Review Of Literature On Medical Properties Of Gliricidia Sepium

The Kakawate leaves came from the Latin word 'glis' which means dormouse and caedere, meaning to kill. “Mata-raton”, a Spanish word, refers to the tree's rodenticial properties. The tree pods hang-dry in the sun, they curl and explode, making a popping cracking sound. A cluster of trees with their pods snapping and popping and falling to the ground, in unison, make a fascinating afternoon of nature's concoction of sound. The tree is common in the southern Tagalog areas, shedding leaves around December and flowering February and March. In some areas, the blooming of its pink flowers is so profuse to deserve a comparison with the cherry blossoms.

According to Dela Cruz (2010), Gliricida sepium or the kakawate tree is the most easiest growing plants one could find. It is a leguminous tree that grows mostly in forest and can grow from five to ten meters tall. It is very easy to propagate and inexpensive. The tree could re-spout very quickly after pruning. Many farmers used them to shade other perennial crops like cacao, coffee and tea. Also, kakawate could provide a lot of uses to the farmers from its roots to its leaves. Kakawate is useful for fixing nitrogen in the soil, thus improving soil quality and increasing crop yields. It also has strong roots which stabilizes sloping lands and reduces soil erosions. Its wood could also be used as firewood, hedges and fencing field while the leaves are rich in nitrogen and other nutrients suitable for green manure and fodder to farm animals.

Madre de Cacao (Gliricidia sepium) is a small to medium-sized, thorn less, leguminous tree up to 10-12 m high. It is branching frequently from the base with basal diameters reaching 50-70 cm. Bark is smooth, varying in color from whitish grey to deep red-brown. The trees display spreading crowns. Leaves are odd-pinnate, usually alternate, sub-opposite or opposite, and approximately 30 cm long. The leaflets are 5-20, ovate or elliptic, 2-7 cm long, and 1-3 cm wide. The leafletmidrib and rachis are occasionally striped red. Inflorescences appear as clustered racemes on distal parts on new and old wood, 5-15 cm long. Flowers borne singly with 20-40 per raceme with colors that vary from bright pink to lilac, tinged with white, usually with a diffuse pale yellow spot at the base of the standardpetal, and the calyxglabrous, green, often tinged red. Standardpetal is round and nearlyerect, approximately 20 mm long keel petals 15-20 mm long, 4-7 mm wide. Fruit green, sometimes tinged reddish-purple when unripe, light yellow-brown when mature, narrow, 10-18 cm long, 2 cm wide, valves twisting in dehiscence; seeds 4-10, yellow-brown to brown, nearly round

Medicinal plants are considered to be significant for being a large source of therapeutic

phytochemicals and also because of their special attributes. According to Stuart Jr. (2016), there are folkloric uses of Gliricidia sepium. For dermatitis and skin itching, apply juice or decoction of leaves, bark or roots on the skin as antipruritic. Fresh leaves can also be used by applying to the skin as insect repellent. It can also used for wound healing by using the sap of bark, leaves and roots. In Guatemala and Costa Rica, bark decoction is used against bacterial and protozoal infectons while in Panama, decoction of leaves used in urticaria, rash, burns and erysipelas. In many folkloric regimens of other countries, kakawate is used for headaches, bruises, burns, colds, cough, fever, fatigue, gangrene, gonorrhea, skin itches and sores as antidote, insecticide and insect repellant. Other parts of Gliricidia sepium can be used for small housing needs, posts, implement handles and firewood. In the Tagalog areas, popularly used as a living fence or live stakes to support plantings. Its leaves have a fetid smell; crushed, used to rid dogs of fleas and ticks and cattle, of ticks. In Latin American, the leaves of this plant is used by farmers to repel insects. They are ground up, mixed with water, and the resulting paste use to bathe animals, and repeated every 7 to 14 days, decreasing the infections from tropical warble fly. There are also some evidence to suggest that Kakawate (Gliricidia sepium) can protect some crops from fungal, insect or viral attack directly or by acting as a diversionary host plant for pets. It has been used to control termite damage in Sri Lanka and stem-borer damage to rice in the Philippines. In India, the tree was found to have a positive effect on the transmission of aphids (Aphis craccivora) causing rosette disease in groundnuts.

Kakawate (Gliricidia sepium) can also be used as a fodder because it has a high nutrient content and great potential for animal feeding. Gliricidia sepium contains various phytochemicals like flavonoids, sterols, alkaloids, glycosides, tannins, saponins, medicarpin, coumarin, and coumaric acid have been isolated. In phytochemical studies, it yielded a formosin (an isoflavan, reportedly with anti-tumor capacity), formononetin, gliricidin-6a-gliricidol-9a, medicarpin (pterocarpan), 7, 4'-dihydroxy-3'-methoxyisoflavin, 2'O-methylsepiol, tannin, and a trihydroxyflavone. Heartwood yielded a stigmastanol glucoside and 3'4-dihydroxy-trans-cinnamic acid octacosylester 2 along with three other known constituents. The study yielded two new triterpene saponins (1 and 2), possessing 3beta, 21beta, 24-trihydroxy-22-oxoolean-12-ene as aglycon, together with known aromatic compounds. In the study of bark oil by GC-MS analysis, it yielded 19 compounds. The major components were methyl?3(E)?pentenyl ether (11. 55%), 3?methyl??2?butanol (10. 65%), 3?methoxy hexane (10. 14%), 1?(1?ethoxyethoxy)??2?hexene (9. 72%), 2? decanol (8. 97%), coumarin (8. 07%) and hexadecanoic acid (5. 16%). The proximate chemical composition of leaves yielded of bark oil by GC-MS yielded (g/100g DM) 34. 5 dry matter, 20. 69 crude protein, 23. 08 crude fiber, 4. 95 ether extract, 7. 69 ash, 43. 59 nitrogen-free extract, 92. 31 organic matter, 48. 18 total digestible N, 0. 95 Ca, 0. 30 P, 0. 03 Na, 0. 46 Mg, 3. 36 K, 21. 0 (ppm) Zn, 300 (ppm) Fe, 80 (ppm) Mn, 5 (ppm) Cu, and 4. 35 (kcal/g) gross energy.

Therefore, these are characterized from the plant that showed antifungal and antibacterial

properties. Tannin is an astringent, bitter plant polyphenolic compound that binds to and precipitates proteins and various other organic compounds including amino acid and alkaloids. The tannin compounds are widely distributed in many species of plants where they play a role in protection from predation, and perhaps also as pesticides and in plant growth regulation.

According to British Journal of Pharmacology (2017), tannins are a heterogeneous group of high MW, water-soluble, polyphenolic compounds, naturally present in cereals, leguminous seeds and, predominantly, in many fruits and vegetables, where they provide protection against a wide range of biotic and abiotic stressors. Tannins exert several pharmacological effects, including antioxidant and free radical scavenging activity as well as antimicrobial, anti-cancer, anti-nutritional and cardio-protective properties. They also seem to exert beneficial effects on metabolic disorders and prevent the onset of several oxidative stress-related diseases. Although the bioavailability and pharmacokinetic data for these phytochemicals are still sparse, gut absorption of these compounds seems to be inversely correlated with the degree of polymerization. Tannins are an important group of secondary plant metabolites that were originally used in the leather production industry in the tanning of animal hides. The varied chemical structures and stability evidenced among the tannin group result in their classification as hydrolyzable, complex, and proanthocyanidins.

According to A. Metwaly (2015), there are two types of tannis: True tannins and pseudo tannins. The first type of tannins, true tannins, are high complex phenolic compounds of high molecular weights ranging from about 1000 to 5000. They display the general properties of tannins and precipitated by gelatin in 1% solution. True tannins can be sub-classified into hydrolysable tannins, condensed tannins and complex tannins. Hydrolysable tannins are hydrolyzed by enzymes or acid. They are formed in several molecules of phenolic acids such as gallic and hexahydroxydiphenic acids which are united by ester linkages to a central sugar, mainly glucose, molecule. Like gallic acid, their solutions will turn blue with iron salts. They were formerly known as pyrogallol tannins, because on dry distillation gallic acid and similar components are converted into pyrogallol. There are two principal types of hydrolysable tannins, gallitannins and ellagitannins which are, composed of gallic tannins and hexahydroxydiphenic acid units. Condensed tannins are also called non-hydrolyzable tannins phiobatannins or proanthocyanidins. They are much resistant to hydrolysis. They are related to flavonoids pigments because they are formed via derivatives of flavones, like catechin or flavan-3-ol or flavan-3, 4-diols. Unlike the hydrolysable tannins, on treatment with enzymes or mineral acids, they are polymerized or decomposed into red colored substances called phlobaphenes, which are insoluble in water and indicate the typical brownish-red color of many plants and drug color. On dry distillation, they yield catechol. Like catechol itself, its solution turns to green with ferric chloride.

Complex tannins are mixtures of both hydrolysable and condensed tannins. On the other hand,

pseudo tannins, the second type of tannins, are not such a different group of tannins. According to the Journal of Pharmacognosy and Phytochemistry, it may be treated as sub group because they do not obey to Goldbeaters skin test and is low molecular weight compounds. Chlorogenic acid in coffee and nux vomica, ipecacuanha acid in ipecacuanha and catechins in cocoa are examples of pseudotannins. The detection test for chlorogenic acid is carried out by extracting the drug with water and treating this extract with ammonia solution, followed by exposure to air, which leads slowly to formation of green color. The kakawate leaves was said to have a tannins, as its constituents, particularly the condensed tannins.

Condensed tannins, also known as proanthocyanidins, are oligomers made of polyhydroxyflavan-3-ol units which can differ in their hydroxylation pattern. Their most common monomeric units are fisitinidol, robinetinidol, catechin, gallocatechin and their epimers, epicatechin and epigallocatechin. The oligomers are generally made of homogenous monomeric units with the exception of the terminal monomer which frequently show different hydroxylation and/or stereochemistry. In the book, Encyclopedia of Food Sciences and Nutrition, G. Grant and F. Marzo, stated that condensed tannins are oligomers of variously substituted flavan-3-ols, and their antinutritional effects have recently been comprehensively reviewed. These compounds can reduce enzyme activity in the gut, impair gut morphology, lower nutrient (protein, carbohydrate and lipid) digestion and absorption, reduce mineral uptake and greatly stimulate excretion of endogenous N. As a result, animal performance in high dietary intake will be affected. Dietary flavan-3-ols have a role in disease prevention, like cardiovascular disease and other forms of cancer. It has antibacterial and angioprotective property and it can inhibit tumor promotion.

According to D. Ghosh (2016), some studies reveal that the tannins possess antioxidant activity. Tannins are used in medicines for other medical purposes as mild antiseptics in treatment of diarrhea, and to check small hemorrhage. There are evidences that show the use of tannins in enhancing the nutrition and animal health. In last few years, they demonstrated that tannins have multiple biological activities including cardioprotective, anti-inflammatory, anticarcinogenic, antiviral and antibacterial properties attributed mainly to their antioxidant and antiradical activity. Recent studies in veterinary medicine mention that these effects are reflected in a better growth performance in different species of food producer animals. Tannins are also able to reduce the risk of livestock disease and transmission of zoonotic pathogens in a sustainable and environmentally friendly manner. Recent reports of the use of tannin in poultry show promising results.

In the book, Botanical Medicine in Clinical Practice, Watson and Preedy stated that tannins affect the surface structure of bacteria and induced bacterial cells to fuse, which might be related to the antibacterial mechanisms of tannin. Tannins was said to have an antibacterial property. According to Ferreira (2012), tannin extract exhibits a strong antibacterial activity with

all the bacterial strains tested like Staphylococcus aureus. The antibacterial property was confirmed by the presence of zone of inhibition. The extraction method of tannins was described by Rhazi et al. (2015). Dried powdered leaves of the plant sample was macerated in a 20% ethyl alcohol using an Erlenmeyer flask for 24-48 hours and filter it using a muslin cloth or filter paper. Ethanol has been evaporated at 40°C. Acidification of aqueous sample with two drops of 6N HCl and then extraction of phenolic compound with diethyl ether has been done. Decantation and separation phase followed and the physical, chemical, instrumental and micriobiological test have been conducted. The following bacterial strains was tested: Staphylococcus aureus, Staphylococcus epidermidis, Escherichia coli, and Staphylococcus epidermidis. According to M. Otto (2010), staphylococci are are common bacterial colonizer of the skin and mucous membrane of humans and other animals. Staphylococcus aureus and staphylococcus epidemidis are both gram positive bacteria. These bacterias currently considered as the two most important pathogens in nosocomial infections. Staphylococcus aureus is a major human pathogen that causes a wide range of clinical infections. It can also frequently causes life threatening invasive infections including septicaemia and endocarditis. Staphylococcus epidermidis, while less virulent than S. aureus, is a frequent cause of infection in hospitalised patients, often associated with implanted medical devices.

Escherichia coli is a rod-shaped, gram-negative bacterium in the family of Enterobacteriaceae. This bacteria inhibits the lower intestinal tract of warm-blooded animals, including humans. The presence of these bacteria, Escherichia coli, can be considered as an indicator of fecal pollution. On the other hand, pseudomonas aeruginosa is a gram negative, aerobic, and rod-shaped bacterium. These bacteria can infect the airway, urinary tract, burns and wounds, and also causes other blood infections. It has been identified as opportunistic pathogens of both humans and plants. According to Gacusan (2007), ethanolic extract from Gliricidia sepium was active against Staphylococcus aureus and Streptococci B Hemoloytic and did not show antibacterial activity against gram negative bacteria like Pseudomonas aeruginosa and Escherichia coli. Straphylococcus aureus is said to be the highest antibacterial activity, whereas they were moderately active against other bacteria tested.

The researchers used these kind of bacterial strains because these are common bacterias that found in the normal flora of the human body. The extract from the leaves Gliricidia sepium is one of the source of antioxidant and antibacterial agents that can be used to prevent enteric disease. Phenol – flavonoid compound, the major contributor for its antibacterial and antioxidant property, presented a considerable amount to the leaf extract. According to Jose and Sujatha (2016), the antibacterial activity of the Kakawate leaves was assessed by determining the zone of inhibition with the four organisms used, namely, Staphycoccus aureus, Staphylococcus epidermidis, Escherichia coli and Pseudomonas aeruginosa. All of the organisms tested showed antibacterial activity using the leaf extract of the kakawate (Gliricidia sepium). The phytochemical test conducted by the researchers showed that the leaves of Gliricidia sepium

contains secondary metabolite like alkaloids and saponins. In this test, it is said to be negative in the leaves of kakawate because it doesn't show green precipitate. On the other hand, this research can still be used as an ingredient that can promote health advantages.

In other researches, the phytochemical test of Kakawate leaves showed that it has various phytochemical constituents. The leaf extract of Kakawate showed positive result for glycosides, oils, saponins, flavonoids, alakaloids, tannins, carbohydrates, phenolic compounds and phytosterols. Cefepime is used to treat a wide variety of bacterial infections. This drug belongs to the cephalosporin antibiotics. It has an extended spectrum of activity against the gram positive and gram negative bacteria. It also works by stopping the growth of bacteria and can treat certain infections caused by bacteria including pneumonia, skin, urinary tract and kidney infections. This drug will not work for colds, flu or other viral infections. Using antibiotics when they are not needed, increases your risk of getting an infection later that resist antibiotic treatment.

Antibacterial activity of the extract of Gliricidia sepium was determined by using gram positive and gram negative bacteria as test samples. After the experiment, the results obtained shown that the extract were active in both gram positive and gram negative bacteria. Pseudomonas aeruginosa and Bacilus subtilis showed the lowest inhibitory concentration. Using the extract and the highest inhibitory concentration was exhibited in Staphylococcus aureus and Escherichia coli. Therefore, the study conducted that Gliricidia sepium has a broad spectrum of antibacterial property and a potential source of new classes of antibiotics that could be useful for infectious diseases. After thorough review of related literature and studies, researcher assures that the research topic is not a duplicate one.