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RESEARCH ARTICLE

AN OVERVIEW OF SEVEN MEDICINAL PLANTS OF SAPINDACEAE FAMILY IN BANGLADESH WITH THEIR PHARMACOLOGICAL, TOXICITY, PHYTOCHEMICAL PROPERTIES AND MEDICINAL EVALUATION OF BIOACTIVE COMPOUNDS

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Abstract

Medicinal plants can be a good alternative for many disease and conditions. They are low cost, and tend to have fewer side effects. Among all plant parts used for the treatment of diseases and leaves are the most active part used in recipe's formulations, which showed quite effective results. They can still have unwanted health effects, especially when used in combination with other drugs. Sapindaceae is a noteworthy medicinal plant family which is also known as soapberry family. It contains 145 genera and 1,925 accepted species. Examples include horse chestnut, maples, and lychee. The Sapindaceae occur in temperate to tropical regions, many in laurel forest habitat, throughout the world. A large number of them are laticiferous, i.e. they contain latex, a milky sap, and many contain mildly toxic saponins with soap-like qualities in the foliage or the seeds, or roots. The largest genera are Serjania, Paullinia, Allophylus and Acer. This study looked at seven medicinal plants which are exhibited different therapeutic activities. These seven medicinal plants are taken namely- *Nephelium lappaceum, Allophus serratus, Cardiospermum halicacabum, Diomocarpus longan, Schleichera oleosa, Litchi chinensis* and *Harpullia arborea*. These plants reported the presence of phytochemical constituents and also characterized by antimalarial, antimicrobial, antioxidant, antimigrane, anti-inflammatory, anti-ulcerogenic, anti-cancer, antiolytic, analgesic, anti-trichomonas, anti-diabetic, hepatoprotective, insecticidal, molluscicidal, piscicidal and spermacidal properties. These Plants have sedative, diuretic, tonic, antispasmodic and antiseptic properties. These medicinal plants could beuseful components of a development strategy which enhances sustainable rural livelihoods; protect habitats and biodiversity throughout the world.

Introduction:-

Medicine:

Medicine is the science and practice of caring for a patient and managing the diagnosis, prognosis, prevention, treatment or palliation of their injury or disease. Medicine encompasses a variety of health care practices evolved to maintain and restore health by the prevention and treatment of illness. (Saunders, J., 2000).

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Drug:
A drug is any substance that causes a change in an organism's physiology or psychology when consumed. Drugs are typically distinguished from food and substances that provide nutritional support. Consumption of drugs can be via inhalation, injection, smoking, ingestion, absorption via a patch on the skin, suppository, or dissolution under the tongue. (Bergström, C. A., et al., 2014). A pharmaceutical drug, also called a medication or medicine, is a specific amount of chemical substance which used to treat, cure, prevent, mitigation or diagnose a disease or to promote well-being and prevention of pregnancy (such as: Histamin used for diagnosis of disease, paracetamol used for treatment of disease, vaxin used for prevention of disease, Contraceptive pill used for prevention of pregnancy etc.).

Crude drugs are natural substances of plant, animal or, mineral origin, which possess therapeutic properties and pharmacological actions and which have undergone no treatment other than collection and drying. Crude drugs comprise of whole plants and herbs, their morphological or anatomical parts, extracts, secretions and other constituents, whole animals, their anatomical parts, glands or other organs, extracts, secretions, and other constitutes of their organs. (Ghani, A., Part I: 7, 2005).

Medicinal Plants:
The plants that possess therapeutic properties or exert beneficial pharmacological effects on the animal body are generally designated as Medicinal plants. Although there are no apparent morphological characteristics in the medicinal plants that make them distinct from other plants growing with them, yet they possess some special qualities or virtues that make them medicinally important. It has now been established that the plants, which naturally synthesis and accumulate some secondary metabolites like alkaloids, glycosides, tannins and volatile oils and contain minerals and vitamins, possess medicinal properties.

Accordingly, the WHO consultative group on medicinal plants has formulated a definition of medicinal plants in the following way: "A medicinal plant is any plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes or which are precursors for the synthesis of useful drugs." (Ghani, A., Part I: 197, 2005).

Complementary and Alternative Medicine:
Complementary medicine is used along with standard medical treatment but is not considered by itself to be standard treatment. One example is using acupuncture to help lessen some side effects of cancer treatment.

Alternative medicine is used instead of standard medical treatment. One example is using a special diet to treat cancer instead of cancer drugs that are prescribed by an oncologist.

People may use the term "natural," "holistic," "home remedy," or "Eastern Medicine" to refer to Complementary and alternative medicine (CAM). However, experts often use five categories to describe it. These are listed below with examples for each.

Complementary and alternative medicine (CAM) is the term for medical products and practices that are not part of standard medical care. People with cancer may use CAM to:
1. Help cope with the side effects of cancer treatments, such as nausea, pain, and fatigue.
2. Comfort them and ease the worries of cancer treatment and related stress.
3. Feel that they are doing something to help with their own care.
4. Try to treat or cure their cancer (Complementary and Alternative Medicine, 2022).

Description of Sapindaceae Family:
The Sapindaceae are mostly trees and shrubs, and tendril-bearing vines comprising about 145 genera and 1,925 species. The leaves are alternate, simple, or more commonly pinnately compound; stipules are absent except in the climbing forms.

The flowers are small, actinomorphic or zygomorphic, and commonly functionally unisexual, although a given individual may bear seemingly bisexual flowers together with either male or female flowers. The perianth typically is biseriate, consisting of calyx and corolla. The calyx comprises 4 or 5 distinct or sometimes basally connate sepals. The corolla consists of 4 or 5 distinct petals or sometimes is absent. The petals commonly have basal appendages on the inner side. The stamens are distinct, often have hairy filaments, and in quantity usually are equal to or twice the number of calyx lobes. The gynoecium consists of a single compound pistil of usually 3 carpels, commonly an equal

number of styles or style lobes, and a superior ovary usually with 3 locules, each containing 1 or 2 axile or axile-apical ovules. Most species have an extrastaminal, often asymmetrical nectary disk situated between the stamens and corolla. The fruit is variable (Carr, Gerald D., 2005).

Scientific classification of Sapindaceae family:
Kingdom:
Plantae

Subkingdom:
Tracheophytes

Superdivision:
Angiosperms

Division:
Eudicots

Class:
Rosids

Subclass:
Rosidae

Order:
Sapindales

Family:
Sapindaceae (Byng, J. W. et al., 2016).

General Characters of Sapindaceae Family:
Characters of Sapindaceae:
Trees, shrubs, and climbers typically have pinnate leaves, and lianous genera' coiled tendrils spring like circinate tendrils. Flower features: unilateral extrastaminal disc, tricarpellate ovary, trilocular, superior, and typically arillate seed; scale- or gland-appended petals (Yashasvi, B., 2013).

A. Vegetative characters:
Habit:
Trees, bushes, or climbing plants with tendrils resembling watchsprings (Yashasvi, B., 2013).

Root:
Tap, deep in tree species, branched (Yashasvi, B., 2013).

Stem:
Erect or weak climbing supported by axillary tendrils that function as the modified inflorescence axis. The branches are frequently flat and rolled like a watch spring, and they are forked at the top. (Yashasvi, B., 2013).

Leaf:
Pinnate, alternate compound, stipulate (climbing species), stipules small and quickly falling off, occasionally imparipinnate; a paripinnate leaf's end leaflet is bent round to function as a terminal leaflet. Latex or resin found in particular lamina cells or sacs (Yashasvi, B., 2013).

Floral characters:
Inflorescence:
Cymose, unilateral, cymes arranged in racemes or panicles (Yashasvi, B., 2013).

Flower:
Obliquely pentamerous, zygomorphic, or actinormophic, bisexual or unisexual, hypogynous, polygamous or polygamodioecious, extra staminal disc is unilateral or glandular.

Both bisexual and unisexual flowers are found in the same individual (polygamous) or bisexual and staminate or bisexual and pistillate flowers (polygamo-dioecious) occur in separate individual plants (Yashasvi, B., 2013).

Calyx:
Sepal 5, polysepalous, imbricate, in actinomorphic flowers sepals become 4 by the union of 3rd and 5th (Yashasvi, B., 2013).

Corolla:
In an actinomorphic flower, one of the five petals (polypelatous, with scaly or hairy appendages) is suppressed, resulting in the remaining four petals. Dodonaea, Schleichera, and other plants lack petals. The floral axis develops into a disc between the stamens and petals. This disc is typically ring-shaped and has glandular swellings opposite the petal insertions. (Yashasvi, B., 2013).

Androecium:
Stamens 8 or 10, in two whorls, polyandrous, inserted inside the dise; dithecous, basifixed, introrse (Yashasvi, B., 2013).

Gynoecium:
Tricarpellary, syncarpotfs; ovary superior, trilocular, with one or two ovules in each loculus, axile placentation; style terminal; stigma trifid (Yashasvi, B., 2013).

Fruit:
Capsule, nut, berry, drupe (Yashasvi, B., 2013).

Seed:
Arillate, non-endospermic (Yashasvi, B., 2013).

Pollination:
Entomophilous (Yashasvi, B., 2013).

$\oplus$ or o|o ☿, ♂ or ♀ K_{5-4} C_{5-4} A_{8-10} $G_{(3)}$.

(Yashasvi, B., 2013).

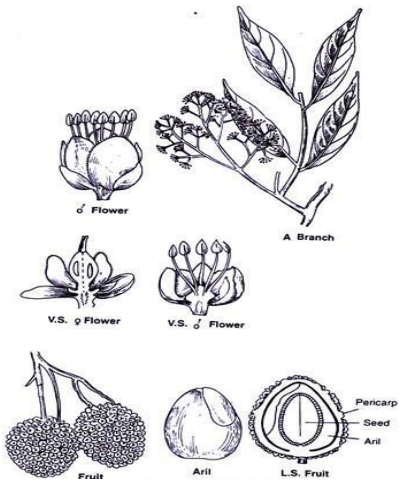

Figure 1:- Parts of *Lichi chinensis* (Litchi, Sapindaceae family).

Distribution of Sapindaceae:
The Sapinadaceae, also known as the Litchi or soap-berry family, is a significant family comprising 1,925 species and 145 genera. The family has 24 genera and 72 species represented in India. Frequently found in the Himalayas' northwestern and eastern regions. The family is primarily limited to areas that are tropical or subtropical. Distributed nearly everywhere in Bangladesh, the principal locations are in the districts of Jessore, Rajshahi, Rangpur, Dinajpur, Khulna, Comilla, Kushtia, Sylhet, and Chittagong. (Yashasvi, B., 2013).

Reasons to Choose Sapindaceae Family for Therapeutic Purpose:

Medicinal plants are the source of many significant contemporary pharmaceuticals, natural products, and the majority of conventional medicines. Thus, it is expected—and even desirable—that students studying traditional medicine and pharmacy have a solid understanding of the various facets of medicinal plants. This work is based on a review of the literature on certain plants in the Sapindaceae family, their distribution in Bangladesh, and their potential applications in medicine. Additionally, it would be beneficial for future researchers to look into any of the following plants:

1) *Nephelium lappaceum*
2) *Allophus serratus*
3) *Cardiospermum Halicacabum*
4) *Diomocarpus Longan*
5) *Schleichera oleosa*
6) *Litchi chinensis*
7) *Harpullia arborea*

Methodology:-

This overview provides a comprehensive data of seven traditional medicinal plants of Bangladesh with cytotoxic, analgesic, anthelmintic, anti-fungal, antibacterial, anti-diarrheal, anti-cancer, anti-nociceptive, and anti-inflammatory properties. It also encourages further investigations for more effective result. The study presents seven medicinal plants of the Sapindaceae family in Bangladesh with pharmacological, phytochemical, toxicity and medicinal activities.

Details About Seven Sapindaceae Family Medicinal Plants That Have Been Investigated Are Available At Overview:

Sl. No.	Plants Scientific name	Local name	Synonym name
1.	*Nephelium lappaceum*	Rambutan, Hairy Lychee	*Dimocarpus crinita*, *Euphoria nephelium*
2.	*Allophus serratus*	Chita, Aitachita.	*Schmidelia serrata* (Roxb.)
3.	*Cardiospermum Halicacabum*	Kopalphutki, Kanphutki.	Winter cherry, Heart seed, heart pea.
4.	*Diomocarpus Longan*	Kathlichu, Asphal	*Euphorbia litchi*
5.	*Schleichera oleosa*	Kusum (Bangla); Joyna (Bangla); Lakkha Lac tree (Eng), Kusum (India), Pongro (French), Kasambi (Indonesian), Takhro (Thai).	Gum lac tree, Ceylon oak
6.	*Litchi chinensis*	Lychee, Litchee, Litchi	*Dimocarpus lichi*, *Nephelium litchi*
7.	*Harpullia arborea*	Harpuli	Tulip-wood tree

Table 1:- Information about seven Investigated Medicinal Plants of Sapindaceae Family.

Plant Preview of *Nephelium lappaceum*:

Rambutan (taxonomic name: *Nephelium lappaceum*) is a medium-sized tropical tree in the family Sapindaceae. The name also refers to the edible fruit produced by this tree. The rambutan is native to Southeast Asia. It is closely related to several other edible tropical fruits including the lychee, longan, pulasan and mamoncillo. (Barstow, M., 2017).

Scientific Classification of *Nephelium lappaceum*:
Kingdom: Plantae – plantes, Planta, Vegetal, plants
Subkingdom: Viridiplantae – green plants
Infrakingdom: Streptophyta – land plants
Superdivision: Embryophyta
Division: Tracheophyta – vascular plants, tracheophytes
Subdivision: Spermatophytina – spermatophytes, seed plants.
Class: Magnoliopsida
Superorder: Rosanae
Order: Sapindales
Family: Sapindaceae – soapberries
Genus: *Nephelium* L.
Species: *Nephelium lappaceum* L. – pulasan, rambutan. (Acevedo, P., *Nephelium lappaceum* 2011).

Distribution of *Nephelium lappaceum*:
The center of genetic diversity for rambutans is the Malaysian−Indonesian region. They have been widely cultivated in Southeast Asia areas, such as Thailand, Myanmar, Sri Lanka, Malaysia, Indonesia, Singapore, and the Philippines. It has spread from there to parts of Asia, Africa, Oceania and Central America (Barstow, M., 2017). In Bangladesh, rambutan found in Joydebpur, Gazipur, Mymensing, Chittagong, Rangamati, Bandarban, Dhaka (Mia, M. A. B., 2016).

Description of *Nephelium lappaceum*:
It is an evergreen tree growing to a height of 15–20 m. The leaves are alternate, 14–30 cm long, pinnate, with three to 11 leaflets, each leaflet 5–15 cm wide and 3–10 cm broad, with an entire margin. The flowers are small, 2.5–5 mm, apetalous, discoidal and borne in erect terminal panicles 15–30 cm wide. Rambutan trees can be male (producing only staminate flowers and, hence, produce no fruit), female (producing flowers that are only functionally female) or hermaphroditic (producing flowers that are female with a small percentage of male flowers). The fruit is a round to oval single-seeded drupe, 3–6 cm (rarely to 8 cm) long and 3–4 cm broad, borne in a loose pendant cluster of 10–20 together. The leathery skin is reddish (rarely orange or yellow) and covered with fleshy pliable spines, hence the name, which means 'hars'. The spines (also known as "spinterns") contribute to the transpiration of the fruit, which can affect the fruit's quality. The fruit flesh, the aril, is translucent, whitish or very pale pink, with a sweet, mildly acidic flavor reminiscent of grapes (Barstow, M., 2017).

Figure 2:- The Plant *Nephelium lappaceum*.

Plant Parts of used of *Nephelium lappaceum*:
The fruit, or berry, is oval-shaped with a single seed. The outer peel is reddish or sometimes orange or yellow and covered with malleable, fleshy spines. The interior flesh is white to pale pink with a flavor similar to grapes. The seed can be cooked and eaten or the entire fruit, seed, and all consumed (Grant, A., 2021).

Phytochemicals of *Nephelium lappaceum*:
Rambutan fruit is 78% water, 21% carbohydrates, 1% protein, and has negligible fat (table; data are for canned fruit in syrup; raw fruit data are unpublished). In terms of nutritional content, the canned fruit contains only manganese at a moderate level (16% of the Daily Value), while providing 82 calories in a 100 gram reference amount (table). Other micronutrients are at a low level. As an unpigmented fruit flesh, rambutan does not contain significant polyphenol content, but its colorful rind displays diverse phenolic acids, such as syringic, coumaric, gallic, caffeic, and ellagic acids. Rambutan seeds contain equal proportions of saturated and unsaturated fatty acids, where arachidic (34%) and oleic (42%) acids, respectively, are highest in fat content. (Barstow, M., 2017). Rambutan is a good source of natural sugars, potassium, calcium and magnesium, and it is also a modest source of fiber, and contains several B vitamins (Shahrajabian, M. H., et al., 2020).

Medicinal Uses of *Nephelium lappaceum*:
Its seeds are bitter and narcotic, while its fruits considered astringent, stomachic, vermifuge and febrifuge. The fruit of rambutan is utilized for consumption, such as fresh fruit, canned fruit, juice, jellies, or jam. It contains of antioxidant, antibacterial, antidiabetic, antihyperlipidemic, anti-inflammatory, hepatoprotective, antiproliferative, biosorbent, antiadipogenesis properties. The most important traditional health benefits of rambutan consist of decreasing unwanted fat, source of iron, its usage in skin and hair care, it is rich in vitamin C, it improves sperm quality, it has anti-cancer characteristics. The obtained findings suggest potential of rambutan as a super-fruit with incredible pharmaceutical advantages (Shahrajabian, M. H., et al., 2020).

Toxicity of *Nephelium lappaceum*:
Rambutan seeds contain fats and oils that increase human body weight (Eiamwat, J., et.al, 2014). Too much fat and oil can affect on body weight and internal body functions (eg: heart, liver, etc.). Rambutan rind extract should be safe to use in cosmetic, nutraceutical and pharmaceutical applications because there were no abnormal clinical signs (Thinkratok, A., et al., 2010).

Plant Preview of *Allophus serratus*:
Allophus serratus is an important genus of the family Sapindaceae, found to grow on upline edges of hills in Western Ghats as well as mangrove associate at West Coast of Bangladesh. Various species of Allophylus carry strong ethnopharmacological background. In Maharastra, the two species of this genus, namely *A.cobbe* (L.) Raeusch, and *A. serratus* (Roxb.) Kurz. Occur. These two species are useful in traditional medical system and and carry strong ethnopharmacological background. *A. serratus* is used against bone fractures. Leaves of *A.cobbe* are used by local people against bone fractures, rashes, stomach ache and cuts and wounds. (Chavan, R. B. et al., 2013).

Scientific Classification of *Allophus serratus*:
Kingdom: Plantae
Subkingdom: Viridiplantae
Infrakingdom: Streptophyta
Superdivision: Embryophyta
Division : Tracheophyta
Subdivision: Spermatophytina
Order: Sapindales
Family: Sapindaceae
Subfamily: Sapindoideae
Genus: *Allophylus*
Species: *Allophylus serratus*. (*Allophylus serratus*, Plants related to Ayurveda, 2019).

Distribution of *Allophus serratus*:
Distribute throughout the world's tropical and subtropical regions, including Australia, Asia, Africa, and the Pacific Islands. In Bangladesh, it can be found in Khulna, Comilla, Rangamati, and Khagrachari. (Jemal, K. et al., 2022).

Description of *Allophus serratus*:
Allophylus serratus - Toothed-Leaf Allophylus. Toothed-Leaf Allophylus is a straggling shrubs with branchlets warty. Leaves trifoliolate. Nerves approximately 13 pairs; leaflets up to 18 x 9 cm, ovate, toothed, tapering at tip, narrowing at base; leaflet-stalk 3-7 mm long; leaf-stalk 8-10 cm long. (Sasidharan, N. D., 2016).

Plant parts usedof *Allophus serratus*:
Leaf, root, flower and seed. (Jemal, K. et al., 2022)

Figure3:- The Plant *Allophylus serratus*.

Phytochemical Constituents of *Allophus serratus*:
The phytochemical compounds which satisfy the Lipinski's rule such as 1H-Benzocycloheptene, 2,4a,5,6,7,8-hexahydro-3,5,5,9-tetramethyl-,(R) and Sulfurous acid, dipentyl ester were subjected to docking experiments using AutoDock Vina. The results from molecular docking study revealed that 1H-Benzocycloheptene, 2,4a,5,6,7,8-hexahydro-3,5,5,9-tetramethyl-, (R)-, Sulfurous acid, dipentyl ester and 1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester bind effectively to the active site region of COX-2 with a binding energy of -8.9, -8.4, and -7.9, respectively. (Jemal, K., 2019).

Medicinal Uses of *Allophus serratus*:
Antibacterial activity of *A. serratus* and found that the aqueous and ethanolic extracts of young and mature leaves of the plant contains Saponins and Terpenoids which exhibit good antibacterial potential against *B. subtilis*. Ethanolic leaf extract of the plant has anti-ulcerogenic property and the mechanism involved in antiulcer activity is cytoprotective mechanism, reduction in acid output and peptic as well as anti-secretary. Also found osteoporotic property of the plant and confirmed that the plant possesses anti osteoporotic activity. Antibacterial activity of *A. serratus* and found that the aqueous and ethanolic extracts. The ethanolic extracts of the leaves were screened for anti-inflammatory activity and analgesic properties. The extracts showed both anti-inflammatory activities, analgesic activity (Jemal, K., et al., 2022). *Allophylus serratus* fruits in decoction form were prescribed as a multifaceted drug and prominent natural remedy for strength adding gastric ailments, stress related, against heat and for other digestion complication (Radhaiah, A., et al.; 2019). The plant has been used in system of medicine as an anti-inflammatory, carminative, elephantiasis, edema, fracture of bones and gastric disorders like dyspepsia, anorexia and diarrhoea. (Avutu, S., et al., 2020).

Toxicity of *Allophus serratus*:
Allophylus serratus showed some degenerative changes. Observed histological sections of the brain, liver and kidney caused visible lesions, medullary spongiosis, congestion and haemorrhage due to this plant (Oladosu, I. A., et al., 2013).

Plant preview of *Cardiospermum Halicacabum*:
Cardiospermum halicacabum L., commonly known as 'Kanphuti', from family Sapindaceae is an annual or perennial climber, widely distributed in tropical and subtropical Asia and Africa, and often found throughout India. *Cardiospermum halicacabum* L. has long been used in Ayurvedic and traditional medicine to treat rheumatism, lumbago, nervous disorders, and as a demulcent for dropsy and orchitis. The herb is diuretic, stomachic and rubefacient (Joshi et al., 1992). The juice of the herb is used to cure earache and to reduce hardened tumors. Decoction of leaf with jaggery and pepper is used for fever associated with cough. The root is mucilaginous and considered emetic, laxative and antirheumatic and the seeds are used as a tonic for fevers and as a diaphoretic. (Sheeba, M. S. et al.; 2009).

Scientific Classification of *Cardiospermum Halicacabum*:
Kingdom: Plantae – plantes, Planta, Vegetal, plants
Subkingdom: Viridiplantae – green plants
Infrakingdom: Streptophyta – land plants
Superdivision: Embryophyta
Division: Tracheophyta – vascular plants, tracheophytes
Subdivision: Spermatophytina – spermatophytes, seed plants, phanérogames
Class: Magnoliopsida
Superorder: Rosanae
Order: Sapindales
Family: Sapindaceae – soapberries
Genus: *Cardiospermum* L. – balloonvine
Species: *Cardiospermum halicacabum* L. – balloonvine, love in a puff. (Acevedo, P., *Cardiospermum halicacabum*, 2011).

Distribution of *Cardiospermum Halicacabum*:
Cardiospermum halicacabum, known as the balloon plant or love in a puff, is a climbing plant widely distributed across tropical and subtropical areas of Africa, Australia, and North America that is often found as a weed along roads and rivers. It grows almost all over Bangladesh. (Pettit, et al; 2016).

Description of *Cardiospermum Halicacabum*:
Cardiospermum halicacabum is a deciduous woody, perennial to annual vine native to Tropical America. The square stems are fast growing and can reach up to 10 ft. (3 m) long. *Cardiospermum halicacabum* is a weed of disturbed ground, especially in wetland areas or riparian corridors. (Dressler, S., et al.; 2014)

Plant parts used of *Cardiospermum Halicacabum*:
Leaves, Seeds, Fruit, Stems (Dressler, S., et al.; 2014)

Figure 4:- The Plant *Cardiospermum halicacabum*.

Phytochemicals of *Cardiospermum Halicacabum*:
Cardiospermum halicacabum reveals the presence of palmitic acid, oleic acid, stearic acid, linoleic acid, and eicosenoic acid. The phytoconstituent responsible for the anxiolytic activity of *C. halicacabum* was identified as cardiospermin, a cyanogenic glucoside.The major chemical compounds identified were cyclohexane-1, 4, 5-triol-3-one-1-carboxylic acid, benzene acetic acid, caryophyllene, phytol and neophytadiene. The ECH was screened for its antibacterial activity against different bacterial strains and anti-fungal activity against Candida albicans by agar well diffusion and minimum inhibitory concentration (MIC) assay. ECH exhibited antibacterial and antifungal activity. All the tested bacterial strains showed MIC values ranging from 80 to 125 µg of extract/ml and *C. albicans* showed 190 µg of extract/ml as a MIC. The maximum activity ECH was observed against human pathogen *Staphylococcus aureus* followed by *Escherichia coli* and the fish pathogen *Aeromonas hydrophila*. ECH exhibited moderate activity against some of the tested multidrug resistant strains (Jeyadevi, R., et al., 2013).

Medicinal Uses of *Cardiospermum Halicacabum*:
The entire plant has emetic, laxative, rubefacient, stomachic, sudorific, diaphoretic, and diuretic properties. It is used to treat snakebite, rheumatism, neurological conditions, and limb stiffness. Because the leaves have a rubefacient quality, they are used as a poultice to treat rheumatism. They are used to make a tea that is used to relieve skin irritation. On swellings, salted leaves are applied as a poultice. The leaf juice has been used as a treatment for earache. The root is diuretic, laxative and rubefacient. It is occasionally used in the treatment of rheumatism, lumbago and nervous diseases (Dressler, S., et al.; 2014). Medicinal plants are valuable natural resources and regarded as potentially safe drugs and have been tested for biological, antimicrobial and hypoglycemic activity also play an important role in the modern medicine (Viji, M., et al., 2010). *Cardiospermum halicacabum* used in chronic inflammation. *Cardiospermum halicacabum* traditionally used to treat symptoms of malaria in parts of East and Central Africa was screened for in vitro and in vivo antimalarial activity (Khunkitti, W., et al., 2000). *Cardiospermum halicacabum* has been used in Ayurveda and folk medicine for a long time in the treatment of rheumatism, lumbago, nervous diseases, as a demulcent. (Sheeba, M. S., et al., 2009).

Toxicity of *Cardiospermum Halicacabum*:
The plant contains saponin. Large amounts of saponin can irritate the gastrointestinal tract, causing vomiting, diarrhea and, in severe cases, abdominal pain, cramps (Balloon Vine, 2018). The leaves of the plant contain traces of tannins, saponins and alkaloids. It is known to increase the risk of gastric ulcer formation and gastric lesions (Sheeba, M. S. & Asha, V. V., 2006).

Plant preview of *Diomocarpus Longan*:
Longan (*Dimocarpus longan* Lour.), belonging to Sapindaceae family is an important subtropical fruit tree in Southeast Asia and grown commercially in many countries, including China, Thailand, Vietnam, India, Australia, and some subtropical regions in the US. Longan has a succulent and edible aril with delicious flavor and health effects, which becomes more and more popular. China has been recognized as the origin of longan, where cultivation has a long history of more than 2000 years and approximately 300 cultivars have been selected for production. China is the largest cultivation and production nation in the world, with 73.6% cultivated area and 59.7% output. (Zhang, X., et al., 2020)

Scientific Classification of *Diomocarpus Longan*:
Kingdom: Plantae – plantes, Planta, Vegetal, plants
Subkingdom: Viridiplantae – green plants
Infrakingdom: Streptophyta – land plants
Superdivision: Embryophyta
Division: Tracheophyta – vascular plants, tracheophytes
Subdivision: Spermatophytina – spermatophytes, seed plants
Class: Magnoliopsida
Superorder: Rosanae
Order: Sapindales
Family: Sapindaceae – soapberries
Genus: *Dimocarpus* Lour.
Species: *Dimocarpus longan* Lour. – longan. (Acevedo, P., *Dimocarpus longan* Lour., 2011)

Distribution of *Diomocarpus Longan*:
It is found commonly in most of Asia, primarily in main land China, Taiwan, Vietnam and Thailand. China, the main longan-producing country in the world, produced about 1,900 thousand tonnes of longan in 2015–2017. Vietnam and Thailand produced around 500 thousand and 980 thousand tonnes, respectively. Also found in Chittagong, Comilla, Noakhali, Rajshahi, Rangpur, Dinajpur, Barisal, Mymensingh, Pabna in Bangladesh. (Pham, V. T., et al., 2016).

Description of *Diomocarpus Longan*:
Depending upon climate and soil type the tree may grow to over 100 feet (30 m) in height, but it typically stands 30–40 ft (9–12 m) in height and the crown is round. The trunk is 2.5 ft (0.8 m) thick with corky bark. The branches are long and thick, typically drooping.The leaves are oblong and blunt-tipped, usually 4–8 inches (10–20 cm) long and 2 in (5 cm) wide. The leaves are pinnately compounded and alternate. There are 6 to 9 pairs of leaflets per leaf. The longan tree produces light-yellow inflorescences at the end of branches. The inflorescence is commonly called a

panicle and are 4–18 in (10–46 cm) long and widely branched. The small flowers have 5 to 6 sepals and petals that are brownish-yellow. The flower has a two-lobed pistil and 8 stamens. There are three flower types, distributed throughout the panicle; staminate (functionally male), pistillate (functionally female), and hermaphroditic flowers. Flowering occurs as a progression. (Pham, V. T., et al., 2016).

Plant parts Used of *Diomocarpus Longan*:
Flower, seed, and fruit of longan (*Dimocarpus longan* Lour.) have been used in the Traditional Chinese Medicine (TCM) serving as a common herb in relief of swelling which can be applied in cases of inflammatory diseases (Nongluk, K., et al., 2015).

Figure 5:- The Plant *Diomocarpus Longan*.

Phytochemicals of *Diomocarpus Longan*:
High-performance liquid chromatography coupled with electrospray ionization mass spectrometry (HPLC–ESI-MS) analysis revealed the phenolics profile of longan (*Dimocarpus longan* Lour.) seed. Gallic acid, ellagic acid, monogalloyl-glucose, monogalloyl-diglucose, digalloyl-diglucose, penta- to heptagalloyl-glucose, ellagic acid-pentose conjugate, galloyl-HHDP (Hexahydroxydiphenoyl)-glucopyranose, pentagalloy-HHDP-glucopyranose, procyanidin A-type dimer, procyanidin B2 and quercetin-3-O-rhamnoside were found to be present in longan seed along with a number of, as yet, unknown compounds. The results illustrate the rich array of phenolic compounds in longan seeds which could be utilized as health-beneficial bioactive compounds rather than just discarded as waste (Soong, Y. Y. & Barlow, P. J., 2005). Gallic acid (GA) and ellagic acid (EA) have been identified in longan seed and by the use of reversed-phase high-performance liquid chromatography (Soong, Y. Y. & Barlow, P. J., 2006). Found to be phenethyl alcohol, 2, 3-butylene glycol, 5-hydroxymethyl-2-furaldehyde, ethyl hydrogen succinate, and 4-hydroxyphenethyl alcohol in the plant. (Tandee, K., et al. 2021). D-glucopyranose (17.6%), d-galactopyranose (33.7%) and d-galacturonic acid (15.9%) found in *Diomocarpus Longan* (Yanga, B., et al., 2005).

Medicinal Uses of *Diomocarpus Longan*:
Fruit flesh is considered an antidote to poison and used as a stomachic, febrifuge, and vermifuge. A tonic and treatment for insomnia and neurasthenic neurosis is a decoction of the dried flesh. In both North and South Vietnam, the 'eye' of the longan seed is pressed against snakebite in the belief that it will absorb the venom. Leaves and flowers are sold in Chinese herb markets but are not a part of ancient traditional medicine. The leaves contain quercetin and quercitrin. The seeds are administered to counteract heavy sweating and the pulverized kernel, which contains saponin, tannin and fat, serves as a styptic. (Kunworarath, N., et al., 2017).

Toxicity of *Diomocarpus Longan*:
Fruit pulp contains a large amount of sugars, vitamins and minerals as well as polysaccharides and polyphenolic substances. These fruits are cautionary for diabetics and related patients. The seeds and pericarp contain high amounts of polyphenolic compounds, eg, ellagic acid, gallic acid (Chiranthanut, M., et al., 2020). So, this fruit is very dangerous for patients with allergy, gastrointestinal, neuropsychological, metabolic and cardiovascular disorders.

Plant Preview of *Schleichera oleosa*:
Schleichera oleosa, a member of Sapindaceae family, is found in South East Asia region and in sub-Himalayan tract of India. This plant is long been used in India as a folkloric plant for its enormous therapeutic effects and as livestock feeds. The plant is used in helminthiasis, acne, itching, menorrhea, malaria, dysentery, rheumatism, hair loss in Ayurveda and evaluated scientifically for anti-inflammatory, antiulcer, anticancer, antibacterial and antioxidant effects. Phenolic compounds, fatty acids, tannins, hydroxyl sterols and triterpenoids are the common active Phytoconstituents of this plant. The present study reviews the Vedic status, traditional uses, Ayurvedic properties, Phytoconstituents, chemistry and biological effects of *Schleichera oleosa* and describes as a potential plant for the source of various therapeutic agents (Goswami, S. & Singh, R. P., 2017). It grows on rather dry to occasionally swampy locations on various, often rocky, gravelly or loamy, well drained, preferable slightly acidic soil. It grows usually at low altitudes, but can be found up to 900-1200 m. The normal rainfall varies from 750 to 2800 mm. Absolute maximum temperatures: 35-47.5°C; Absolute minimum temperature: -2.5°C (Kundu, M., & Schmidt, L. H., 2011).

According to the spirit of the age the herbal formulations are also set up their own positions in global market. The traditional uses of Indian medicinal plants are of long practice. It is helpful to maintain proper healthsystem in mankind. (Khandekar, U., et al., 2019).

Scientific Classification of *Schleichera oleosa*:
Kingdom: Plantae – plantes, Planta, Vegetal, plants
Subkingdom: Viridiplantae – green plants
Infrakingdom: Streptophyta – land plants
Superdivision: Embryophyta
Division : Tracheophyta – vascular plants, tracheophytes
Subdivision: Spermatophytina – spermatophytes, seed plants
Class: Magnoliopsida
Superorder: Rosanae
Order: Sapindales
Family: Sapindaceae – soapberries
Genus: *Schleichera* Willd.
Species: *Schleichera oleosa* (Lour.) Oken – lac tree. (Acevedo, P., *Schleichera oleosa*, 2011).

Distribution of *Schleichera oleosa*:
S. oleosa occurs naturally from the foothills of the Himalayas and the western Deccan to Sri Lanka and Indo-China. It was probably introduced to Malesia and has naturalized in Indonesia (Java, the Lesser Sunda Islands Bali and Nusa Tenggara), (Sulawesi, the Moluccas, Ceram and the Kai Islands). It is occasionally cultivated throughout the tropics, especially in India. ("*Schleichera oleosa*". Germplasm Resources Information Network GRIN. 2017). It's also cultivated Botanical Garden, Mirpur, Dhaka-1216, and Bangladesh. (Anjum, N., et al., 2021).

Description of *Schleichera oleosa*:
It is a medium-sized to large deciduous or nearly evergreen tree, up to 40 m in height, and 2-3.7m in girth usually with a clean bole of about 6 m in length and a dense and spreading shady crown. Bark grey or brown, reddish inside, exfoliating in small, round irregular flakes. Leaves paripinnate, w/ (2-)3(-4) pairs of pinnae, petiole cross-section circular somewhat flattened or slightly grooved above, 2-6(-8) cm long, swollen at base; rachis cross-section round to triangular; petiolule swollen, slightly grooved above, 1-3 mm long. (Kundu, M., & Schmidt, L. H., 2011).
Schleichera oleosa, kusum tree, Ceylon oak, lac tree, gum lac tree. It is a large deciduous (nearly evergreen) tree with a comparatively short fluted trunk and a shade spreading crown. It is frost and drought hardy and is subject to damage by grazing. It produces root-suckers freely, and it has good cropping power. The wood is very hard and reddish brown. This tree is noted for its growth of new leaves that are bright red. In India the growth of these bright red leaves happens around March. ("*Schleichera oleosa*". Germplasm Resources Information Network GRIN. 2017).

Plant Parts of used of *Schleichera oleosa*:
Leaves, twigs and seed-cake are used to feed cattle. ("*Schleichera oleosa*". Germplasm Resources Information Network GRIN. 2017)

Figure 6:- The Plant *Schleichera oleosa*.

Phytochemicals of *Schleichera oleosa*:
Preliminary phytochemical analysis revealed the presence of alkaloids, carbohydrates, flavonoids, glycosides, phenols, saponins and steroids in ethanol and aqueous extracts. ("*Schleichera oleosa*". Germplasm Resources Information Network GRIN. 2017). A methanol extract of leaves of *S. oleosa*. A total of four compounds were separated and identified as 5, 7-dihydroxy-4'-methoxyflavone, stigmasterol, lupeol and betulinic acid. The structures of the isolated compounds were elucidated by analysis of their H NMR data and comparison with published values.(Anjum, N., et al., 2021). The presence of antioxidant constituents in the methanol and ethyl acetate extracts of the roots of *S. oleosa* (Thind, T. S., et al., 2017). The bark of *S. oleosa* contained lupeol, lupeol acetate, betulin, betulinic acid, β-sitosterol. (Dan, S. & Dan, S. S., 2015).

Medicinal Uses of *Schleichera oleosa*:
Cattle wounds and ulcers are treated with powdered seeds to get rid of maggots. An infusion is used to treat malaria, while the bark, which has an astringent quality, is used to treat ulcers, skin inflammations, and leprotic ruptures. About 10% of the bark is made up of the analgesic substance lupeol. It has also yielded the antitumor agents betulin and betulic acid. In conventional medicine, itching, acne, and other skin conditions are treated externally with the oil extracted from the seed. It is believed that rubbing oil into the scalp will encourage the growth of hair that has been lost due to baldness. The fruit's pulp stimulates appetite and has an astringent taste. (*Schleichera oleosa*, Useful Tropical Plants, 2014). The unripe fruit is sour, heating to the body, heavy to digest, causes biliousness; destroys "Vata"; astringent to the bowels. The ripe fruit is sweet, sour, digestible, astringent to the bowels, heating; increases taste and appetite. (Guleria, H., et al., 2019). A bulk of research revealed that the phytochemicals exhibit their anticancer properties either by suppressing the proliferation of tumor cells via suppression of various cell signaling pathways or by induction of apoptotic death in tumor cells by generation of free radical, such as reactive oxygen/nitrogen. *Schleichera oleosa* ethyl acetate leaf extract showed good inhibition against *E. coli*. (Bhatia, H., et al., 2013). Leaves, twigs and seed-cake are used as cattle-feed. The tree yields an excellent fuel and char coal. Oil extracted from the seed, called 'kusum oil', is a valuable component of true Macassar oil used in hairdressing, culinary and lighting purposes and in traditional medicine (Kundu, M., & Schmidt, L. H., 2011).

Toxicity of *Schleichera oleosa*:
Schleichera oleosa did not cause any significant changes in blood hematology, blood biochemistry and histopathological picture of liver, kidney, heart, lymph and lung. However, the white blood count is significantly increased (Zulham, et al., 2023). When there are too many white blood cells, there is usually an infection or inflammation in the body.

Plant Preview of *Litchi chinensis*:
Litchi chinensis, commonly known as lychee, is an evergreen monoecious tree with a dense rounded crown that is native to southern China. It is noted for producing an excellent tasting globose to ovoid red fruit. Cultivation of this fruit tree (particularly cultivars there of) now occurs in tropical and sub-tropical areas around the world including

southern Florida, California and Hawaii. It will grow to 110' tall in its native habitat, but usually grows slowly in cultivation to only 20-30' tall over the first 25-30 years. Pinnate compound glossy lime green leaves, each with 4-8 pointed lanceolate leaflets in pairs, are evergreen. Yellow flowers in long terminal and axillary panicles (separate male and female flowers in each panicle) bloom in spring. Flowers are followed by globose to ovoid fruits which turn red when ripe with inner white translucent flesh. Fruits typically mature June -July (sometimes to September). Fruit is eaten fresh when in season, made into preserves, dried (lychee nut), pickled, or frozen with little loss of flavor. Lychee was introduced from China to Hawaii in 1850s. In Hawaii, the tree is grown both commercially for fruit production and as a landscape tree for both shade and fruit harvest. (*Litchi chinensis*, Missouri Botanical Garden, 2010).

Scientific Classification of *Litchi chinensis*:
Kingdom: Plantae – plantes, Planta, Vegetal, plants
Subkingdom: Viridiplantae –green plants
Infrakingdom: Streptophyta – land plants
Superdivision: Embryophyta
Division: Tracheophyta – vascular plants, tracheophytes
Subdivision: Spermatophytina – spermatophytes, seed plants.
Class: Magnoliopsida
Superorder: Rosanae
Order: Sapindales
Family: Sapindaceae – soapberries
Genus: *Litchi* Sonn. – lychee
Species: *Litchi chinensis* Sonn. – lychee. (Acevedo, P., *Litchi chinensis*, 2011).

Distribution of *Litchi chinensis*:
It is a tropical tree native to the Guangdong, Fujian, and Yunnan provinces of Southeast and Southwest China, where cultivation is documented from the 11th century. China is the main producer of lychees, followed by India, other countries in Southeast Asia, the Indian Subcontinent, Madagascar and South Africa (Spencer, P. S. & Palmer, V. S., 2017). At present China, Taiwan, Thailand, India, South Africa, Madagascar, Mauritius and Australia are major litchi producing countries in the world (Singh, G., et al., 2012). In Bangladesh, the leading litchi growing districts are Dinajpur, Rajshahi, Rangpur, Jessore, Pabna, Chittagong, Dhaka, Sylhet and Mymensingh. (Akter, R., et al., 2016).

Description of *Litchi chinensis*:
Litchi chinensis is an evergreen tree that is frequently less than 15 m (49 ft) tall, sometimes reaching 28 m (92 ft). Its evergreen leaves, 5 to 8 in (12.5–20 cm) long, are pinnate, having 4 to 8 alternate, elliptic-oblong to lanceolate, abruptly pointed, leaflets. The bark is grey-black, the branches a brownish-red. Its evergreen leaves are 12.5 to 20 cm (4.9 to 7.9 in) long, with leaflets in two to four pairs. Lychees are similar in foliage to the family Lauraceae, likely due to convergent evolution. They are adapted by developing leaves that repel water, and are called laurophyll or lauroid leaves. Flowers grow on a terminal inflorescence with many panicles on the current season's growth. The panicles grow in clusters of ten or more, reaching 10 to 40 cm (3.9 to 15.7 in) or longer, holding hundreds of small white, yellow, or green flowers that are distinctively fragrant. The lychee bears fleshy fruits that mature in 80–112 days depending on climate, location, and cultivar. Fruits vary in shape from round to ovoid to heart-shaped, up to 5 cm long and 4 cm wide (2.0 in × 1.6 in), weighing approximately 20 g. (Spencer, P. S. & Palmer, V. S., 2017).

Figure 7:- The Plant *Litchi chinensis*.

Plant Parts of used of *Litchi chinensis*:
The parts of the plant used are leaves, flowers, fruits, seed, pulp, and pericarp (Kilari, E. K. & Putta, S., 2016).

Phytochemicals of *Litchi chinensis*:
Phytochemical investigation revealed that the major chemical constituents of litchi are flavonoids, sterols, triterpenens, phenolics, and other bioactive compounds (Ibrahim, S. R. M. & Mohamed, G. A., 2015). Lychees have moderate amounts of polyphenols, including flavan-3-ol monomers and dimers as major compounds representing about 87% of total polyphenols, which declined in content during storage or browning. Lychees naturally produce butylated hydroxytoluene. Cyanidin-3-glucoside represented 92% of total anthocyanins (Spencer, P. S. & Palmer, V. S., 2017). Chemical investigation of the 95% ethanol extract of Litchi chinensis seeds led to the isolation of four new compounds, 2α,3α-epoxy-5,7,3′,4′-tetrahydroxyflavan-(4β-8-catechin), litchiol A and litchiol B, soscopoletin, coumaric acid, protocatechuic acid, Narirutin, naringin, dihydrocharcone-4′-O-β-d-glucopyranoside, pinocembrin-7-rutinoside, pinocembrin-7-neohesperidoside (Wang, L., et al; 2011).

Medicinal Uses of *Litchi chinensis*:
Litchi chinensis Sonn. (Sapindaceae) has been widely used in many cultures for the treatment of cough, flatulence, stomach ulcers, diabetes, obesity, testicular swelling, hernia-like conditions, and epigastric and neuralgic pains.The ethnopharmacologial history of *L. chinensis* indicated that it possesses hypoglycemic, anticancer, antibacterial, anti-hyperlipidemic, anti-platelet, anti-tussive, analgesic, antipyretic, hemostatic, diuretic, and antiviral activities (Ibrahim, S. R. M. & Mohamed, G. A., 2015). The fruit, its peel and the seed are used in traditional medicine; decoctions of the root, bark and flowers are used as a gargle to alleviate throat ailments. The fruit peel is used in the treatment of diarrhoea. Seeds are used as an anodyne in neuralgic disorders and orchitis. (*Litchi chinensis*, Useful Tropical Plants, 2014).

Toxicity of *Litchi chinensis*:
Excessive consumption of raw litchi contains toxins such as hypoglycin-A or methylene cyclopropylglycine (MCPG) that can cause death from hypoglycemia and acute toxic encephalopathy (Logesh, R., et al., 2023).

Plant Preview of *Harpullia arborea*:
An evergreen tree of medium size that is native to Indo-Malayan is part of the Sapindaceae family. Compound, alternating, usually even, pinnate leaves can grow up to 40 cm in length. Flowers in axillary or subterminal panicles are greenish yellow in color. Ovate and tomentose sepal 5. Five ovate, clawed petals. Place stamens 5-8 onto the disc. Ovary ovoid, 2-celled; ovules 2 in each cell, superposed. Fruit is an inflated, coriaceous, 2-lobed, 2-celled, loculicidally 2-valveddehiscent capsule, orange-red in color with 2 black seeds. Solvent extracts of seeds were shown to possess antibacterial activity against Gram positive and Gram negative bacteria. Leaves and stem extracts were shown to exhibit antimalarial activity against Plasmodium falciparum HRP2. The present study was carried out to investigate antiradical and antimicrobial activity of leaf of *H. arborea* (Carr, Gerald D., 2005). *Harpullia arborea* is a tree in the family Sapindaceae that grows up to 33 meters (108 ft.) tall (Satyanti, A. & Kusuma, Y.W. C., 2010).

Scientific Classification of *Harpullia arborea*:
Kingdom: Plantae – plantes, Planta, Vegetal, plants
Subkingdom: Viridiplantae – green plants
Infrakingdom: Streptophyta – land plants
Superdivision: Embryophyta
Division: Tracheophyta – vascular plants, tracheophytes
Subdivision: Spermatophytina – spermatophytes, seed plants
Class: Magnoliopsida
Superorder: Rosanae
Order: Sapindales
Family: Sapindaceae – soapberries
Genus: *Harpullia* Roxb.
Species: *Harpullia arborea* (Blanco) Radlk. – tulip-wood tree. (Ruggiero, M. & Gordon, D. P., 2014).

Distribution of *Harpullia arborea*:
Harpullia arborea is a tree in the family Sapindaceae that grows up to 33 metres (108 ft) tall. It is found from India and Sri Lanka throughout Southeast Asia and Malesia to Australia and the Western Pacific (Zich, F. A., et al., 2020). It grows in Rangamati, Bandarban also in Jamalpur, Meherpur, and Comilla in Bangladesh (Sharmila, S., et al., 2019).

Description of *Harpullia arborea*:
Harpullia arborea is an evergreen shrub that grows into a large tree with a dense, conical crown; it typically reaches a height of 35 meters. For the majority of its length, the straight, cylindrical bole—which may have a diameter of 60 to 70 cm—is branch-free, slightly fluted, or has tiny buttresses that can reach a height of three meters (Yashasvi, B., 2013).

Plant parts Used of *Harpullia arborea*:
Stem, Leaves, Flower, Fruits, Seeds. (Sharmila, S., et al., 2019).

Figure 8:- The Plant *Harpullia arborea*.

Chemical constitutes of *Harpullia arborea*:
Each and every part of the plant is used traditionally in various ailments. The secondary metabolites present in *Harpullia arborea* were found to be alkaloids, flavanoids, glycosides, phenols, tannins, steroids, tri-terpenoids and resins (Sharmila S, et al., 2019). Seeds yield oil (hydnocarpus oil) which is used in the treatment of skin diseases such as leprosy (Prashith, K. T. R. & Vinayaka, K. S., et al., 2017).

Medicinal Uses of *Harpullia arborea*:
The barks, fruits and seeds of *Harpullia arborea* are traditionally used by the ethnic communities of Cannore (Kerala) as leech repellent, hair wash and excellent source of an antirheumatic activity. However, folk medicines

administrations have mode of administrations notbeen studied in the seeds of *Harpullia arborea* keeping this in view, the present study was undertaken in our laboratory to investigate the antibacterial activities of methanol and aqueous extracts of seeds of *Harpullia arborea* against various strains of bacteria. The oil from the seeds is applied externally as remedy against rheumatism (Gowri, S. S. & Vasantha, K., 2009). Gram negative bacteria; *P. aeruginosa* and *E. coli* were inhibited to highest and least extent respectively (Sharmila, S., et al., 2019). The use of good quality and disease free seeds results in desired germination and emergence of plants. Seeds often act as passive carriers of several fungi such as species of Aspergillus, Mucor, Rhizopus, Rhizoctonia and these fungi reduces. (Prashith, K. T. R. & Vinayaka, K. S., et al., 2017). Harpullia arborea extracts against Gram positive and Gram-negative bacterial species. (Rajeswari, R. & Murugesh, S., 2020).

Toxicity of *Harpullia arborea*:

Many plants are used in the therapy of several diseases. Extracts and purified compounds from plants have shown to inhibit a wide range of pathogenic bacteria including antibiotic resistant strains. Antibiotic caused high inhibition of test bacteria when compared to leaf extract. (Raghavendra, H. L., et. al., 2017).

Result:-

Table 2:- Medicinal evaluation of bioactive compounds of seven Investigated Medicinal Plants of Sapindaceae Family with their Pharmacological activity.

Plants name	Phytochemical Constitute	Pharmacological activity
1.*Nephelium lappaceum*	Carbohydrates, protein, arachidic, oleic acids, syringic, coumaric, gallic, caffeic, ellagic acids.	Antioxidant, antibacterial, antidiabetic, antihyperlipidemic, anti-inflammatory, hepatoprotective, antiproliferative, biosorbent, antiadipogenesis properties.
2.*Allophus serratus*	Terpenoids, saponins.	Antibacterial activity, anti-inflammatory, antioxidant.
3.*Cardiospermum Halicacabum*	Phenol, tannins, saponins, amino acids.	Anti-inflammatory, analgesic and antipyretic activities, diuretic, emetic, laxative, refrigerant, rubefacient, stomachic.
4.*Diomocarpus Longan*	Protein, carbohydrate, vitamin C, polysaccharides, polyphenols.	Anti-inflammatory, stomachic, febrifuge.
5.*Schleichera oleosa*	Terpenoids, betulin, betulinic acid, phenolic compounds, fatty acids, tannins, hydroxyl sterols, triterpenoids.	Wounds and ulcers, anti- inflammations, astringent, anticancer activity.
6.*Litchi chinensis*	Polyphenols, flavonoids, sterols, triterpenens, phenolics, butylated hydroxytoluene.	Hypoglycemic, anticancer, antibacterial, anti-hyperlipidemic, anti-platelet, anti-tussive, analgesic, antipyretic, hemostatic, diuretic, and antiviral activities.
7.*Harpullia arborea*	Alkaloids, flavonoids, glycosides, phenols, tannins, steroids.	Antibacterial activity, antifungal activity, antimicrobial activity.

Discussion:-

Nephelium lappaceum:

From literature review, the entire fruit, fleshy spines and seed of *Nephelium lappaceum* are mostly used parts of this plant. Carbohydrates, protein, arachidic, oleic acids, syringic, coumaric, gallic, caffeic, and ellagic acids were the common active phytoconstituents observed from the literature rivew. Its seeds are bitter and narcotic. It uses in skin and hair care, it is rich in vitamin C, it improves sperm quality. The plant showed antioxidant, antibacterial, antidiabetic, antihyperlipidemic, anti-inflammatory, hepatoprotective, antiproliferative, biosorbent, antiadipogenesis properties based on literature review.

***Allophus serratus*:**

The literature review demonstrated that the most frequently used parts of *Allophus serratus* were the leaf, root, flower, and seed.This plant's terpenoids and saponins have been isolated from a variety of parts, particularly the leaves. The literature review revealed antibacterial, anti-inflammatory, and antioxidant properties. Young and mature *A. serratus* leaf extracts in both aqueous and ethanolic forms show promising antibacterial properties.

***Cardiospermum Halicacabum*:**

After a literature review, it was shown that the plant's leaves, seeds, and fruits are the parts that are most frequently used. Different solvent extracts from this plant were primarily found to contain phenol, tannins, saponins, and amino acids. There is a large variety of secondary metabolites in the leaf and stem. This literature review reveals that the plant possesses anti-inflammatory, analgesic, antipyretic, diuretic, emetic, and laxative properties. The anti-inflammatory effect was assessed using the whole plant's ethanolic extract. The stem's acetone extracts had the strongest inhibitory effect on *Escherichia coli*.

Diomocarpus Longan:

The longan (*Dimocarpus longan* Lour.) flower, seed, and fruit were found to be the most widely used parts of the plant based on the literature review. Numerous phytochemicals, including protein, carbohydrates, vitamin C, polysaccharides, and polyphenols, were present in the plant. These compounds have a variety of biological activities, including immune-stimulating, antioxidant, and antitumor effects. In longan seed, galic acid (GA) and ellagic acid (EA) have been found. As the amount of seeds increased, antioxidant activities increased significantly.

Schleichera oleosa:

The majority of *Schleichera oleosa*'s edible parts, according to the literature that follows, are the leaves, twigs, and seeds. The common active phytoconstituents found in the literature review were hydroxyl sterols, triterpenoids, phenolic compounds, betulin, betulinic acid, fatty acids, and tannins. It was discovered that the extracts of methanol, ethyl acetate, and water effectively inhibited the growth of specific cell lines. The leaf produced ursolic acid, friedelin, betulin, bauerenol, and bauerenol acetate. Based on a review of the literature, the plant demonstrated anti-inflammatory, astringent, and anticancer properties.

Litchi chinensis:

According to the literature review, the most commonly used parts of *Litchi chinensis* are the leaves, flowers, fruits, seeds, pulp, and pericarp. The common active phytoconstituents found in the literature review were polyphenols, flavonoids, sterols, triterpenens, phenolics, butylated hydroxytoluene, and cyanidin-3-glucoside. Gargling with decoctions of the root, bark, and flowers helps soothe sore throats. Neuralgic disorders are treated with seeds as an anodyne. Based on a review of the literature, the plant demonstrated antiviral, hemostatic, analgesic, antipyretic, anticancer, antibacterial, anti-hyperlipidemic, anti-platelet, and anti-tussive properties.

Harpullia arborea:

It was noted from the literature research that many study types have made use of the stem, leaves, flower, fruits, and seeds of *Harpullia arborea*. Additionally, it was discovered that various plant components included alkaloids, flavonoids, glycosides, phenols, tannins, steroids, and resins. Antimicrobial, antifungal, and antibacterial properties were displayed by the plant. The disc diffusion method was used to test the antimicrobial activity. Furthermore, this plant exhibited inhibitory action against *Escherichia coli*, *Pseudomonas aeruginosa*, and *Bacillus subtilis*.

Conclusion:-

Medicinal plants of Sapindaceae family are effective remedies for different diseases. These plants reported the presence of phytochemical compounds and also analgesic, anthelmintic, antibacterial, antifungal, anticancer, anti-diarrheal, anti-nociceptive, anti-inflammatory, anti-platelet, aggregation, anti-hyperlipidemic, anti-migraine, anti-diabetic, anti-ulcerogenic activities. The Plant possesses sedative, diuretic, tonic, antispasmodic and antiseptic qualities. The importance of these medicinal plants highlighted to populations of developing countries, and their prospective role in primary health care. Furthermore, under favorable circumstances, these medicinal plants could be useful components of a development strategy which enhances sustainable rural livelihoods. Additionally, it can benefit the environment by preserving habitats and biodiversity across developing nations.

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