvaceae	Dayupang	shrubs	Leaves	Crushed the leaves	Apply the extract on the forehead and body	For fever
3	<i>Cynosurus pectinatus Lam.</i>	Poaceae	Bila-bila	herbs	Leaves, roots, stem	Boil with water for a	Drink three times a day	For fever and as diuretic

						longer time		ic
4	Artemisia coarctata Frs elles	Aster aceae	Hilbas	herbs	Leaves	Preheat the leaves, extract the juice	Applied on the chest and back to loosen the phlegm.	For cough , “pano hot” and fever
5	Eriodendro manfractuoso um DC.	Malv aceae	Gapas	shrubs	Leaves	Preheat the leaves, extract the juice	Rub or massage on the chest and back.	For cough and fever
6	Jatropha curcas	Euph orbia ceae	Tuba-tuba	shrubs	Leaves, stem, roots	-scrape the stem preheat , squeeze to produce juice. - Preheat the leaves, extract the juice -boil the stem with water	-apply externally rub and massage on the body. - Drink three times a day	- Relief of flatu lence or panu hot that cause s cough . -As antisp asmo dic
7	Coleus aromaticus	Labi atae	Garabo	herbs	Leaves	Preheat the leaves and extract juice with agridul si	Take one tablespoon three times a day	Relief and soften cough
8	Persea americana Gaertn	Laur aceae	Abukado	Tree	Leaves	Boil with water	Drink three times a day	For diarrh oea, relief stoma ch- ache
9	Psidium guajava	Myrt aceae	Bayabas	shrubs	Young leaves	Boil with water	Externally, used as	Disinfect the

							washing or antiseptic Internally , drink three times a day	wound, for diarrhoea
10	Chrysophyllumcainito	Sapotaceae	Kaymito	Tree	Leaves	Boil with water	Drink three times a day	For diarrhoea, relief stomachache
11	Blumea balsamifera	Compositae	Sagbong	herbs	Leaves	Boil with water	Drink four times a day to induce urination.	Treat kidney infection
12	Chromolaena odorata	Asteraceae	Hagonoy	herbs	Leaves	Pound leaves to soften and extract the juice	apply to affected area	For boils
13	Kyillingamonocephala	Cyperaceae	Bosikad	herbs	Stem and leaves	Soaking in water during night time	Drink the water morning time.	Relief headache, muscle pain, fever
14	Ipomoea batatas	Convolvulaceae	Ugbos nan Kamote	runner	Young leaves	Blanch the leaves	Eat the blanched leaves	As source of vitamin Iron.
15	Moringa oleifera L.	Moringaceae	Kalamungay	shrubs	Leaves	Crush the leaves	Apply on the open wound	Abate bleeding
16	Vitex negundo L	Rutaceae	Agriidulsi + Garabo	Shrubs herbs	fruit juice + Leaves	Extract juice + Preheat then extract juice then mix	Take one tablespoon three times a day	Relief cough

17	Vitex negundo L	Verbenaceae	Lagundi	shrubs	Leaves	Infusion of leaves	Drink three times a day.	For cough and colds
18	Euphorbia hirta L	Euphorbiaceae	Tawa-tawa	herbs	leaves and stem	Boil in water	Drink three times a day.	For dengue fever
19	Zingiber officinale Roscoe	Zingiberaceae	Luja	rhizomes	Rhizome	Pound and extract the juice and mixed with oil	Rub on affected area to induce gas pain.	For Stomach-ache
20	Coleus blumei L	Zingiberaceae	Duyaw	rhizomes	rhizome	Preheat the rhizome and extract the juice mixed with coconut oil	Apply directly on the affected area.	Heals bruise and boils
21	Premna odorata Blanco	Verbenaceae	Adgaw	shrubs	Leaves	Boil with water	Drink four times a day	Relief and loosen cough
22	Tinospora crispa (L).Hook.f. & Thomson	Menispermaceae	Panyawan	Vine	Stem	Boil in water	Drink three times a day as needed	For diabetes and for stomach-ache
23	Anona muricata L.	Anonaceae	Guyabano	Tree	Leaves	Boil with water	Drink one glass three times a day, during ailment occur.	Treat for diarrhoea, relief stomach-ache
24	Cymbopogon citratus	Gramineae	Tangyad	Herbs	Leaves	Boil with water	Drink three times a day	Lower hypertension

25	Portulacaole raceae L.	Piper aceae	Sinaw- sinaw	herbs	leaves and stem	Infusio n of leaves	Drink four times a day, induce urination	For kidne y infecti on, arthrit is
26	Eleusine indica (L.) Gaetn	Gram inae	Bila-bila	herbs	Leaves	Boil in water	Drink three times a day	As diuret ic
27	Coleus blumei	Labia tae	Mayana	herbs	Leaves	Pound until soft and juicy	Apply the leaves directly to affected area.	For mump s and boils
28	Bryophyllu mpinnatum (Lam.) Oken	Crass ulace ae	Anghelika	herbs	Leaves	Pound leaves until soft	Apply and attach to the affected area.	Relief of tootha che
29	Phyllanthus humilis Salisb.	Euph orbia ceae	Talikod	herbs	Leaves and stem	Boil with water	Drink three times a day to induce urination.	For kidne y infecti on
30	Terminalia catappa L.	Comt retac eae	Talisay	Tree	Leaves	Pound leaves until soft	The extract directly massage to the body	For fever
31	Euphorbia neriifolia Linn.	Euph orbia ceae	Soro-soro	herbs	Leaves	Pound leaves until soft	apply to affected area	For boils
32	Chromolaen a odorata	Aster aceae	Hagonoy	shrubs	stem	scrape the stem preheat , squeeze to produc e juice	apply externall y rub and massaged on the body	Relief heada che, muscl e pain, fever
33	Ephemerum discolor Moench	Cam elina ceae	Bangka- bangaan	herbs	Liso	Boil with water	Drink three times a day	For diarrh ea

34	Pipturusarborescens	Urticaceae	Handamay	herbs	Leaves	Crushes the leaves	Apply to the affected area.	Treatment for herpes simplex
35	Cordia brownie A.DC	Boraginaceae	Anonang	shrubs	Stem	scrape the stem preheat, squeeze to produce juice	Apply externally rub and massaged on the body	Relief of flatulence or panuhot that causes cough and fever

The present study provides information on ethnomedicinal uses of 35 plant species belonging to 25 families (Table 2, Fig. 1). Out of 25 families, the dominant family with the highest number of medicinal plants was Euphorbiaceae (4 species) followed by Asteraceae(3 species), and 2 species each in Malvaceae, Labiatae, Graminae, Verbenaceae, Zingiberaceae, and the rest of the families composed of one species. Moreover, the

informants mostly use herbs (50%) followed by shrubs (27%) (Table 2, figure 2). The study revealed that the people of Sitio Ayoke have been using plant resources for their various ailments. The local people know the useful plants and preparation of recipes through personal experience and ancestral prescription and long utility [18].

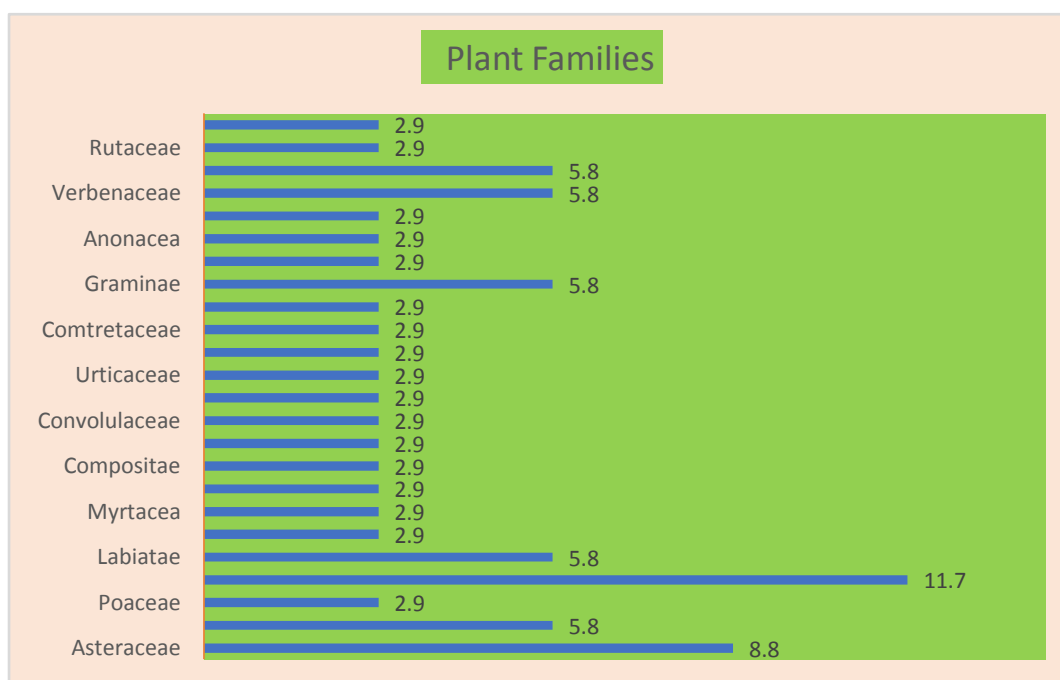


Figure 1. Plant Families used by the informants

The dominance of medicinal plant species from families of Euphorbiaceae, Asteraceae, Malvaceae, Labiatae, Graminae, Verbenaceae, and Zingiberaceae could be attributed to their wider distribution and abundance in the flora area [19,20]. As leaves and stems of medicinal plant species were reported to be harvested for most remedy preparations, the gathering of medicine may have a little negative impact on the species. It is well recognized by conservationists that medicinal plants primarily valued for their root parts and those which are intensively harvested for their bark often tend to be the most threatened by

overexploitation [21]. Results also showed prominent use of freshly harvested plant parts for traditional remedy preparation used against various ailments. The recurrent use of freshly harvested medicinal plant materials in the area is reported to be related to the notion of attaining high efficacy using active ingredients of fresh plant parts which they thought could be lost on drying. Other ethnomedicinal inventories [22, 23] have also indicated wide use of fresh plant materials for remedy preparations due to reportedly better efficacy-related factors than the use of dried plant materials.

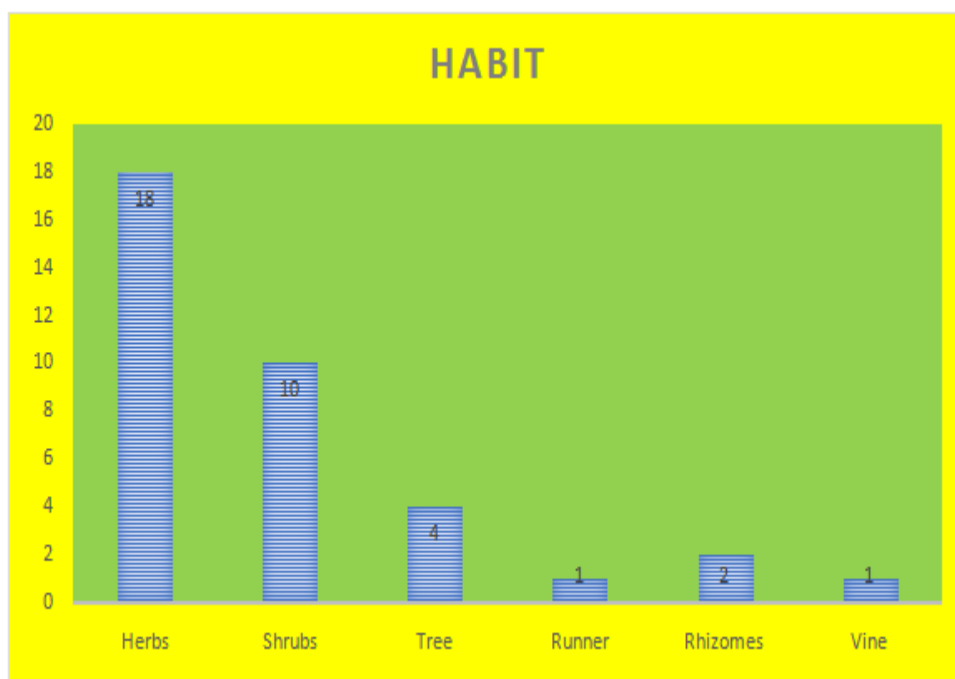


Figure 2. Habit of Ethnomedicinal plant used

The present study elucidates that the herbs are the major growth form used in the area for curing human ailments followed by shrubs. High usage of herbs in some studies could be an indication of their abundance, easy availability, and

centuries-old traditional knowledge of the healers. The trend of using more herbaceous plants could be advantageous as it is easier to cultivate them when they are short in supply(24).

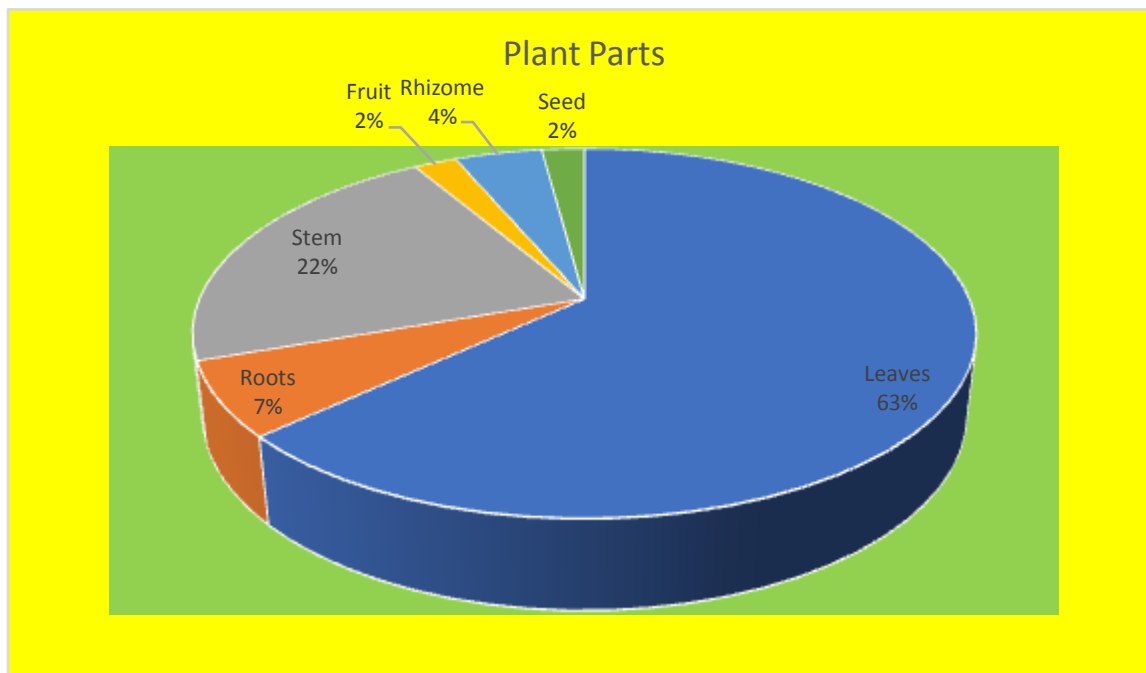


Figure 3. Different Plant Parts used by informants

Different parts of medicinal plants are used as medicine by Ayokeresidents(Figure 3). Among the different plant parts, the leaves (63%)and stem (22%) are the most frequently used for the treatment of diseases followed by whole plant parts, roots, fruit, rhizomes, and seeds. Ethnomedicines were mostly taken through the oral

route (57%) followed by topical (43%). The decoction is the most common method used for remedy preparation (Table 2). Among the ailments, treated cough and colds are the highest followed by muscle pain and fever (Table 3). The informants used usually fresh plant parts for the preparation of ethnomedicines (Table 2).

Table 3. Informant consensus factor for different ailment categories

Ailments	Plant species	Number of taxa (Nt)	Number of use reports (Nur)	F _{IC}
Diarrhea	Persea americana (6), Psidium guajava (4), Chrysophyllum cainito (3), Ephemerum discolor (3)	4	16	0.80
Stomach ache	Jatropha curcas (6), Euphorbia hirta (1), Eriodendromanfractuosum (5), Chromolaena odorata (1), Blumea balsamifera (5), Artemisia coarctata (4), Coleus aromaticus (1), Jatropha curcas (1), Zingiber officinale (1)	9	25	0.66
Cough	Blumea balsamifera (4), Artemisia coarctata (9), Coleus aromaticus (24), Jatropha curcas (2), Anona muricata (1), Portulacaoleraceae (1), Pseudelephantopusspicatus (1), Eriodendromanfractuosum (2), Vitex negundo (5), Vitex negundo (5), Cordia brownie (1)	11	55	0.81
Fever	Blumea balsamifera (4), Artemisia	13	51	0.76

	coarctata (10), Jatropha curcas (7), Portulacaoleraceae (1), Euphorbia hirta (6), Pseudelephantopuspicatus (3), Cynosurus pectinatus (7), Eriodendromanfractuosum (4), Kyllingamonocephala (5), Premna odorata (1), Cordia brownie (1), Terminalia catappa (1), Urena lobata (1)			
Kidney infection	Blumea balsamifera (2), Anona muricata (1), Cymbopogon citratus (1), Portulacaoleraceae (7)	4	11	0.70
Boils	Coleus blumei (2), Coleus blumei (1), Euphorbia neriifolia (1)	3	4	0.33
Muscle pain	Blumea balsamifera (10), Artemisia coarctata (13), Eriodendromanfractuosum (7), Chromolaena odorata (2), Jatropha curcas(16), Tinosporacrispa (1), Zingiber officinale (2), Cynosurus pectinatus Lam (1), Kyllingamonocephala (1).	9	53	0.84
Wound	Moringa oleifera (3), Psidium guajava 1)	2	4	0.66
Vitamins	Ipomoea batatas (2), Moringa oleifera (1)	2	3	0.55
Hypertension	Cymbopogon citratus (4), Coleus blumei (1)	2	5	0.75
Diabetes	Tinosporacrispa (2)	1	2	1.0
Dengue	Euphorbia hirta (3)	1	3	1.0
Toothache	Bryophyllumpinnatum (4)	1	4	1.0

About 14 ailments were identified from the investigated area. The highest F_{IC} values were muscle pain (0.84), cough and cold (0.81), and diarrhea (0.80) (Table 3). This may be related to a high prevalence of these ailments. Muscle pain, cough, and colds or respiratory infections and diarrhea are a major concern not only in the study area but also in the whole country and result in a high mortality rate if not treated promptly [28]. The informants of Sitio Ayoke mostly used ethnomedicines in decoction form. The medicinal plant decoctions for various ailments might be related to their proven effectiveness over many years of trial and indigenous knowledge accumulated on the efficacy of such preparations. The finding is in line with other studies indicating that the oral route is the most preferred mode of administration [25,26]. According to (27) preparation of plant medicines from several plants, parts is believed to cure diseases more rapidly compared to single plant medicine.

In the present study, the lowest F_{IC} value below 0.55 was only recorded for boils ailment, which would typically result from the plant used to treat rare diseases; however, all other diseases have F_{IC} value above 0.55, suggesting that the present survey addressed medicinal plant species commonly used to treat common human ailments in the study areas. The high F_{IC} value medicinal plants contain a variety of bioactive compounds and many of them have been scientifically proved by various studies. For example, the natives of the area are using a large number of plants like *Blumea balsamifera*, *Artemisia coarctata*, *Eriodendromanfractuosum*, *Chromolaena odorata*, *Jatropha curcas*, *Tinosporacrispa* and so forth for the treatment of muscle pain, cough and colds and diarrhea, while many plants like, *Anona muricata*, *Cymbopogon citratus*, *Portulacaoleraceae* are used for kidney infection. Further, *Portulacaoleraceae*, *Euphorbia hirta*, *Pseudelephantopuspicatus*, *Cynosurus pectinatus*, *Eriodendromanfractuosum*, *Kyllingamonocephala*, *Premna odorata*, *Cordia*

brownie , Terminalia catappa , Urena lobata used for fever.

The aforementioned plants contain a variety of chemical constituents like tannins, saponins, alkaloids, flavonoids, and phenol compounds that are responsible for their therapeutic action against such diseases [29–31].

IV. CONCLUSION

In conclusion, Sitio Ayoke has plenty of medicinal plants and the people of the area are highly dependent on these plants for medicinal and other ethnobotanical purposes. The people of the area have tremendous traditional knowledge regarding the utilization and preparation of various ethnomedicinal remedies. Moreover, they are using some medicinal plants for multipurpose and posing great pressures on certain medicinal plants like *Jatropha curcas* , and *Artemisia coarctata*. Hence, natives should be educated regarding the sustainable usage of medicinal plants. The persistence of traditional knowledge is more among old age people; however, as a matter of concern, young people are taking less interest in such knowledge due to multiple reasons. As such, studies on the documentation of ethnomedicines may be extended to other areas for the protection of traditional knowledge. Further phytochemical analysis, pharmaceutical application, and clinical trials are therefore recommended in order to evaluate the authenticity of ethnomedicines to scientific standards.

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