

Ethnomedicinal Study of Plants Used for Gastrointestinal Disorders by Cultural Communities of Pandan, South Upi, Maguindanao, Philippines

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Publication Date: 2026/03/14

Abstract: This study investigated the medicinal plants used by the Teduray for the treatment of gastrointestinal disorders in the Pandan, South Upi, Maguindanao. It is consisted of two phases: the ethnographic phase and the laboratory phase. The ethnographic phase involves extensive fieldworks such as series of surveys and interviews, focusing on the practices of Tedurays in their processes and use of the medicinal plants. The laboratory phase focused on the assessment of the antibacterial properties and determination of the secondary metabolites present in the identified medicinal plants through photochemical screening. The respondents of the study were the folk doctors of the cultural community of Teduray from Pandan, South Upi, Maguindanao. The data were gathered through an interview. During the laboratory phase, the Data gathered after the procedure of antibacterial activities of the selected plants and measurement of the zone of inhibition of the bacteria towards the plant extracts. The study discloses these significant findings. The Teduray elders and herbalist used 16 plant species, belonging to three plant families and which parts are used for medication to treat gastrointestinal disorders. These medicinal plants and their appropriate used are: *Sida acuta* Burm.f. (Sapar) was prescribed for vomiting and diarrhea, *Kaempferia galanga* L. (Kisol) was prescribed for diarrhea and *Cyperus rotundus* were used for vomiting and bleeding after giving birth. These medicinal plants were not included in the list of medicinal herbs by Eduardo Quisumbing or by any authorities in the study of Philippine Medicinal Plants, and the proper endorsement of their medicinal properties have not been endorsed to the local health centers. The habits of the three plants were all categorized as herbs. The plants were dicotyledonous and monocotyledonous in nature. A part of the plants that was being used were all of leaves as it is said to be the most effective part according to the folk doctors in Pandan, South Upi, Maguindanao. Decoction is the usual process performed to use the herbs for medication, and it is taken internally. Any of its parts, in particular, the fruits, flowers and roots are valued for their medicinal characteristics, but the leaves are the commonly used in the study. The study concludes that, plants with the presence of secondary metabolites have a significant effect on the effectiveness of the plants. It was associated on what these plants could do to become an effective plant used for gastrointestinal disorders. The study recommends that further research about the medicinal plants used by cultural communities should be conducted to acknowledge the effectiveness of the different medicinal plants used by them. They can also explore other plants used for medication for other ailments by other tribes in Mindanao.

Keywords: Cultural Communities, Ethnomedicinal Study of Plants, Gastrointestinal Disorders, Medical Treatment, Teduray.

How to Cite: Aljean Mae C. Catedral (2026) Ethnomedicinal Study of Plants Used for Gastrointestinal Disorders by Cultural Communities of Pandan, South Upi, Maguindanao, Philippines. *International Journal of Innovative Science and Research Technology*, 11(3), 614-626. <https://doi.org/10.38124/ijisrt/26mar423>

I. INTRODUCTION

According to the World Health Organization (WHO) Traditional medicine refers to health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral based medicines, spiritual therapies, manual techniques and exercises, applied singularly or in combination to treat, diagnose and prevent illnesses or maintain well-being. Countries in Africa, Asia and Latin

America use traditional medicine to help meet some of their primary health care needs. In industrialized countries, adaptation of traditional medicine are termed complementary or alternative. Plants have been used for medicinal purposes long before prehistoric period. Ancient Unani manuscripts Egyptian papyrus and Chinese writings described the use of herbs. Evidence exist that Unani Hakims, Indian vaidas and European and Mediterranean cultures were using herbs for over 4000 years as medicine

Indigenous cultures such as Rome, Egypt and Iran used herbs in their healing rituals, while other developed traditional medical system. This study aimed to determine which plants are used for the treatment of gastrointestinal disorders among the people of some distinct of Izmir province, located in the Western Anatolian part of Turkey. During the field trips, the information was collected through interviews, including various data obtained from local healers and traditional medicine (Biswas, Rogers, Mclaughlin, Daniels, & Yadav 2014).

Moreover, plants are the most helpful living things here on earth that will help us or fulfil our everyday lives. It could help us in terms of clothing, food, shelter, and the most beneficiary is for the medicinal purposes. There are a lot of plants that we do not know, we always think that is useless specially the grass and some plants that are not familiar to us but through this study, people will be aware that there are plants that will help them to satisfy their needs.

As time goes many Scientist and Tribes discover a lot of plants that could help us to cure diseases. In this study the researcher's wants to know what kind of plants were used by the Indigenous people to cure Gastrointestinal Disorders, and also to know what parts of plants are being used, and the process how it is done.

Teduray is one of the major indigenous people of Southern Philippines that is composed of two distinct ethnic group- the Teduray and the Lambangian. The word Teduray comes from the word "tew" meaning, man and duray referring to a small bamboo with a hook and a line fishing instrument. Tedurays are known for their distinct and unique culture, beliefs, customs and traditions. These people exhibits strong family ties but are too dependent on other members who are more influential and affluent in the community. They are honest, soft spoken, shy, sensitive and soft hearted people. They are also hospitable and peace loving. Since the extent of these medicinal plants used by the Indigenous People has not yet been studied in depth, the researchers were motivated to investigate the taxonomic diversity of medicinal plants in Pandan, South Upi, Maguindanao.

A. Statement of the Problem

The study aimed to determine the plants used by Cultural Community for gastrointestinal disorders.

➤ Specifically, it Answered the Following Questions:

- What plants do Cultural Community use for the treatment of Gastrointestinal Disorders?
- How do the medicinal plants vary in terms of:
 - ✓ Habit;
 - ✓ Cotelydon; and
 - ✓ Parts used?

- How do the preparation of the medicinal plants affect the effectiveness in treating the gastrointestinal disorders?
- What secondary metabolites are present on the said plants?
- Do the medicinal plants possess antibacterial property?
- Is there a significant difference in the zone of inhibition of the different bacteria using medicinal plants?

II. LITERATURE REVIEW

➤ Gastrointestinal Disorders

Gastrointestinal disorder invoked morbidity and can lead to mortality, especially in developing the world where sanitation is fragmentary. Much of the human population depends on the medicinal plants to cure different disorder, including this gastrointestinal disorder. Since that these medicinal plants helps them in their needs through treating their diseases, and also this medicinal plants will not cost a lot of money to cater their needs to cure their diseases. In Nepal most of the people use medicinal plants to cure gastrointestinal disorder and evaluate this bio efficacy based on the available phytochemical and pharmacological literature.

Through the use of medicinal plants in Nepal to cure gastrointestinal disorders, they find different electronic database and libraries for the literature of each medicinal plants, they also search about the literature of the species they collected for the more information and preservation status, as well as for the phytochemical and pharmacological studies in support of the ethno botanical information. They also used the principle component analysis to explore if the medicinal plants vary informs of the plant families, plant life forms, plant parts and preparation. In order to determine if the botanical families were used more often than expected considering availability in Nepal, they performed permutation test (Rokaya, Uprety, Poudle, Timsina, Munzbergoua, Tiwari, Shrestha & Sigdel 2014).

➤ Teduray

They are scattered in different provinces in Mindanao like Agusan, Bukidnon, Davao, Lanao and ain the cities of Davao, Zamboanga and Manila. Cotabato province is the main place of origin of the teduray and lambangian people. With the estimated population 350,925. In central Mindanao region 12, teduray used to have the highest number of population among the 21 ethniolinguistic groups with total population 239,475. But due to the devolvement of Maguindanao province to the ARMM, the population was reduced to 67745. The teduray in central Mindanao region 12 are found in cotabato city municipalities of columbio, Isulan, Tacurong, Bagumbayan, Esperanza, Clamansig and lebak. Sultan Kudarat province, Alamada, Carmen, Cabacan, Midasayap, Pikit, Antipas, Aracan, Kidapawan City, President Roxas and Tulunan Cotabato Province. In the later part of the 1889, teduray are scattered all over the undivided cotabato and concentrated in the south western mountain of province. Some teduray leaders have classified and further name themselves after their place they come from- the Tew dage. Tew dawa, Tew dugot and Tew tudok. Although the teduray belong to one ethnic group, they differ

in some ways like their dialect, intonations, rituals, and dress and color identities (Schlegel 2015).

➤ *Medicinal Plants*

Medicinal plant is a plant that has similar properties as conventional pharmaceutical drugs that humans have used throughout history to either cure or lessen symptoms from an illness. A pharmaceutical drug is a drug that is produced in a laboratory to cure or help an illness. There are different plants used by the tribes of Wayanad for the treatment of Digestive disorders. They discovered 32 species. The plants used for the treatment with their botanical names, local names, mode of administration and status of plants. The tribal groups who are interviewed states that they use different parts of plants to cure digestives disorders like piles, ulcers, abdominal pain, diarrhea, dysentery, pain worms, vomiting, acidity chest burning, and stomach pain. The Tribal group did not want other people to know about their knowledge in their ancient tradition. Moreover, young people did not learn about the traditional knowledge from the tribal group because of the lack of interest and also because of the tribal groups who did not share their knowledge about the medicinal plants to other people. So the documentation and sustantation of their knowledge is very important (Prasad, Shyma, & Raghavendra 2013). According to Rahmatulla, Khatun, Barua, Alam, Jahan and Jahan (2013) the Indigenous medicine provide significant information for the discovery of new and more efficacious drugs. Most of the tribes depend on the medicinal plants who cater their needs in terms of the different diseases, which may not be augmented with the different species of animals, insects, fish and incantations. Since it has been practiced for centuries the indigenous medicinal practitioners already have the knowledge about the medicinal plants especially the plants that can be found in their areas. Dogan and Ugulu (2013) states in this study that it determines which plants are used for gastrointestinal disorders in Izmir province, located in the Western Anatolian part of Turkey. The information were gathered through interviews, including various data obtained from local healers and traditional medicine men, herbalist, shepherds, patients and aged persons. The researcher documented a total of 33 plants belonging to 25 families for their medicinal use for gastrointestinal disorders. In the analysis of the families of the medicinal plants it is clearly shown that the family Lamiaca is represented as the highest number of species to cure gastrointestinal disorders. These plants are mostly used for constipation, diarrhea, gastritis, intestinal winds, nausea, gastralgia and indigestion. The tribal people of Grand, Korke, Bhil and Bhilalas have valuable information about the medicinal property and medicinal use of many plants. Many of the traditional herbal healers exit and utilized local plants in ethno medicinal practices prevailing in the area. In this study, the tribal groups documented 75 species belonging in 68 genera and 35 families. Including its traditional use, local name, scientific name, family and parts of the plants being used (Jeetendra & Jeetendra 2013) Balangcod and Balangcod (2015) states that the development of drugs and plants based on medicine is very important and natural in indigenous communities. It is natural for them because they know much of the plants

that are not familiar to us. Ethno botanical survey through interviews are more focused in the group discussion in the local community of Sablan, Benguet province that share their 75 plants belong to 68 genera and 43 families to have medicinal values. In the parts of plant the most used for the treatment of different ailments is in the leaves part. Decoction is the mode of preparation for the treatment of cough, kidney ailments, and stomach disorders such as diarrhea, ulcers and related ailments.

The Medicinal plants in traditional healthcare practice is now well recognized and important to our society since it provides our needs through health problems, give us an ideas about what is medicinal plants and provides clues to the new area of research. However, the knowledge on the use of medicinal plants in the area of Himalaya is not yet known but the tribal of dominated Hinterland of Western Himalaya are still or keeping present this study so that the tribe in the area of Himalaya will know how to use the plants for the treatment and also for them to have a knowledge about medicinal plants. In order to gather the information about the medicinal plants used by the Western Himalaya they planned Questionnaires survey, participatory observation and field visit. They evaluated that 35 plant species are commonly used by the local people for the treatment of different dis orders. In this area they documented that the *Ranunculus hirtellus* and *Anemone rupicola* is the effective medicinal plants to cure some dis orders (Uniyal, Singh, Jamwal & Lal 2011).

Srinivasan, Nathan, Surreh and Perumalsamy (2011) researchers state that there are 50 medicinal plants belonging to 50 families where studied for their antimicrobial activity. There are 22 plant extracts from 25 families exhibited activity against both gram positive and gram negative bacteria. 14 plants belonging to 11 families did not undergo activity against in the bacteria tested. It is only the plant extract who exhibit the antifungal activity.

➤ *Decoction Process*

It is the usual process performed in using the herbs for medications and it taken internally. Any of its part in particular, the fruits, flowers, and roots are valued for their medicinal characteristics but the leaves are the commonly used (Goodwin 2013).

➤ *Phytochemical Screening*

Phytochemical screening refers to the extraction, screening and identification of the medicinally active substances found in plants. Some of the bioactive substances that can be derived from plants are flavonoids, alkaloids, carotenoids, tannin, antioxidants and phenolic compounds. Plant extract is one important to traditional medicine to cure some diseases, this study gives us health application at affordable cost because we do not need to buy some medicine in the pharmacy but we just simply have a process on how the plants become one of our effective medicine and serve as a provider of our need especially in health problems. "Qualitative phytochemical analysis of these plants confirm the presence of various phytochemicals

like saponins, terpenoids, steroids, anthocyanins, coumarins, and emodins” (Savithamma, Rao & Suhrulatha 2011).

➤ *Antibacterial Activity*

Anything that destroys bacteria or suppresses their growth or their ability to reproduce. Heat, chemicals such as chlorine, and antibiotic drugs all have antibacterial properties. Many antibacterial products for cleaning and handwashing were sold today. Such products do not reduce the risk for symptoms of viral infectious diseases in otherwise healthy persons. This does not preclude the potential contribution of antibacterial products to reducing symptoms of bacterial diseases in the home. According to Alanis, Calzada, Cervantes, Torres and Ceballos (2011) Antibacterial properties of aqueous and methanolic extracts of 26 medicinal plants for gastrointestinal disorders were tested in 8 different species of enteropathogens which are the 2 *E. coli*, 2 *Shigella sonnei*, 2 *Shigella flunei* and 2 *Salmonella sp* species. All the crude extract exhibit antibacterial activity, at least against in the microorganism tested, at concentration of 8 mg/mL or lower. The species that possessed strong antibacterial activity against the pathogen tested are the extract of *Caesalpinia pulcherrima*, *Chiranthodendron pentadactylon*, *Cocos nucifera*, *Geranium mexicanum*, *Hippocratea excelsa*, and *Punica granatum*.

➤ *Zone of Inhibition*

An area of growth that inhibit around a point source, within a lawn of cultured organisms on a solid medium due to the action of a growth inhibitory substance, such as an antimicrobial agents, present at the source. According to Biswas, Rogers, McLaughlin, Daniels, and Yadav (2013) state that In this study they want to determine the antimicrobial potential of guava leaf extract against two gram negative bacteria (*E. coli* and *Salmonella enteritidis*) and the two gram positive bacteria (*S. aureus* and *Bacillus aureus*) which are some of foodborne and spoilage bacteria. The guava leaves were extracted in four different solvents of increasing polarities (hexane, methanol, ethanol, and water). The efficacy of these extract were tested against those bacteria through a well diffusion method employing 50 mL leaf extract solution per well. Based on the result of the antibacterial assay, the methanol and ethanol extracts of the guava leaves should inhibitory activity against gram positive bacteria, whereas the gram negative bacteria were resistant to all the solvent extract. The methanol extract had an antibacterial activity with mean zones of inhibition of 8.27 and 12.3mm, and the ethanol extract had a mean zone of inhibition of 6.11 and 11.0mm against *B.aureus* and *S. aureus*. In this result guava leaf extract is best for the natural antimicrobial agent.

Doughari, El-Mahmood, and Tyoyina (2010) states that the antimicrobial properties of leaf extract of *Senna obtusifolia* were examine against both clinical and laboratory isolates of extracts (12mm zone diameter of inhibition MIC 200µg/mL and MBC 300 µg/mL) showed the highest activity followed by dichloromethane (8mm zone diameter of inhibition, MIC 300 µg/mL) and hexane (6mm zone diameter of inhibition, MIC 800µg/mL and MBC 1000 µg/mL). Water extract showed the small activity

against the test bacteria and fungi (4mm zone diameter of inhibition, MIC 800 µg/mL and MBC 800 µg/mL). Phytoconstituents present included saponins, tannins, alkaloids, and flavonoids. This *S. obtusifolia* (leaf) can be used as possible treatment of antibacterial and antifungal infections like gonorrhoea, pneumonia, urinary tract infection and some mycotic infections.

➤ *Bacillus Subtilis*

Subtilis is a gram positive, aerobic, Spore forming soil bacterium ubiquitous in the environment. The advantageous effect on *B. subtilis* spores on the balance of the intestinal microflora is the explanation for its general use as a probiotic preparation in curing intestinal disorders. *B. subtilis* spores are available in Italy as a pharmaceutical preparation for oral use. "Each dose contains a mixture of 10 spores of four distinct antibiotic resistant derivatives of ATCC 9799 per vial" (Oggioni, Pozzi, Valensin, Galieni & Bigazzi, 2010). The pathogenicity of *B. subtilis* is generally described as low or absent. Data on the general significance of infections due to *B. subtilis* are deficient.

➤ *Escherichia Coli*

Nordqvist (2016) stated that "*E. coli* is a bacterium commonly found in the gut warm blooded organism". Much of the *E. coli* strains show no harm to humans. However, the six group of *E. coli* is known for their ability to cause human diseases. *E. coli* also prevent harmful bacteria from establishing in the intestine.

According to Pietrangelo (2015) Diarrhea, abdominal pain, and fever are some of the symptoms of intestinal infection. More hard cases can lead to bloody diarrhea, dehydration, or even kidney failure. This pregnant women, young children, and older adults have weaker immune systems so that it has a big chance that they increased risk for developing these implications.

➤ *Salmonella Enterica*

Parry, Hein, Doughan, White, and Farrar (2012) states that it is a species of bacteria that is often pathogenic (disease causing), leading to an infection called Salmonellosis. The main symptoms of this condition, which generally appear 12-72 hours after infection, are diarrhea, vomiting, fever, and abdominal cramps.

III. METHODOLOGY

➤ *Research Design*

The study used field and experimental design which is found in Figure 1, showing the antibacterial activity and phytochemical screening. The study used five treatments for antibacterial assay. Three replicates prepared for each treatment. Treatment one (T₁) was the water, (T₂) was the tetracycline, (T₃) was the leaf extract of *K. galangal* L, (T₄) was the leaf extract of *S. Acuta* Burm f, and (T₅) was the leaf extract of *C. rotundus*. The result gathered after three days of treatment application. In antibacterial activity, the extract of medicinal plants was used to determine the activity in bacteria (*E. coli*, *S. enterica* & *B. subtilis*). The positive and negative control that they will use is the water, tetracycline.

Phytochemical screening was done to identify the secondary metabolites present in each plants. The test conducted was

for the determination of alkaloids, carotenoids, saponins, tannins and flavonoids.

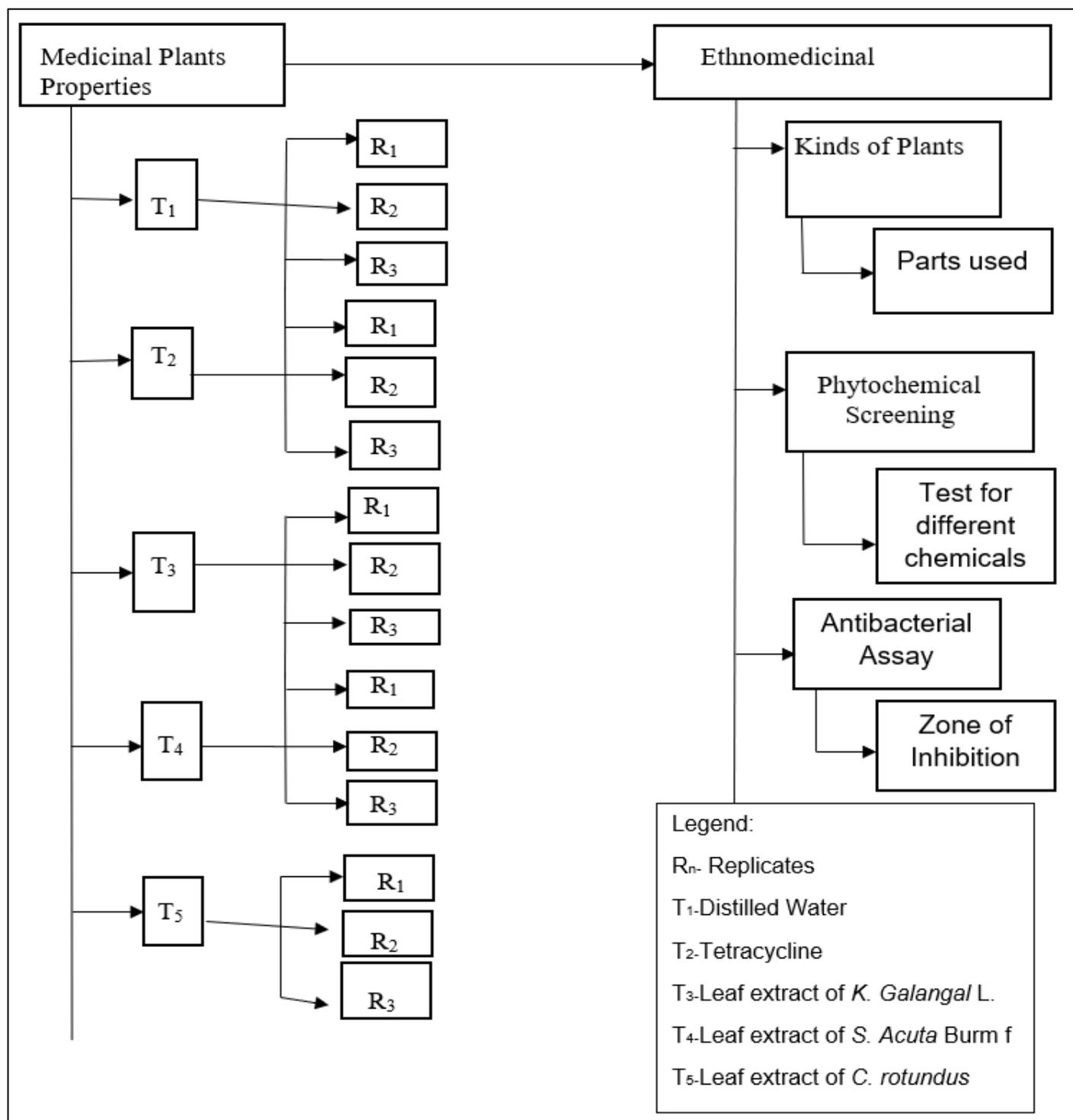


Fig 1 Research Design

➤ *General Procedure*

• *Preparation of Materials*

The researchers acquired the materials from the Biology Laboratory of Notre Dame of Dadiangas University. For the antibacterial assay, they utilized materials such as Petri dishes, inoculating loops, alcohol lamp, test tubes, forceps, and sterile cotton applicator and

filter disc. In the antibacterial test they used sterilized filter disc in each agar plates. These materials will use for septic transfer and a streak plate method of bacteria. The treatment utilized in the strain were the negative control and positive control of each medicinal plants. The organism used for antibacterial activity were the *E. coli*, *B. subtilis*, and *S. enterica*. In this organism the researchers used Eosin Methylene blue, Nutrient agar and Macconkey agar

plate. There are three replicates in each assay which have five treatment. The 100 grams of plant extract were used for extraction and 20 mL of 95% ethyl alcohol.

- *Field Protocol*

The researchers have written letters to and sought permission of the local leaders of Pandan, South Upi, Maguindanao. They negotiated for the approval to conduct the study; to assist them in identifying their target participants; to give them native interpreters who can translate Teruray language to local dialects common used, Filipino and English; and, to provide them of security while they gather the needed data in the area. They do have written letters of invitation to the identified participants, requesting of their participation and making them understand the purpose of the study and clarified with them their roles and those of the participants. They have assured the participants, as ethics of research required it, the confidentiality of the conduct study

- *Collection and Sampling Site*

Before the researchers collected some medicinal plants for the laboratory, they needed first a clearance from the National Commission of Indigenous People (NCIP) for the formal interview and for the collection of their medicinal plants. There were 100 grams for each medicinal plants collected include the stem, leaves, and roots. It was transferred and studied on the Biology Laboratory of Notre Dame of Dadiangas University. The plants that is collected are freshly picked and labelled properly. There were mature plants flattened and dried with denature alcohol and it will be send to National Museum for formal identification by a certified taxonomist. The medicinal sample of plants were compare with the specimen of the Taxonomy Division of the National Museum. After it will verify the researcher can test now the medicinal plants if it can treat gastrointestinal disorders.

- *Preparation of Plant Extract*

The medicinal plants collected were washed with distilled water. It has been air dried and weighed. The researchers collected 100 grams of each leaves, stems and roots using the Erlenmeyer flask with 95% ethanol to completely submerge the material. The plant sample were allowed to stand for 48 hours. After two days the soaked plants is filtered through a funnel. The extract were transferred in bottles and labelled according to each kind of plants.

- *Phytochemical Screening*

Screening procedures for secondary metabolites namely, alkaloids, tannins, saponins and flavonoids were taken from Journal of Pharmacognosy and Photochemistry (2015).

- ✓ *Test for Alkaloids*

The researchers had put 3 mL of extract and was stirred it with 3 mL of 1% HCl on the steam bath. 1 mL of mixture was taken separately in two test tubes. Few drops of Dragendorff's reagent were added in one tube and occurrence of orange red precipitated was taken as positive.

Two the second tube Mayer's reagent was added and appearance of buff colored precipitate was taken as positive test for presence of alkaloids.

- ✓ *Test for Tannins*

The researchers had 2 mL of the extract and stirred with 2mL of distilled water and few drops of ferric chloride (FeCl₃) solution were added. Formation of green precipitate was indication of presence of tannins.

- ✓ *Test for Saponins*

The researchers had 5 mL of extract in the test tube and were shaken vigorously with 5 mL of distilled water in a test tube and warmed. The formation of stable foam was taken as an indication of the presence of saponins.

- ✓ *Test for Flavonoids*

About 1 mL of extract, 1mL of 10% lead acetate solution was added. The formation of a yellow precipitate was taken as a positive test for presence of flavonoids.

- *Antibacterial Assay*

The researchers sterilized media in an autoclave or oven sterilizer for 15 to 20 minutes. The paper discs, Petri dishes, pipettes, test tubes with cotton plugs where wrapped in paper or aluminium foil for sterilizing in an oven for 1.5 hours at 160 degree Celsius to 170 degree Celsius. There are 45 agar plates used, wherein 15 was used to Eosin Methylene Blue (EMB) agar for *E. coli*, 15 was used for Nutrient agar which was for *B. subtilis* and Macconkey agar for *S. enterica*. There were 15 sterilized petri dishes used in each isolates bacteria since there are five treatments to be applied in each three replicates. The researchers must observed the proper labelling of dishes. The bacteria and fungi test organisms, banded in Nutrient agar, EMB agar and SDA agar in which 20 mL mixture will be poured in each agar plates. In making 20mL agar solution for every petri dish, the researcher added 8.40 grams of Nutrient agar, 10.79 grams of EMB agar, and 19.50 gram of SDA agar in every 300 mL of distilled water. It must be stirred and heated in a separate beaker. Then it must set aside for how many minutes, it will sterilized and put in to agar plates. In order to determine the effect of the treatment of microorganisms. The researchers will use the streak plate technique. They will also use the filter disc diffusion method. The culture was incubated for 24-48 hours at 35 degree Celsius for bacteria The data obtained by using vernier caliper where the zone of inhibition was measure after the incubation.

- *Statistical Tools*

For the quantitative aspect of the study, some statistical tools were used. Specifically, to present, analyse and interpret the data, the following formula were used, namely: frequency count, percentage, ranking, and mean. For determining the significant difference in the zone of inhibition of the different medicinal plant part extracts the One-Way ANOVA will used to set at 5% level of significance. The commercial antibiotic will be using to look at the effectiveness of the plant extracts. The researcher also used the least Significant Difference Test in the Zone of

Inhibition. Post-hoc analysis was also done by using the Least Significant Difference Test to determine the measurement of the difference from the control.

IV. RESULTS AND DISCUSSION

➤ *Plants used by the Teduray's for the Treatment of Gastrointestinal Disorders*

During the individual interview with the Teduray healers in Pandan, South Upi, Maguindanao they identified 16 medicinal plants that were used for healing Gastrointestinal Disorders. These plants are categorized according to their types, parts used, its cotyledon, habit and the process of preparation. These are the 16 plants given by the teduray healers, it is name based on the common name of teduray. These plants are Aligbun, Aloe vera, Banaba, Bayabas, Burunggkot, Geya, Kamalunggay, Kamangkis, Katuray, Kifut, Kisol, Legebu, Mangga, Sapar, Star affle,

and Tudi. Out of 16 plants, 3 of them are common, and these plants have been identified by the healers namely; Mrs. Maria Magunda, Mrs. Mantos Abdullah and Mrs. Vinancia Gunsil. Kisol (*Kaempferia galanga* L.), Sapar (*Sida acuta* Burm. f.), and Tudi (*Cyperus rotundus*). The folk doctors have specify these 3 plants for treatment of common gastrointestinal disorders such as diarrhea, dysmenorrhea, vomiting, gallstones and ulcer. All of these plants have undergo decoction process, a method that processes the extracts in plants through boiling in water. These plants are classified into families namely: *Zingiberaceae*, *Malvaceae* and *Cyperaceae*.

Presented in Table 1 are the medicinal plants of the Tedurays for treating gastrointestinal disorders. These medicinal plants, used by Tedurays for gastrointestinal disorders show their variation as to their type and families.

Table 1 Plants Used by Teduray's for Gastrointestinal Disorders.

Plants Common Name For Teduray	Scientific Name	Family	Uses
Sapar	<i>Sida acuta</i> Burm.f.	<i>Malvaceae</i>	Diarrhea, vomiting, ulcer
Kisol	<i>Kaempferia galangal</i> L.	<i>Zingiberaceae</i>	Diarrhea, dysentery
Tudi	<i>Cyperus rotundus</i>	<i>Cyperaceae</i>	Dysmenorrhea, diarrhea, dysentery

The data shows that these plants are used by the Teduray as herbs for treating gastrointestinal disorders. *S. acuta* belongs to the family of *Malvaceae*, this plant is a shrub or woody. It is an erect, much branched with a small perennial shrub or herb with a woody tap root and hairy branches up to 1 meter high that reproduce seeds. This kind of plant can see everywhere. The leaves of this plant are used for their diuretic, demulcent, anthelmintic and wound healing properties. Surveys conducted in indigenous places revealed that the plant had many traditional usages that varied from one region to another. The most cited illnesses are fever, headache and infectious diseases. Indeed, many laboratory screening have been conducted to show the scientific rationale behind these usage and many compounds have been isolated from the plant.

The *K. galanga* L belongs to the family of *Zingieraceae*. It is a small herb with short underground stems. Leaves are usually in pairs, oval, glabrous, pointed and spread out above ground with prominent veins. Its leaves have strong fragrance and are enable to cure some gastrointestinal disorders. And also this kind of plants not

only cure gastrointestinal disorders but in many aspects of diseases. The herb also have an analgenic (relieving pain) and antipyrec (reducing fever) properties and it may also help reduce bacterial and fungal infections. The leaves of galangal has shown an inhibitory effect in vitro on many pathogenic bacteria like anthrax bacillus, haemolytic streptococcus and various strains of Staphylococcus. Galangal is often recommended for motion and morning, an effect that is primarily attributed to ginger

C. rotundus (Nut-grass or Motha) can be seen growing as weed in garden, lawn, fields and waste lands. It looks like grass and have tuberous roots underground. It is a perennial plant. Its blackish tuberous roots have distinct smell due to presence of essential oil. These rhizomes roots are rich in medicinal properties and used in Ayurveda for treatment of diseases since time immemorial. They are used fresh and dried. For medicinal purpose the dried powder or decoction of roots are prescribed. It is also a medicinal herb traditionally used to treat various clinical conditions at home such as diarrhea, diabetes, pyresis, and inflammation, malaria, and stomach and bowel disorders.

Table 2 Medicinal Plants that Vary in Terms of

Scientific Name	Habit	Cotyledon	Parts Used
<i>Sida acuta</i> burm f	Herb/woody/shrub	dicot	Leaves
<i>Kaempferia galangga</i> L	Herb/ perennial	dicot	Leaves
<i>Cyperus rotundus</i>	Herb/ perennial	monocot	Leaves

S. acuta Burm f is a common wire weed, it is also woody and shrub. Its stem is woody, round and slender, rather fibrous and hairy especially when young. A perennial herbaceous plant or small shrub usually growing 30-100 cm tall, but occasionally reaching up to 1.5 m in height.

However, it often behaves as a short-lived plant in the wet-dry places like Savannah and Southern America.

K. galanga L is commonly known in its herbal purposes in some places such as India, Southern China, Bangladesh, Myanmar, Thailand, Cambodia and Vietnam. It

is a small and perennial herb growing up to 45 cm tall from a rhizomatous rootstock. It is also a bitter herb that is used to promote digestion and stimulate appetite and production of digestive fluids. Some properties of this it can relieve pain and reduce fever and reduce bacterial and fungal infections.

C. rotundus can be seen growing as weed in garden, lawn, fields and waste lands. It looks like grass and have tuberous roots underground. It is a perennial plant. Its blackish tuberous roots have distinct smell due to presence of essential oil. And also known as a traditional Chinese medicine for treating digestive disorders and dysmenorrhoea. And only *C. rotundus* have a monocot while the *S. acuta* burm f, and *K. galanga* L are dicot. The Teduray healers states that the leaves are the common parts of plants used for the treatment of gastrointestinal disorders

➤ Variation in Terms of Plants Use and the Process of Preparation

The 16 identified medicinal plants used for gastrointestinal disorders could be studied further as to their taxonomy and preparation. In terms of taxonomy, it is important to classify the plants by family for us to see their species which are related to each other for us to know easily if the plants are related to medicinal purposes. This is done by referring the scientific names to the voucher specimen, the certificate issued by the Botany Section of the National Museum and reference material written by authorities in medicinal plants.

Table 3 presents the plants used by Teduray's for gastrointestinal disorders and the process of preparation.

Table 3 Plants Used by Tedurays for Gastrointestinal Disorders and the Process of Preparation.

Scientific Name	Process of Preparation	Effectiveness of plants
<i>Sida acuta</i> Burm.f.	Leaves are boiled for 5-10 minutes and put the extract in glass and drink	The decoction of the plant extract is more effective than taking the plant orally.
<i>Kaempferia galangal</i> L.	Boil the leaves for 10-15 minutes and get the extract to drink. It must be taken for 3 days continuously.	Decoction is also the most effective way in preparing the plant that affects the treatment for gastrointestinal disorder.
<i>Cyperus rotundus</i>	Boil the leaves and stem together and put the extract in a glass of water to drink.	Same with the others, decoction is also the process that is most effective in preparing the medicinal plants that affects its ability for gastrointestinal disorders.

The plants have their flowers, leaves and roots used for medicinal purposes. As observed, the parts of plants are usually in boiling process.

Magunda, Abdullah and Gungsi (personal communication, April 7, 2017) stated that “*I de daoni kisol, sapor, tudi toow fo feyo uwa dumawet sur*” (we need to use the leaves of *S. acuta*, *K. galanga* L. and *C. rotundus* plants to treat gastrointestinal disorders). “*gagaeni de daon limo taman flo he minute do ten iy genagaanede inoke inemen*” (We boil the leaves for 5-10 minutes, and get the extract to drink).

Diarrhea is the reversal of the normal weight net absorptive status of water and electrolyte absorption to secretion. The augmented water content in the stools (above the normal value of approximately 10 ml/kg/d in the infant and young child, or 200 g/d in the teenager and adult) it is due to an imbalance in the physiology of the small and large intestinal process involved in the absorption of ions, organic substances and thus water.

According to Magunda et.al (personal communication, April 7, 2017) “*Gelid go geinem enda tekow metadin ey dawet sur muwe taman froyge oras n*” (After you drink the extract of plants, it does not mean that your abdominal pain will take away, it takes how many hours to relief your abdominal pain).

“*Feseleneon ka daon folo, folo bra limo ke minute I'nemen ke wayeg taman telew ge tersangan fara mefe'adi'adi ke dysmenorrhoea, ulcer, dysentery*” (The leaves must boil for 10-15 minutes, drink its plant extract for

3 days continuously to cure ulcer, dysmenorrhea and dysentery). According to Deligeoroglou (2013) Dysmenorrhea presents as painful periods that start two to three years after menarche. The pain usually begins when the bleeding starts and lasts for 48 to 32 hours. During menstruation your body sheds the lining of the uterus (womb). Menstrual blood flows from the uterus through the small opening in the cervix and passes out of the body. Girls can feel the pain if they have a period because the contractions inhibit blood flow to the lining of the uterus. In addition, substances known as leukotriene are also elevated during menstruation and they may be the cause of menstrual cramps. Stomach ulcers are painful sores that can be found in the small intestine. Stomach ulcers are easily cured, but they can become severe without proper treatment. Some causes of ulcer are an infection with the bacterium, excess acid in the stomach which may be related to genetics, lifestyle and certain food and also in smoking.

The respondents believed that these diseases, accruing inside the human's body are due to the imbalances. Their traditional knowledge about the medicinal plants began from their ancestor, since in their years or ages they use different medicinal plants to cure their diseases and they continuously practice it up to this time. The Teduray prefer to use medicinal plants for treating illnesses because the absences of doctors require it. These barangay are far from the city or hospital it takes more than 3 hours before you reach hospitals. In their barangay there has a health center but it is lack of antibiotic or facilities to cater their need. It is hard for them to buy antibiotics because most of these natives are economically poor. This is the reason why natives utilize the plants in their surroundings as remedy to their ailments.

In these three plants the most effective to cure gastrointestinal disorders is through decoction or boiling in water. Unlike when the plants that taken orally, according to Magunda, Abdullah and Gunsu, it is easier to heal or cure gastrointestinal diseases when you boil the plants. They also said that there’s no matter if you over boiled the plants but if you boiled it less than on the proper time or exact time given, it is not more effective.

In *K. galanga* L, it can also use the roots or stem of the plants to cure gastrointestinal diseases but it is lesser chance to cure the diseases in short period of time. But in other medicinal plants like *S. acuta* Burm.f. and *C. rotundus* only the leaves is used for their treatment.

Table 4 Phytochemical Screening of Plant Extracts

Plant Extracts	Secondary Metabolites			
	Alkaloid	Flavonoid	Tannins	Saponins
<i>S. acuta</i> burm f	✓	✓	✓	✓
<i>K. galanga</i> L	✓	✓	✓	✓
<i>C. rotundus</i>	✓	✓	✓	X

Secondary metabolites are very essential in plant use by humans. Most pharmaceuticals are based on plant chemical structures and secondary metabolites are widely used for recreation and stimulation. Ethno pharmacology is the study of such plant use. Psychoactive plant chemicals are central to some religions and flavors of secondary compounds shape our food preferences (Bidlack, 2000). A vast number of natural plant-based extracts and chemicals are purported to have beneficial effects on human brain function. Zhang identified extracts and constituents from 85 individual medicinal plants that have demonstrated potential

efficacy for treating psychiatric disorders on the basis of animal behavioural models alone. However, few plant-based products have been assessed in methodologically adequate human trials.

There are two plant species that possess alkaloids, flavonoids, tannins and saponins, the *S. acuta* Burm.f. and the *K. galanga* L., and only the *C. rotundus* that do not possess saponins but possesses the other three secondary metabolites which are the flavonoids, tannins and alkaloids.

Table 5 Description of Secondary Metabolites

Characteristics	Flavonoids	Tannins	Alkaloids	Saponins
Function	Its main function is to attract prey. Many times the flavonoids are the plant adaptive response to intense ultraviolet rays. It protects the plant from the harmful effects of these noxious rays.	Tannins solution are acid and have an astringent taste. It is responsible for the astringency, colour, and some of the flavour in tea.	They may act as reservoirs for protein synthesis. They also act as protective substance against the animal or insect attack. Also function as plant stimulants or regulators in activities like growth, metabolism and reproduction.	Saponins reduce cholesterol reduction and reduce the risk of heart diseases.
Properties	It is used for antioxidant properties, anticancerous properties, antimicrobial properties, protection of the stomach, and protection of the liver.	Tannins are freely soluble in water, alcohol, glycerol, and acetone. They are also sparingly soluble in chloroform, ethyl acetate and other organic solvents.	It possesses curative properties and are of great value in medicine, they are powerful poison. It is colourless, crystalline,, solids non volatile	It is a plant chemical, possessing detergent qualities that foam when mixed with water.

Flavonoids are non-nitrogenous plant pigments. They are also responsible for the colors of many fruits. Some flavonoids have demonstrated their protective power against liver diseases. It is very useful to eliminate certain digestive ailments related to liver, like the feeling of fullness or vomits.

Some plants produces alkaloids the make the plants taste bad or have poisonous effects, which may keep animals from eating them. Other possibilities are that alkaloid may actually encourage animals to eat certain parts of plants to help spread the seeds.

Tannins are naturally occurring complex organic compounds possessing nitrogen free polyphenols of high molecular weight. Tannins bind to and precipitate protein and various other organic compounds including amino acids and alkaloids.

Saponins are characterized by their structure containing a triterpene or steroid aglycone and one and more sugar chains.It can be found in most vegetables, beans and herbs (Mazza, 2012).

As seen in table 4 only *C. rotundus* did not show secondary metabolites in saponins since *C. rotundus* cannot cure any heart diseases or lower cholesterol and it is based on the function of saponins.

➤ *Secondary Metabolites*

These secondary metabolites can be unique to specific species or genera and do not play any role in plants primary metabolic requirements, but rather they increase their overall ability to survive and overcome local challenges by allowing them to interact with their environment. An indication of how essential these secondary metabolites are to plants survival can be seen in the energy invested in their synthesis, which is usually far in excess of that required to synthesised primary metabolites. Some of the roles of secondary metabolites are relatively straight forward to the antioxidant and antibacterial.

There are four secondary metabolites were determined in the three identified medicinal plants. These are alkaloids,

flavonoids, tannins and saponins. These secondary metabolites are possibly associated with the antibacterial of plants. The plants that were tested showed varied results on the four secondary metabolites.

➤ *Antibacterial Activities of Selected Medicinal Plants*

Antibacterial is anything that destroys bacteria or suppresses their growth or their ability to reproduce. Heat, chemicals such as chlorine, and antibiotic drugs all have antibacterial properties.

Teduray healers identified many medicinal plants, thus the researches decided to reduce the list into three and get only the most common medicinal plants. The bases included that these plants are not yet known for their medicinal properties. Upon the discoveries of researchers, these plants are documented to have medicinal properties. Moreover, they are included in the list of prescribed plants of the Teduray healers and uses who participated in the conduct of study.

Table 6 Summary Table for the Mean Zone of Inhibition of the Three Bacteria

Treatments	Mean Zone of Inhibition of the bacteria (mm)					
	E. coli		B. subtilis		S. enterica	
	24hrs	48hrs	24hrs	48hrs	24hrs	48hrs
T ₁ (Distilled Water)	0	0	0	0	0	0
T ₂ (Tetracycline)	33.02*	31.02*	30.16*	37.43*	20.94*	12.07*
T ₃ (<i>Kaempferia galanga</i> L.)	6.73*	5.67*	9.14*	7.46*	12.45*	1.98
T ₄ (<i>Sida acuta</i> burm f.)	7.79*	6.01*	10.00*	7.51*	8.76*	8.37*
T ₅ (<i>Cyperus rotundus</i>)	9.26*	8.91*	8.99*	8.20*	11.45*	10.35*
LSD _{0.5}	1.00	5.00	0.32	9.62	3.38	6.72

Legend: * Significant Difference

Table 6 presents the data for the growth of the organisms using the different treatment. The data showed the result of the mean zone of inhibition of *E. Coli*, *B. subtilis* and *S. enteric* in 24 and 48 hours.

For the gram-negative *E. coli*, (T₃) *K. galanga* L. has 6.73mm zone of inhibition for 24 hours and 5.67mm for 48 hours that show a significant zone of inhibition. This plant is not really known for its medicinal purposes, its phytochemical screening was conducted and it shows a positive result in alkaloid, saponins, tanins and flavonoids which contribute to the antibacterial against the gram negative bacterium, *E.coli*. In Mexico it is used to treat renal inflammation, gonorrhoea, malaria, diarrhea, dysentery, abortion, and ulcers. (Benjumea, Betancur, Vasquez & Alzate, (2016).

The (T₄) *S. acuta* Burm.f. has 7.79mm zone of inhibition for 24 hours and 6.1mm for 48 hours which shows a significant result. Phytochemical screening of *K. galanga* L. yielded flavonoids, tannin and saponins. The whole plant

is used as a postpartum protective medicine, treatment for stomach ache, diarrhoea, dysentery, tooth ache, chest pain and other constipation.

The (T₅) *C. rotundus* has a zone of inhibition of 9.26mm for 24 hours and 8.91mm for 48 hours. It signify a significant zone of inhibition on first 24 hours and in 48 hours it also shows a significant result of zone of inhibition which is 8.91mm. Through the presence of the secondary metabolites tannins, saponins, alkaloid and flavonoids which contribute to the antibacterial against the gram negative bacterium, *E. coli*. This medicinal plant is used for menopause, menstrual disorder, and dysmenorrhea and breast tumors.

After 24 and 48 hours of incubation, the computed F-values of *E. coli* are 952.72 and 32.53 respectively. Both 24 and 48 hours the, computed F- value is greater than the tabular value and these is significant difference at 5% level of significance .The significant difference in the mean zone of inhibition of leaves of *S. acuta*, *K. galanga* L. and *C. rotundus*.

Table 6 also shows the data for the growth of gram-positive bacteria *B. subtilis* using different treatments. T₂ has a 30.16mm zone of inhibition for 24 hours and in 48 hours it gave a result 37.10mm meaning there is an inhibition in the growth of bacteria. T₃ has a zone of inhibition of 9.14mm during the 24 hours of incubation and during the 48 hours, the mean zone of inhibition is 7.46mm which means there has no significant inhibiting activity that took place toward this time. T₄ has a zone of inhibition of 10mm during 24 hours and in 48 hours it takes 7.51mm zone of inhibition it means that there has no significant inhibiting activity that took place toward the bacteria. T₅ during 24 hours it takes 8.99 mm in the zone of inhibition and in 48 hours its zone of inhibition is 7.51 it means the effectiveness of medicinal plants will result after 48 hours of intake.

After 24 and 48 hours of *B. subtilis*, the mean zone in five treatments has no significant result since the computed F- value is greater than the tabular value, so it means that in 24 hours the plant extract did not show any significant antibacterial towards the bacterium.

After 24 and 48 hours of incubation, the computed values are 672.75 and 13.58. The value in 24 and 48 hours is greater than the tabular F-value with df(4,10) which is 3.48. These is significant at 5% level of significant. Thus the null hypothesis is rejected.

Data for the growth of another gram-positive bacteria *S. enterica*. Are also shown in Table 4. T₃ had a zone of inhibition of 12.45mm and 1.93mm for 24 and 48 hours of incubation which means there is no inhibition in the growth of bacteria. T₄ had a zone of inhibition of 8.76mm and 8.36mm for 24 and 48 hours. Which mean that there is an inhibition of growth of bacteria. T₅ had a zone inhibition of 11.45 for 24 hours of incubation it means that there is an inhibition in the growth of bacteria. In 48 hours of incubation it has a zone of inhibition of 10.35mm.

After 24 and 48 hours of incubation, the computed F-value is 92.20 and 4.79 is greater than the tabular value with the df (4,10) which is 3.48. These are significant in 5% level of significance. Thus the null hypothesis is rejected.

Since the significant difference among treatment was observed, the data were subjected for further analysis using the Least Significant Difference (LSD) Test at 5% level of significance. This is to determine which of the treatment means significantly differed from the control.

C. rotundus get the highest significant difference among the 3 plants; it is because this perennial herb is an astringent. These substances have the property to shrink the body tissues subjected to inflammation. In this way, they hasten the process of healing. And its grass herb is used for menstrual pain and disorders, for liver, as a digestive stimulant and for memory. Treatment of gas, diarrhea, infertility, depression and even cervical cancer is possible with this perennial herb (Uddin, Mondal, & Shilpi 2015). Because of the secondary metabolites present in this plants

such as alkaloid that possess curative properties and have a great value in medicine. The presence of Flavonoid serves as a protection of the stomach, and protection of the liver. While tannins is known as folk medicine used to combat diarrhea, haemorrhoids as bactericides.

V. FINDINGS

The findings based from the presentation, analysis and interpretation of data obtained from the series of field and laboratory works. It also presents the conclusions and the recommendations.

The study described the medicinal plants used by the cultural community for the treatment of gastrointestinal disorders. After thorough analysis and interpretation of data, the study has found the following:

➤ *Plants Used by the Cultural Community for the Treatment of Gastrointestinal Disorders*

There are three plants that were consistently identified and were commonly used by the Teduray folk doctors to their diseased town folks. Those three plants were subjected to different bioassays. *S. acuta* Burm.f. (Sapar) was prescribed for vomiting and diarrhea, *K. galanga* L. (Kisol) was prescribed for diarrhea and *C. rotundus* were used for vomiting and bleeding after giving birth. These plants were selected as to their use for the treatment of gastrointestinal disorders, the number of individuals who use the medicinal plants, financial constraints to be considered for the authentication and laboratory assays. However, the Teduray folk doctors had not processed to introduce these plants to the barangay health centers, although criterion is required.

These plants had not been documented for their medical properties by authorities in the study of Philippine Medicinal Plants.

➤ *Variations in Terms of Habit, Cotyledon and Parts used*

The identified three plants used for the treatment of gastrointestinal disorders were classified to belong to three family types, considering their varied taxonomic properties. The plants were representative of species of these families, namely: *Malvaceae*, *Zingiberaceae* and *Cyperaceae*.

The habit of plants belongs to herb which are the *S. acuta* Burm.f, and *K. galanga* L and *C. rotundus*.

The plants cotyledons were identified to be monocotyledon and dicotyledon in where *S. acuta* Burm.f. and *K. galanga* L. are dicotyledonous plants and *C. rotundus* is a monocotyledonous plant. The three plants were prepared for medication by boiling the part to produce the decoction. Only one identified part of the plant are used for this purpose, which is their leaves. The decoction was commonly prepared, and was taken internally.

➤ *Preparation of the Medicinal Plants Affects the Effectiveness in Treating Gastrointestinal Disorders*

Decoction is the most common way of preparing the medicinal plant according to the survey. Boiling the part

which is the leaves to produce decoction is said to be the effective way to prepare the medicinal plants. It affects the effectiveness of plants as based on the folks that the researchers interviewed, the intake of washed plants only does not get the pain easily same with the other processes like cutting it into smaller pieces and take it orally after. Boiling the medicinal plants for them makes it more effective as the nutrients are being extracted.

➤ *Antibacterial Activity of the Medicinal Plants*

The three bacterial species were specifically *E. coli*, *B. subtilis* and *S. enterica* show sensitivity to the one plant that is subjected to antibacterial assays. The leaves of *C. rotundus* displayed the highest antibacterial activity but there were some treatments that show antibacterial activities in the first 24 hours.

Like the *S. acuta* Burm.f. but after 48 hours the *E.coli*, *B.subtilis* and *S. enterica* became resistant of the treatments. *C. rotundus* gives the highest antibacterial property from the results after the experimentation.

➤ *Secondary Metabolites Present of the Plants*

All the species showed variety of presence of the four secondary metabolites, namely: alkaloids, tannins, flavonoids and saponins.

➤ *Significant Difference in the Zone of Inhibition*

There is a significant difference in the zone of inhibition in the medicinal plants and most of the greater zone of inhibition is during the 24th hours of the bacteria being subjected to the different plant extracts and in the 48th hours, the bacteria became resistant to it but there is still a difference in zone of inhibition.

VI. CONCLUSIONS

➤ *Based on the Significant Findings, the Researchers have Drawn these Conclusions:*

- Tedurays used three common plants which are the *S. acuta* Burm.f, and *K. galanga* L and *C. rotundus* for treating gastrointestinal disorders.
- The plants used were all the same in terms of their habit as it is under the herbs. Two of the plants are dicotyledonous which are the *S. acuta* Burm.f. and *K. galanga* L. As to the part used for medication.
- The plant part which is the leaves undergoes the process of Decoction and it is the most effective way to treat gastrointestinal disorder compared to the plants that is orally taken.
- The plants show presence of secondary metabolites, namely; alkaloids, tannins, flavonoids and saponins. *K. galanga* L. and the *S. acuta* Burm.f. has all the four secondary metabolites. *C. rotundus* contains tannins, flavonoids and alkaloids.
- The plant extracts inhibit the growth of the three representatives of bacteria. *C. rotundus* inhibit commercial antibiotic; and

- There is a significant difference in the zone of inhibition of bacteria after 24 and 48 hours. *C. rotundus* have shown greater zone of inhibition among the two other plants.

RECOMMENDATIONS

➤ *On the Basis of the Conclusions Drawn, the Researchers Recommend:*

- That a study should be done to the identified other medicinal plants used by the different cultural communities for treating gastrointestinal disorders or even other disorders. But these plants were not documented to be recognized by the local health centers nor included in the list of recognized medicinal plants based on the investigation done by Eduardo Quisumbing.
- That other researchers may delve into studies that will identify the variations of the medicinal plants that is not yet being acknowledged by the local health centers or journals.
- That other researchers may investigate a similar Ethnomedicinal investigation to other tribes in the island of Mindanao and study about how the preparation of these medicinal plants affects its effectiveness in treating a disorder.
- That to use other techniques in preparation of the plant samples and utilize other parts of the plant that will undergo antibacterial activities.
- That other researchers may investigate specific levels of secondary metabolites, according to the percentage be determined by other procedures, in order to make the assay more quantitative and reliable by phytochemical screening; and,
- That other researcher may explore essential assays like antihelminthic,
- antiangiogenic, anti-inflammatory, anti-cancer and anti-viral activities of the identified and selected plants used in this study.

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