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A comparative analysis of ethnobotanical use of medicinal plants by Q'eqchi' Maya of Sothern Belize and the Yucatec Maya of Northern Belize

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Abstract

A study was conducted among the indigenous people of Belize to understand the similarities and differences of the medicinal use of plants. The research focused on the medicinal use of plants by Q'eqchi' Maya of Toledo district and the Yucatec Maya of Orange walk and Corozal districts of Belize. The southern Belize is mostly tropical rain forest and the northern districts are mostly swamps and lowland savannah. The study revealed that majority of the herbalists of the Q'eqchi' Maya were males whereas majority of the Yucatec Maya herbalists were females. Majority of the plant species used by the Yucatec Maya were herbs whereas most of the plants used by Q'eqchi' Maya were shrubs. Both groups mostly used leaves as the main source of medicine and most of the times leaves were boiled in water and taken orally to cure many ailments. In both culture groups, the herbalists were providing mostly free service to their respective communities as a social service. The Yucatec Mayas used even resin, sap and thorns of plant species in medicinal preparations while the Q'eqchi' Maya used many epiphytes in their medicinal preparations. Both ethnic groups believed in culture bound syndromes and the Q'eqchi' Mayas even treated mental disorders. Infections or infectious diseases were the common ailment treated by both groups. Both groups passed on their herbal knowledge through their family hierarchy. Both ethnic groups expressed that deforestation and other human activities are causing some of the important medicinal plants to disappear or make it harder to find. Both cultures treated snake bite. Some plants were used to treat more than one ailment and some diseases were treated with a combination of plants combined together.

Keywords: Ethnobotany, medicinal plants, Q'eqchi Maya, Yucatec Maya

1. Introduction

Belize is a small English speaking country in Central America with a population of about 340,000. Belize as a country hosts several ethnic groups including the Creole, Garinagu, Mayans, and Mestizo ^[1]. Before the arrival of the Europeans, the Maya thrived in Belize and lived in an area that stretched from Central Mexico, through to El Salvador ^[2]. The linguistic family called "Mayan" contains about 30 closely related but mutually unintelligible languages, which is the result of a long period of internal divergence. The modern-day Maya of Belize are descendants of the ancient Mayas that inhabited these areas. Three groups of Maya are living in Belize; these are the Q'eqchi' Maya, the Mopan Maya, and the Yucatec Maya. The Q'eqchi', who inhabits the Toledo district of Southern Belize as well as the neighbouring Guatemala, is the least acculturated of the three groups because they continue to live in relatively remote areas ^[3]. In the southern districts of Belize, Q'eqchi' Mayas and Mopan Mayas have maintained much of their cultural practices, but the Yucatec population that came after the Caste War has almost entirely integrated in the Corozal and Orange Walk areas. The Maya lowlands, which include parts of Belize, Mexico and Guatemala, have been affected by a complex mixture of both climatic change and anthropogenic disturbance. Forest clearance is associated with the appearance of crops, intensive cultivation of crops, deforestation and management of arboreal resources ^[4]. These disturbances in combination pose a threat to the ethnobotanical knowledge on the ancient Maya. In addition, indigenous knowledge on usage of medicinal plants as folk remedies are getting lost due to migration from rural to urban areas, industrialization, rapid loss of natural habitats of medicinal plants and changes in life style. This highlights the importance of the documentation of medicinal plants in traditional healing in order to preserve this knowledge ^[5, 6].

Due to the population growth in Belize, the influence of foreign cultures and the continued clearing of land for agriculture, industry and rural expansion are also threatening these cultural and biological resources ^[7]. Therefore, the healers of the country Belize on a whole have difficult times in finding these medicinal plants nearby, instead they travel long distances in

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search of these plants [8]. In addition, due to changing life style, extreme secrecy of traditional healers and negligence of youngsters, the practice and dependence of ethnic societies in folk medicines is in rapid decline globally [9]. Thus, ethnobotanical exploitation and documentation of indigenous knowledge about the usefulness of such a vast pool of genetic resources is deliberately needed [10]. In Belize, this can also be seen since it is evident that knowledge about the use of plants is itself in greater danger of extinction than the plants themselves [7].

The objective of this study was to document use of plant resources by the Q'eqchi' Mayas of Southern Belize and the Yucatec Mayas of Northern Belize by using surveys, field observations and semi-structured interviews and compare the similarities and differences in their approach to plant use, preparation and treatments of ailments by these two major native ethnic groups.

2. Materials and Methods

2.1 Data collection

The Study area for Yucatec Maya included Yo Creek and Santa Cruz village from the Orange Walk District, and Cristo Rey and Patchakan from the Corozal District. Snowball sampling technique was used to recruit the informants. To obtain a representative sample size, the concept of species-area curve was applied to the ethnobotanical collection [7]. The herbal practitioners targeted for the Q'eqchi' Maya were inhabitants of villages of Big Falls, Jalacte and Indian Creek of Toledo District.

2.2 Field work and ethnobotanical data collection

Field work was carried out during 12-week period between January to April 2016. Sample population participated in semi-structured interviews and structured surveys regarding the use of the local flora for medicinal purposes [11]. Standard ethnobotanical methods were employed and prior informed consent was obtained for all study participants. Questionnaires, field observations, and guided field walks were conducted. Questionnaires were used in the form of interviews, where researcher met with each participant and documented all relevant information. Participants led researcher to guided field walks where keen observations of the plants were made and documented properly. During these field observations, photographs of the parts of the plants were taken in their habitat and fresh plant specimens were collected for identification purposes. Identification was done using relevant literature and consulting experts in the field of taxonomy.

2.3 Data analysis

Data from each study was entered in a Microsoft Excel spread sheet. Use-reports for individual plant species, scientific

name, local plant name(s), and names of health condition treated, plant part used, and mode of administration were recorded for the quoted plant species. Descriptive analyses such as frequency table, charts and percentage were used to summarize ethnobotanical data. Each plant species was listed, according to alphabetical order of their scientific names. Descriptions including the parts used, the methods of preparation, and its traditional uses were provided. The reported ailments were grouped into categories based on the information gathered from the interviewees. The plant usage categories include "infections" (INF), "digestive system disorders" (DIG), "skin/subcutaneous cellular tissue disorders" (SKI), "respiratory system disorders" (RES), "endocrine system disorders" (END), "culture-bound syndromes" (CUL), "injuries" (INJ), "genitourinary system disorders" (GEN), "musculoskeletal system disorders" (MUS), circulatory system disorders" (CIR), and "sensory system disorders"(SEN); Mental Disorders (MEN), Metabolic System Disorders (MET), Nervous System Disorders (NER), Poisonings (POI), Pregnancy/ Birth Disorders (PRE) [3].

3. Results

3.1 The Q'eqchi' Maya Plant Use

Traditional medicine encompasses the knowledge and practices applied in the diagnosis, prevention, and healing or treatment of an ailment affecting the physical, mental or social health of an individual. The geographic location and environment results in rich biodiversity of medicinal plants in the study area. Despite the increase in deforestation and slash/burn by nearby inhabitants the Q'eqchi' Mayas have still been hunting local medicinal plants for the treatment and prevention of ailments. The number of medicinal plants recorded shows the depth of indigenous knowledge on the medicinal plants and their applications by the Q'eqchi' Mayas. Interviews conducted showed that the traditional healers of the Q'eqchi' group consists of mostly males within the age range of 40-60 years. The data recorded discovered that the herbal practitioners had no educational background; they gained knowledge and experience of medicinal plants either on their own or from past generation such as community elders, parents and uncles. The herbal practitioners also commented that at an average they began practicing healing at an age of 17 and as time went by they knew more plants leading to over 50 plants. They heal a wide variety of individuals rather than simply treating only individuals from the same culture. As time went by these traditional healers faced a loss in finding a few of the medicinal plants at a close distance. Herbal practitioners mentioned that the developments in different areas of the country cause loss of forest for agricultural and urbanization purposes causing these plants to diminish.

Table 1: List of Medicinal Plants Traditionally Used by the Q'eqchi' Mayas of Southern Belize.

Scientific Name	Common Names (English/Q'eqchi')	Parts Used	Medicinal Uses
<i>Acosmium panamense</i>	Billy Web	Bark	END, INF, RES
<i>Anthurium gladiifolium</i>	Devil Sword	Leaves	CIR, MEN, MUS
<i>Anthurium pentaphyllum</i>	Tail-Flower/ Flamingo Flower	Leaves	CIR, MEN, MUS
<i>Arthrostemma ciliatum</i>	Ever-blooming Eavender, Pink-fringe	Leaves and Vine	GEN
<i>Bauhinia forficata</i>	Cow's Hoof	Leaves and Root	END
<i>Begonia grandis</i>	Hardy Begonia	Leaves	INF, SKI
<i>Blakea cuneata</i>	Oxlaju' Ch'ajom (Q'eqchi')	Leaves	CUL
<i>Bryophyllum pinnatum</i>	Sh'ik K'uay (Q'eqchi')	Leaves	CIR, MUS
<i>Cissampelos pareira</i> L	False Pereira, Pereira Brava	Leaves	PRE
<i>Combretum fruticosum</i>	Chameleon Vine	Leaves & Stem	DIG

<i>Desmodium adscendens</i>	Strong Back	Leaves and Stem	MET, MUS
<i>Gonzalagunia panamensis</i>	Tzuul Che' (Q'eqchi')	Leaves	INF, MET, MUS, NER
<i>Gurania makoyana</i>	Pumpkin Vine	Leaves	SKI
<i>Hyptis verticillata</i>	Wild Mint, John Charles	Leaves	INF, MET, MUS, GEN
<i>Justicia adhatoda</i>	Squirrel's Tail	Leaves	CIR, INF, NER
<i>Lantana montevidensis</i>	Trailing lantana	Leaves	INF, MUS, GEN
<i>Lantana trifolia</i> L.	Lavender Popcorn, Wild Sage	Leaves	INF, RES
<i>Lygodium japonicum</i>	Japaneses Climbing Fern	Leaves and Vine	CUL
<i>Lygodium palmatum</i>	Climbing Fern	Leaves and Vine	INF, MUS, NER
<i>Mimosa pudica</i>	Sensitive Plant, Touch-me-not	Leaves, Stem and Root	CIR, DIG, MUS
<i>Mollinedia guatemalensis</i>	Sak' I K'ejen (Q'eqchi')	Leaves	INF, MEN, NER
<i>Morinda citrifolia</i>	Cheese fruit/Indian mulberry	Leaves	INF
<i>Morinda lucida</i>	Brimstone tree	Leaves	INF
<i>Neurolaena lobata</i>	Jackass Bitters	Leaves	DIG, END, INF, RES
<i>Osmunda cinnamomea</i>	Cinnamon fern	Leaves	INF, MUS, NER
<i>Peperomia incana</i>	Felted Pepperface	Leaves	CIR, POI
<i>Piper amalago</i> L.	Buttonwood	Leaves	MUS
<i>Piper dilatatum</i>	Pepper plants	Leaves and Root	DIG, MUS
<i>Piper hispidum</i> Sw.	Jamaican Pepper	Leaves	INF, MUS
<i>Piper peltatum</i> L.	Santa María / Monkey's Hand	Leaves and Stem	GEN, SKI
<i>Piper tuerckheimii</i>	Cux Sawi' K'ejen (Q'eqchi')	Leaves and Root	DIG, GEN
<i>Piper yucatanense</i>	Spanish Elder	Leaves and Root	GEN
<i>Polypodium vulgare</i>	Common Polypody	Leaves	CIR, INF, NER
<i>Priva lappulacea</i>	Velvet-burr	Leaves	DIG
<i>Psychotria poeppigiana</i>	Hot Lips	Leaves and Flower	GEN
<i>Securidaca diversifolia</i>	Easter Flower	Roots	DIG, INF
<i>Securigera securidaca</i>	Goat Pea	Roots	DIG, INF
<i>Selaginella umbrosa</i>	Spike moss	Leaves	RES
<i>Sida rhombifolia</i> L.	Broom weed, Common Wireweed	Leaves and Stem	INF, SKI
<i>Solanum torvum</i>	Prickly solanum	Leaves	SKI
<i>Souroubea sympetala</i>	Hub'ub' (Q'eqchi')	Leaves	CIR, MEN, MUS
<i>Stachytarpheta jamaicensis</i> L.	Blue Porterweed, Vervain	Leaves	SKI
<i>Strychnos panamensis</i> Seem	Chicoloro Vine, Snake Seed	Leaves and Root	DIG, INF

Table 1 summarizes the plant species used by Q'eqchi' Maya with the common names, parts used and the ailments treated with. A total of 44 plant species were successfully identified and documented. The type of medicinal plants used by the Quiché Maya ranged from shrubs, epiphytes, herb, vine, tree,

fern, and spike moss (Figure 1). The result of medicinal plants used showed that shrubs plants constituted the highest proportion represented by 29.55% of plants, while there were 25% herbaceous species, 20.45% of vines, 9.09% of trees and 9.09% of ferns.

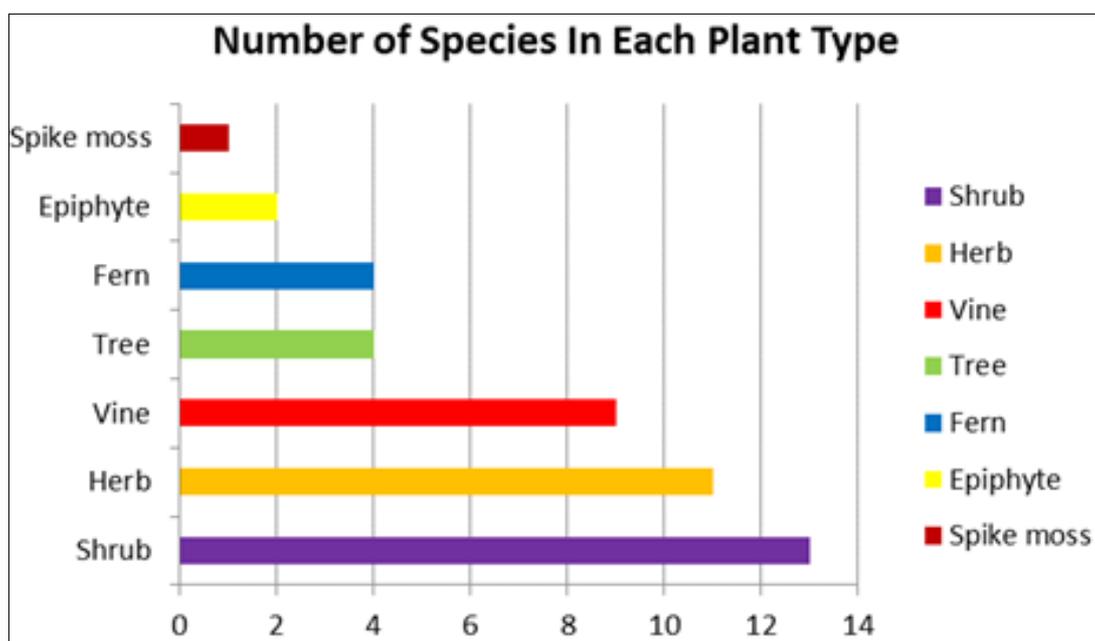


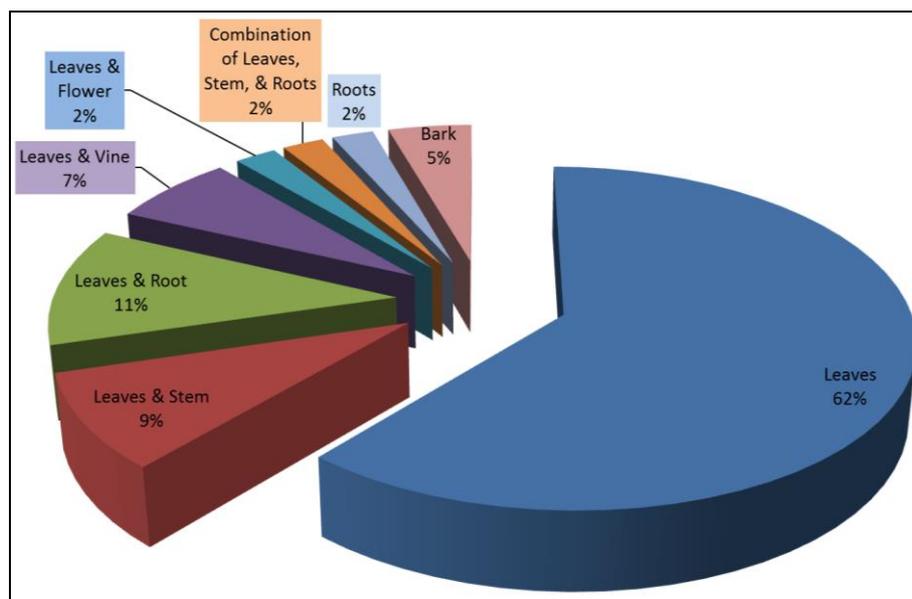
Fig 1: Growth Habit of Plants used by Q'eqchi' Maya of Southern Belize

Table 2: Number of Species Used in Treating Different Diseases by Q'eqchi' Maya.

Disease Treated by Medicinal Plants	Number of Species
CIR = Circulatory System Disorders	8
CUL = Culture-Bound Syndromes	3
DIG = Digestive System Disorders	9
END = Endocrine System Disorders	3
GEN = Genitourinary System Disorders	7
INF = Infectious/Infestations	20
MEN = Mental Disorders	4
MET = Metabolic System Disorders	3
MUS = Muscular-Skeletal System Disorders	14
NER = Nervous System Disorders	6
POI = Poisonings	1
PRE = Pregnancy/Birth Disorders	1
RES = Respiratory System Disorders	4
SKI = Skin/Subcutaneous Cellular Tissue Disorders	6

Table 2 shows the number of medicinal plant species used in treating the different disease to the body system. The category of diseases which is treated more by these herbal practitioners are those that are related to cause infectious and infestations on the body. The number of plant species being used is 20 being the highest. These different diseases range from individuals with Athlete's Foot, Bay Sore, Fever, Yellow Fever, Gastritis, Hepatitis, and Malaria. The herbal practitioners also used a total of 14 plant species which is the

second highest in treating disorders caused to the muscular-skeletal system. Individuals that suffers from Back ache, Cramps, Crazy Headache, and Numbness are the ones that are being cured. The third highest was a total of 9 plant species used to treat sicknesses caused to the digestive system. This is then followed by 8 species used to treat circulatory system disorders, 7 species used to treat genitourinary system disorders, 6 species used to treat nervous system disorders and skin tissue disorders.

**Fig 2:** The Plant Parts Used by Q'eqchi' Maya

The Qeqchi Maya herbal practitioners used different plant parts for the preparation of traditional drugs (e.g. leaves, stem, bark, roots, vine, flowers or a combination). Figure 2 above displays the different parts of the plant being used most. From the pie chart it can be seen that leaves are the most commonly used part with 62%. The other 32% of the times the leaves are being used in a combination with roots, stems, vines or flowers. Herbal practitioners also reported that 2% of roots and 5% of bark is being used to prepare traditional remedies.

3.2 The Yucatec Maya Plant Use

The Yucatec Maya traditional knowledge is transmitted in oral form, so there are no documents that can be used to study ancient knowledge of the Yucatec Maya regarding medicinal plants. Similarly, in this study it was found that only a small percentage of participants document their knowledge in written form (21%). However, 93% of individuals reported

that they share their knowledge to their children, relatives and community members verbally. The same 21% that document their traditional knowledge in manuscripts reported to be actively involved in their communities teaching younger children and interested individuals about Yucatec Maya folk medicine. Most participants in this study were 71 years of age or older (50%), followed by individuals 61-70 years of age (36%), 51-60 years of age (7%) and less than 31 years of age (7%). An important observation made during this research is that 93% of participants had been practicing the use of medicinal plants for more than 25 years, including individuals who had been practicing this for over 50 years. All participants reported learning the use of medicinal plants from their parents and elders in their family or community, indicating that this knowledge is mostly managed within households or families.

All healers apply a variety of medicinal plants for preventing, healing and treating ailments. The informants reported 91 plant species that they use for medicinal purpose; 59 plant species were recorded since the remaining had only 1 use report. Recorded species had at least 2 use reports to ensure that they were representative of the Yucatec Maya

community. A total of 59 plant species (Table 3), grouped within 57 genera and 35 families used in traditional medical practices were identified and studied. It can be observed in Figure 3 that there is a wide range of botanical families, with most families having 1-3 plant species cited.

Table 3: List of Medicinal Plants Traditionally Used by the Yucatec Mayas of Northern Belize.

Scientific Name	Common Names English/Yucatec Names	Parts Used	Medicinal Uses
<i>Abelmoschus esculentus</i>	Okra/Ocoro	Seeds	GEN
<i>Allium cepa</i>	Onion/Cebolla	Stem	RES
<i>Allium fistulosum</i>	Welsh Onion/Cebollina	Whole plant	RES
<i>Aloe vera</i>	Aloe/Sabila	Leaves	DIG, INF, INJ, SKI
<i>Annona muricata</i>	Soursop/Guanabano	Leaves	END, INF
<i>Artemisia ludoviciana</i>	White sagebrush/Sisim	Leaves	DIG
<i>Astronium graveolens</i>	Glassywood/X'kulinsis, Kulinche'	Leaves	SKI
<i>Basella alba</i>	Indian Spinach/Espinaca	Leaves	SEN
<i>Bauhinia forficata</i>	Cow's foot/Pata de vaca	Leaves	RES
<i>Brosimum alicastrum</i>	Maya nut, Breadnut/Ramon, O'ox	Sap	DIG
<i>Bunchosia swartziana</i>	Sip che	Leaves	NER
<i>Bursera simaruba</i>	Gumbo Limbo /Chaca	Leaves, bark	INF, SKI
<i>Cecropia obtusifolia</i>	Trumpet tree/Guarumo, K'och	Leaves	INF
<i>Cedrela odorata</i>	Cedar/Cedro, Ku-che	Bark	CIR, END
<i>Cestrum nocturnum</i>	jasmine/Dama de noche	Leaves	CUL
<i>Chamaesyce hyssopifolia</i>	Hyssop leaf /Cura ash	Sap	SKI
<i>Chenopodium ambrosioides</i>	Mexican weed/Epasote, Apasote	Leaves	INF, MUS
<i>Citrus ×aurantiifolia</i>	Mexican lime/Limon	Fruit	INF
<i>Citrus aurantium</i>	Sour orange/Naranja agria	Leaves	DIG, GEN
<i>Cnidioscolus chayamansa</i>	Chaya	Leaves	GEN, MUS
<i>Cucurbita moschata</i>	Squash/Calabaza	Fruit	END
<i>Cymbopogon citratus</i>	Lemon grass /Sacate limon	Leaves	INF, RES
<i>Diphysa carthagenensis</i>	Tzuk-tzuk	Leaves	NER
<i>Gossypium barbadense</i>	Cotton/Algodon, Pitz	Leaves	RES
<i>Hamelia patens</i>	Polly Redhead/Xkanaa	Leaves, flower	DIG, END, INF
<i>Helianthus petiolaris</i>	Wild sunflower/Girasol de monte	Leaves	MUS
<i>Hylocereus undatus</i>	Dragon fruit/Pitahaya	Fruit	DIG
<i>Kalanchoe pinnata</i>	Leaf of life/Siempre viva	Leaves	INF, NER, SKI
<i>Lippia graveolens</i>	Oregano/Oregano castillo	Leaves	DIG, GEN
<i>Manilkara zapota</i>	Sapodilla/Sapote	Bark	DIG
<i>Melissa officinalis</i>	Common balm/Toronjil	Leaves	DIG
<i>Mentha spicata</i>	Spearmint/Hierba buena	Leaves	DIG
<i>Microgramma nitida</i>	Fern/Tip' te' -ak'	Bark	DIG
<i>Momordica charantia</i>	Balsam pear/Sorosi	Whole plant	INF, SIR
<i>Moringa oleifera</i>	Moringa/Cura todo	Leaves, flower	CIR, END, NER
<i>Murraya paniculata</i>	Orange jessamine/Limonaria	Leaves	INF
<i>Nicotiana tabacum</i>	Tobacco/Ku'tz	Leaves	INF, NER
<i>Ocimum basilicum</i>	Basil/Albahaca, xcacaltun	Seeds	INF
<i>Opuntia cochenillifera</i>	Cactus/Nopal, Pak'am	Stem	INF, CIR
<i>Persea americana</i>	Avocado/Aguacate	Leaves	RES
<i>Phyllanthus liebmannianus</i>	Baby's tears/Chin-chin-ojo	Whole plant	CUL
<i>Pimenta dioica</i>	Allspice/Pimienta gorda	Leaves	DIG, END
<i>Piper amalago</i>	Spanish elder/Cordoncillo	Leaves	CUL
<i>Piper auritum</i>	Acuyo, Sacred pepper/Makulan	Leaves	GEN
<i>Plantago major</i>	Broadleaf plantain/Llanten	Leaves	INF
<i>Plectranthus amboinicus</i>	Mexican mint/Oregano grueso	Leaves	INF, RES
<i>Psidium guajava</i>	Guava/Guayaba	Leaves	DIG, INF, SKI
<i>Punica granatum</i>	Pomegranate/Granada	Leaves	DIG
<i>Ricinus communis</i>	Castor bean/Higuerilla	Leaves	INF, INJ
<i>Ruta graveolens</i>	Rue/Ruda	Leaves	CUL
<i>Senna occidentalis</i>	Yama bush/Frijolillo	Leaves	CUL
<i>Spondias purpurea</i>	Purple mombin/Ciruela, a'ba'l	Leaves	DIG, SKI
<i>Symphytum officinale</i>	Knitbone/Suelda consuelda	Root	MUS
<i>Syzygium aromaticum</i>	Clove/Clavo de comida	Flower	DIG
<i>Tagetes erecta</i>	Marigold/Flor de muerto	Leaves	SKI
<i>Urtica dioica</i>	Stinging nettle/Ortiga	Whole plant	CUL
<i>Zanthoxylum caribaeum</i>	Prickly yellow/Sinanché	Thorns	INF, NER
<i>Zea mays</i>	Corn, Maiz, Nal (Tzuk hair)	Flower	GEN

The growth habits of the medicinal plants used by Yucatec Maya (Figure 3) include herbs (37%), trees (25%), shrubs (15%), trees/shrubs (14%), and vines (9%). Herbs was the most common growth habit of plants used by the Yucatec Maya of Corozal and Orange Walk. The tropical medicinal

plants to be used were shrubs, herbs, or vines. They suggest that this is perhaps because shrubs, herbs, and vines are more accessible and the leaves, which are the most frequently used part of the plant to treat diseases, are easier to reach [3].

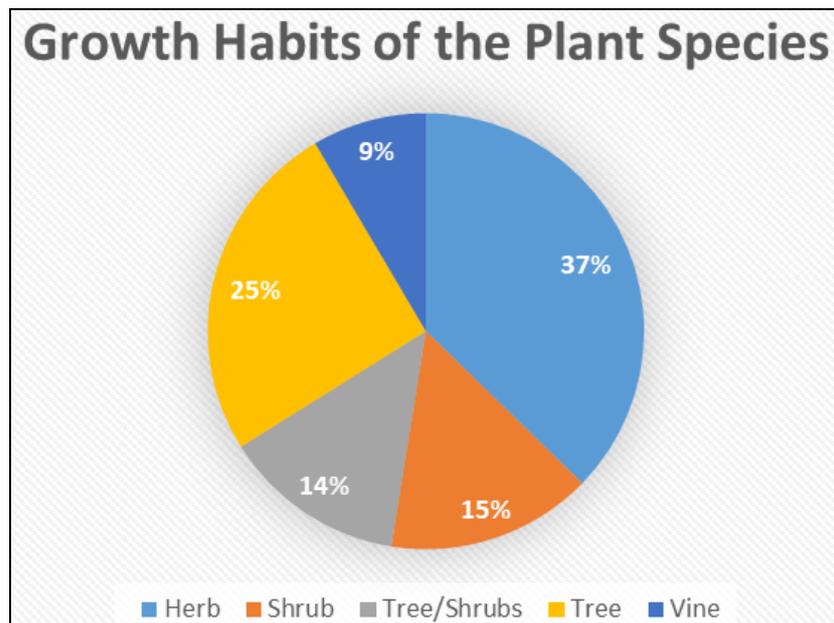


Fig 3: Growth Habit of Medicinal Plants Used by Yucatec Maya.

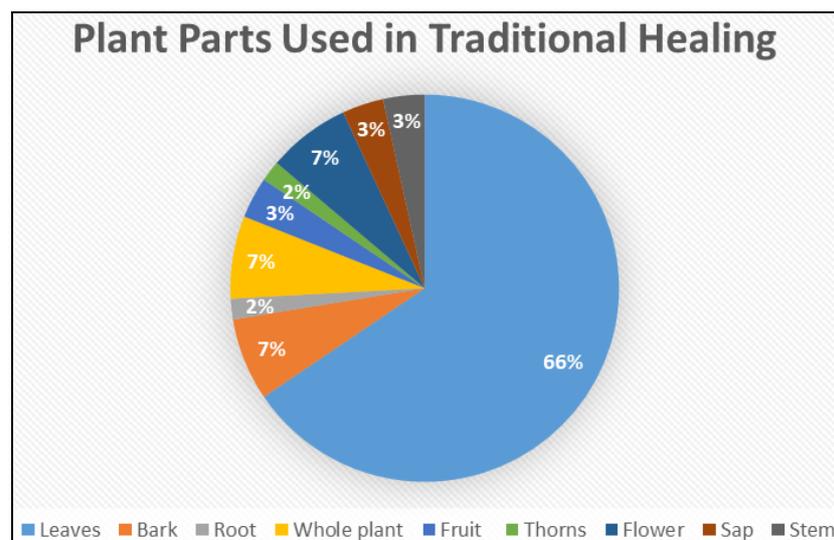


Fig 4: Plant parts used by Yucatec Maya for Medicinal Purpose.

The Yucatec Maya of Northern Belize reported leaves as the most common plant part used (66%) followed by bark, whole plant and flower (each with 7%). Other parts used include stem, sap, fruit, thorns, and root (Figure 4). Other studies have cited leaves as the most commonly used plant part used in traditional medicinal healing [15]. In addition, all of individuals participated in this study cited leaves as the most common part of the plant used in remedies used to treat a variety of ailments.

The reported ailments were placed under different disease categories (Figure 5). The most commonly treated ailments were infections and digestive system disorders as these are common ailments affecting the Yucatec Maya communities. Infections include ailments such as fever, athlete’s foot, chicken pox and swelling. Digestive system disorders include diarrhea, vomiting, dysentery and tooth ache. The frequency

of a disease was calculated in terms of the number of plant species used to treat that particular ailments. Data indicates that out of the total number of medicinal plants, 20 species were used to treat infections, 16 for digestive system disorders, 9 for skin/subcutaneous cellular tissue disorders, 7 for respiratory system disorders, 6 for endocrine system disorders, 6 for culture-bound syndromes, 5 for genitourinary system disorders, 4 for musculoskeletal system disorders, 4 for circulatory system disorders, 2 for injuries and 1 for sensory system disorders (Figure 5). Some ailments such as “cirro,” and “mal de ojo,” that were classified as culture-bound syndromes. In the Yucatec Maya community, “cirro” is a condition where a small “organ” located below the navel becomes dislocated from its original position. It is diagnosed by the healers pressing their fingers under the navel. “Cirro” may be caused by lifting heavy objects or forcing the body to

perform a strenuous activity (such as childbirth). It causes gas and cramps in the stomach as well as headache, nausea and

vomiting. Common conditions treated in Yucatec Maya communities include diarrhoea, vomiting, fever and headache.

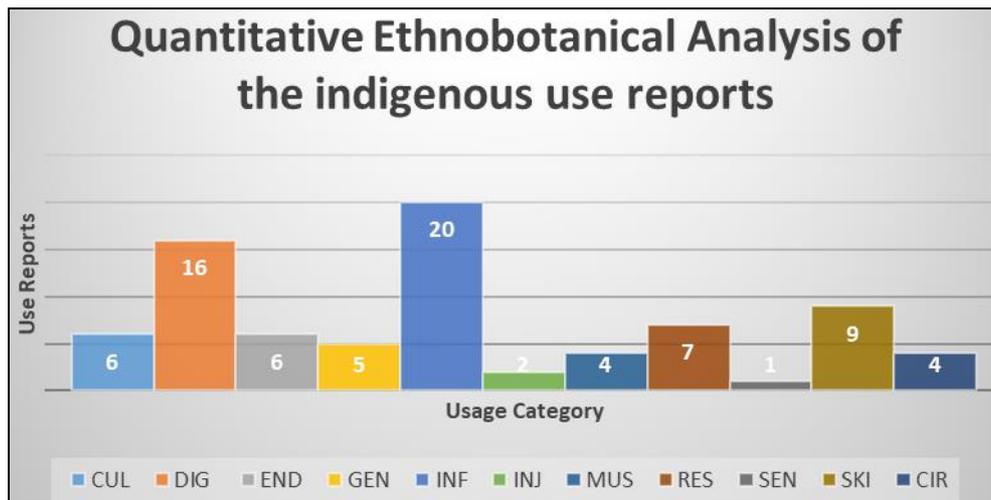


Fig 5: Ailment Categories Treated by Yucatec Maya

4. Discussion

Reports suggest that Belize has a total of 3,408 native and cultivated flora species and that study attempted to identify the distribution of medicinal plants used by the Maya and made recommendations for the establishment of a forest reserve of a total 50,000 acres of land to be set aside for conservation of medicinal plants [7]. Another study conducted in Southern Belize led to a collection of 169 medicinal plant species from 67 different plant families and the majority of these plants were from the rainforests of Southern Belize. The species were grouped into 17 medicinal usage categories. It was also noted the well-defined medicinal usage by different healers of each plant species [12].

Recent reports suggest that the Yucatec culture is no longer commonly practiced among the younger generations in Belize [2]. Indigenous knowledge on usage of medicinal plants as folk remedies are getting lost due to migration from rural to urban areas, industrialization, rapid loss of natural habitats and changes in life style [13, 14]. The importance of ethnobotanical studies lies in that they often lead to the discovery of crude drugs [15, 16]. Traditional medicine is very important in developing countries such as Belize. For instance, in Ethiopia, traditional medicine is still the main resource for approximately 80% of the people for treating health problems since it has a much lower cost than modern medical attention [6].

A study on the ethnobotanical knowledge among the Q'eqchi' Maya of Belize found that although the bark and whole plants are sometimes used, the leaves (and/or stems) are used most often in the preparations. These are soaked in cold water or boiled to prepare the remedy, and they are either given orally or the water is used as a bath. For treating culture-bound syndromes, the healers often perform a ritual of "smoking" the patient where certain plants are burned with various other items and the smoke is set to rise around the patient. Other plant parts used by the Q'eqchi' Maya included resin, fruits, seeds, vines, roots, stems, flowers, and a combination of roots, stems, vines, flowers or leaves [17].

In the Central American countries, medicinal plants continue to be the most economically and culturally suitable treatment for a variety of health conditions, including those related to women's health [18]. According to the Q'eqchi', all living creatures on earth are seen as possessing a guardian spirit that

can become angered if respect and homage are not paid prior to starting a particular activity or treatment. For the Q'eqchi they must follow certain rules and regulations that must be honoured in order to maintain harmony. For this they include prayers and rituals to Ajaw (God) and to the 13 local mountains, prior to hunting wild game, cutting down a tree for firewood, building a home, or collecting a plant for medicinal purposes. These prayers and incantations usually incorporate the use of candles, herbs, and incense. In regard to healing practices, the Q'eqchi believes that these ceremonies are essential to a medicinal plant's efficacy. Furthermore, if such ceremonies are not performed, the patient as well as the healer may suffer from a more severe illness [19, 20].

5. Conclusion

Yucatec Maya traditional knowledge is transmitted in oral form. A small percentage of participants document their knowledge in written form (21%). Majority are not formally educated. However, 93% of individuals reported that they share their knowledge with their children. Most participants in this study were over the age of 60 years (86%) and Majority of participants (Over 50%) had been practicing the use of medicinal plants for more than 25 years. Younger generations lack interest in medicinal plants. Within households, females are responsible for the general health of the family (79%). Males usually perform rituals and ceremonies such as "Primicias" where they pray for a successful crop season. Most herbalists treat individuals within their own families and usually do not charge for their services. Some specialized in treating snake bites and few specialized in "Cirro" (culture-bound syndrome). Majority of the plant species used by the Yucatec Maya were Herbs and the most frequently used part of the plant was the leaves are easier to grow and convenient to reach by the women herbalists. Most of the medicinal plants were used individually while a few were being used in a combination to treat ailments. The practitioners mainly used the method of boiling, crushing or heating of leaves to prepare the medication.

The geographic location of the Q'eqchi' Maya habitat is in rich biodiversity for medicinal plants. 64% of the plants were collected from nearby forests. The 36% plant species common around the homes of herbal practitioners. The southern Belize is mostly tropical rain forest and most of the plants used by

Q'eqchi' Maya were shrubs. The increase in deforestation and slash/burn by nearby inhabitants makes the herbal practitioners to travel distances in search of local medicinal plants for the treatment. Boiling was the most effective method for the Q'eqchi' Maya because they believed that this method extracts the essence of the plant. The use of fresh plants was preferred over dry plants in the preparation because the herbalists believed that the fresh plants had the ingredients concentrated and readily soluble in water. The patients were given the decoction to drink, a poultice to place on sores or boils and used for the person to bathe the body. The data revealed that the herbal practitioners had no educational background. They gained knowledge of medicinal plants from community elders, parents and relatives.

Both groups mostly used leaves as the main source of medicine and most of the times leaves were boiled in water and taken orally to cure ailments. In both culture groups, the herbalists were providing mostly free service to their communities as a social service. The Yucatec Mayas used even resin, sap and thorns of plant species in medicinal preparations while the Q'eqchi' Maya used many epiphytes in their medicinal preparations. Both ethnic groups believed in culture bound syndromes and the Q'eqchi' Mayas even treated mental disorders. Infections were the common ailment treated by both groups. Both groups passed on their herbal knowledge through their family hierarchy. Both groups expressed that deforestation and other human activities are causing some of the important medicinal plants to disappear or make it harder to find. Some plants were used to treat more than one ailment and some diseases were treated with a combination of plants combined together. Only few plant species belonging to "Piperaceae" were commonly used by both groups which shows their knowledge base is independent of each other.

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