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Review Article

Mallotus philippensis: A Review on its Phytochemistry and Pharmacology

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Abstract

The present study aimed to assess the pharmacological and phytochemical and pharmacogenetic properties of the Euphorbiaceae family of plants, namely *Mallotus philippensis*. The assessments included organoleptic, microscopical, and physicochemical analyses, and included measurements of LOD, total powder ash, percentage of extraction, swelling index, foaming index, and foreign particle., were used to conduct pharmacognostical investigations. According to the results, the LOD was determined to be 1.74 Percentage. Likely, 0.8 cm was reported as the swelling index. Index of foaming (less than 100). Through sequential soxhlet extraction, a phytochemical research was conducted. The extractive values for petroleum ether, chloroform, ethyl acetate, ethanol, and distilled water were 4.9%, 5.45%, 9.77%, 8.75%, and 4.4%, respectively. The existence of steroid, flavonoid, alkaloid, glycoside, phenolic compounds, fixed oils, and lipids was identified by the preliminary qualitative phytochemical screening. The ethyl acetate extract of the *Mallotus philippensis* plant was used in the pharmacological experiment to examine the anthelmetic action. The dosage of 120 mg/kg was shown to have a good pharmacological effect.

Keywords: *Mallotus philippensis*; Phytochemistry; Pharmacology

Introduction

The enormous genus Mallotus (family: Euphorbiaceae) of trees and shrubs, which has over 20 species in India, is mostly found in tropical and subtropical regions of the Old World [1]. Known by several names, including Kamala, Kapila, and Kampillaka, and locally as Shendri, *Mallotus philippensis* Muell is a common perennial shrub or small tree that grows up to 1500 meters in elevation in the outer Himalayas. When fruits are fully ripe, their glandular hairs are gathered as a reddish-brown powder that is rubbed and shaken into a cloth. The material that has been gathered is a fine, granular powder that floats on water and has a dull red or madder red tint. This plant has been used traditionally as an anti filarial [2]. It has antimicrobial, antiparasitic, immune- regulatory, antibacterial, and inflammatory properties [3] and is helpful in the treat the disease chronic obstructive pulmonary disease, gastrointestinal issues, and other ailments. Moreover.

Classification in science

KINGDOM	PLANTAE
SUBKINGDOM	TRACHEOBIONTA
SUPERDIVISION	SPERMATOPHYTA
DIVISION	MAGNOLIOPHYTA

Figure a

Description of botany

Since ancient times, these herbs have been utilized to cure medical conditions in people. Many people still receive care from the ancient medical systems (Ayurveda, Siddha, and Unani-Tibb) and folk medicine, even with the development of modern medicine, especially inrural regions. India is home to about 45,000 distinct plant species, of which 15,000–20,000 have therapeutic properties, making it one of the world's top twelve biodiversity hotspots. However, traditional societies only employ around 7,500–7,500 of these for medicinal purposes.

In nature, plant are tiny to medium-size, monoecious, and can grow to an height of 25 m anda diameter of 50 cm for their boles, however they are often far fewer in number. Slash becomes a vivid shade of crimson. Branchlets have glandular reddish-brown color. Simple, alternating, cuneate to rounded, ovate to lanceolate, and with two glands at the base, the leaves have a slightly leathery texture. Petioles are puberulous, reddish-brown in color, and have an acute or acuminate tip most of the time. Their length ranges from 1 to 4 cm. Underneath, they are conspicuously reddish-glands, hairy, and 3-nerved. Each bloom on a female plant features a stellate, hairy, three-celled ovary with three papillose papillae, and the flowers are slender racemes or spikes. The terminal and axillary male flowers have numerous stamens and are solitary or fascicled paniculate spikes, measuring 2 to 10 cm in length. Fruit is globose and depressed; three-lobed capsule with three seeds. The seed are 4 mm in diameter, sub globose, and black in color [5].

Biology

Mallotus philippensis, the fruits of this genus. ripen in July and August, whereas the blooms ripen in March and April. Ants are drawn to the additional floral nectaries of *M. philippinensis*.

Ecology

The native range of *M. philippinensis* is extensive, extending from the west side of Himalaya to south China, to India, SriLanka, and Malesian country, and finally to US. It can be gregarious at times, although it is most often found in mixed species environments, such as woods are open scrub bland. The kamala plant is widespread in green forests, particularly in 2nd forests, where it can occasionally even take over the underbrush.

The kamala tree is drought- and frost-resistant, and it can tolerate a lot of shadow.

Biophysical boundaries

The majority of kamala tree cultivation occurs at elevations of 0 to 1600 m, where typical Average annual Temp. percentage is between 16 degree Celsius to 28 degree Celsius, and Avg. percentage annual precipitation is between 800 and 2000 mm.

Most types of soil, rock terrain, acidic soils, and limestone, are suitable for plant growth.

Common names

The following are the colloquial names:

- Kamala in English.
- Kamala in Hindi. Kambhal and Sindur. Kamalagundi in Bengali.
- Hindi: The Kapilo plant
- Marathi: Shindur;
- Malayalam: Sinduri. Kumila is the Punjabi word. Kapli Kungumam in Tamil.

Traditional uses

Bioassay is the term used to describe the process of estimating the strength of a crudemedication or its preparation by observing how it affects live organisms such as bacteria,fungi, animal tissue, or the complete animal. This technique is typically applied whenuniformity cannot be sufficiently achieved by chemical or physical methods, as well aswhen the therapeutic activity of the raw material and the final product are not in compliance. Ayurveda says leaf of *M Philippinensis* are cooling, bitter, and tasty.. The components of the *M Philippinensis* containing the fruit's or capsules' glands and hairs, are utilized ascarminative, maturant, hot, purgative, anthelmintic, vulnerary, and alexiteric remedies. Inaddition to being helpful in treating bronchitis, gastrointestinal disorders, and spleenenlargement [6]. In combination with milk or yogurt It could be fairly, successful ineliminating tape worm. Oral contraceptives such as kamala or kampillakah are also utilized.Additionally, kamala is used externally to aid in the healing of wounds and ulcers. They areapplied to skin care parasite diseases Like, herpes, ringworm, and scabies.

Analysis pharmacognostic of *Mallotus philippensis*

According to morphological analysis, the fruit depresses into a three-lobed capsule that measure s5 by 7 mm by 8 by 10 by 12 mm, is stellatepuberulose, and has several granules that are orange or reddish-pink. The seeds are dark in color and sub glo-

bose. The crimson fruit's organoleptic properties indicate that it has no flavor or smell. A microscopic examination revealed the existence of the epicarp, which was made up of a tightly packed layer of mucilaginous cells, and the mesocarp, which is made up of closely spaced columnar cells. Its polygonal cells are neatly organized into two or three layers. The transverse segment has been shown to have lignified vascular organization [7].

Organoleptic evaluation

Analysis of the plant *M philippenesis* using organoleptic methods

Aerial part	
Characters	**Observation**
Colour	Reddish brown
Texture	Coarse
Taste	Bitter
Odour	Odourless

Figure b

Pharmacology

The tree's historic usage suggest that it may be able to treatment a long range of illnesses and ailments. Numerous researchers, particularly pharmacologists, have examined and verified the plant's medical potential using scientific methods, drawing inspiration from these traditional use. Consequently, an evaluation of around 84 papers relating to various biologicalprocesses has been included in this part. Additionally, if information is available, the active chemicals in question have been described along with their method of action and their activity. About half of all pharmacological research on this specific plant has focused on its antibacterial, antioxidant, and anti-parasitic properties, according to the distribution of these studies among the many biological activity categories species.

Pharmacological activities

Anti filarial activity

Aqueous and alcoholic leaf extracts of *M. philippinensis*, Muell. were investigated for their effects on the *in vitro* survival of microfilariae, the worm's overall spontaneous movement and the development of nerve-muscle (n.m.) of Setaria cervi. The entire worm's spontaneous motility is inhibited by both extracts, as is the n.m. preparation., It displays first stimulation and then melancholy in terms of amplitude. There was a noticeable absence of change in the tone or pace of contractions. A larger quantity of aqueous extract immediately reduced tone.

Anti fertility activity

M. philippinensis seed extract has negative impacts on several female rat reproductive parameters. The study reports that extract lowers blood levels of LH and FSH in experimentalmice, most likely by altering the hypothalamic/pituitary axis. This lower level may have an impact on the growth of follicles, the quality of ovulated eggs, the development of the luteum, the cycle of estrus, and the preservation of pregnancy in animal [8]. The plant extract's antifertility action is thought to be attributed to rottlerin, a product of phloroglucinol. Whereas is rottlerin is either inert or very marginally active, acetyl rottlerin could be active [9]. To learn more about the potential of phloroglucinol derivatives, more research on the effects of pure rottlerinis possible.

The anti bacterial and anti fungal properties

The antibacterial qualities of many Indian herbal medicinal plants from thirty-three different families that are use to treat a range of infectious diseases were examined. Using the agar dilution technique, screening was conducted against *Bordetella bronchiseptica*, *Micrococcus Luteus*, *Bacillus subtilis*, *Bacillus pumilus*, and *Bacillus cereus* var mycoides and *Staphylococcus aureus*. at doses of 1000 and 500 □g/mL. *Escherichia coli*, *Staphylococcus epidermidis*, and *Saccharomyces cerevisiae*, *Candida albicans*, and *Klebsiella pneumonia*. In the screening process, at least one of the test organisms was active against twenty-eight plant extracts. Basedon the findings, the research comes to the conclusion that *M. philippinensis* crude extracts had strong antimicrobial activity [3] and characteristics that lend credence to their traditional usage as broad-spectrum antibacterial agents in the treatment of a number of illnesses. Significant zones of inhibition when the pathogenic bacteria are suppressed by the steam bark of the *M. Philippinensis* are seen, which are comparable to those of the standard medicine its chloroform alcohol fractions as well as the extract made of methanol. The hexanic extract, however, did not exhibit any appreciable action [10]. With a minimum inhibitory concentration (MIC) of 15–20 mg/mL, the glandular hair of Mallotus fruits has strong antibacterial action against human pathogenic microorganisms. When used against several types of candida, this extract does not exhibit any inhibition. This demonstrates that fruit extract has antibacterial properties but no antifungal ones. The study's findings could support the plant's usage in the fight against bacterial infections. This likely explains why the native people used these herbs to treat various illnesses [10].

Immunoregulatory and anti-inflammatory activities

The fruits of *M. philippinensis* contain derivatives of chalcones that prevent (NO) nitric oxidesynthesis and the I NOS gene's expression in a (RAW 264.7) cell line that resembles a mouse macrophage. This cell line was stimulated with lipo poly saccharide (LPS) and recombinant mouse interferon-gamma (IFN-gamma). Subsequent research indicates that the expression of the cyclooxygenase-2, interleukin-6, and interleukin-1b genes is down regulated. The aforementioned findings demonstrate the potent anti-inflammatory and immunoregulatory properties of these chalcones [11].

Activities that protect hepatology

An extract of *M. philippinensis* in methanol the plant leaf lowers the rise in biochemical parameters during the treatment caused by CCl4 and reverses the functional and antioxidant parameters at dosages of 100–200 mg/kg. According to this study, leaf extract improved hepatocyte function effectively. Studies on histopathology also point to the plant's hepatoprotective properties [12].

Chemical constituents

Numerous organic substances, like numerous other substances, including cardenolides, Phenol, lactone, corticosteroids, polyphenols, isoprenoids, common organic molecules, and Bioactive monocerin. to be discovered, make up the majority of the phytochemicals found in this genus. Regarding the phytochemistry and biological activities of this rare variety of therapeutic herb, nothing is now known. On the other hand, a few researchers have made contributions to the isolation of some unique components and their functions. The chemical structure and primary biological activity of rottlerin, one of the main chemical constituents of *M. philippinensis*, are mentioned here, along with additional phytochemicals.

Cardenolide

The seeds of kamala plant contain cardenolides. 4 cardenolides were shown to be present in *M. philippinensis* seeds after fermentation.

Triterpenoids

It was shown that Triterpenoids pentacyclic having a 6/6/6/6/5 ring structure share a characteristic with several Mallotus species. The *M. philippinensis* alcoholic extracts [15]. In addition to the triterpeniods mentioned above, a-amyrin, an ursane-type triterpenoid, was discovered in ethereal and bark of *M. philippinensis* extracted with Pet ether [14].

Estrogen

using bark and heartwood extracts from *M. philippinensis* in petroleum ether, the common steroid b-sitosterol was discovered [9]. Ether extract of *M. philippinensis* bark was used to produce daucosterol [14].

Phenolic compounds

Isocoumarins: The is coumarin Bergen in was extracted from *M. philippinensis* heartwood in 1972. Additionally, this chemical was extracted from *M. philippinensis* leaves and bark.

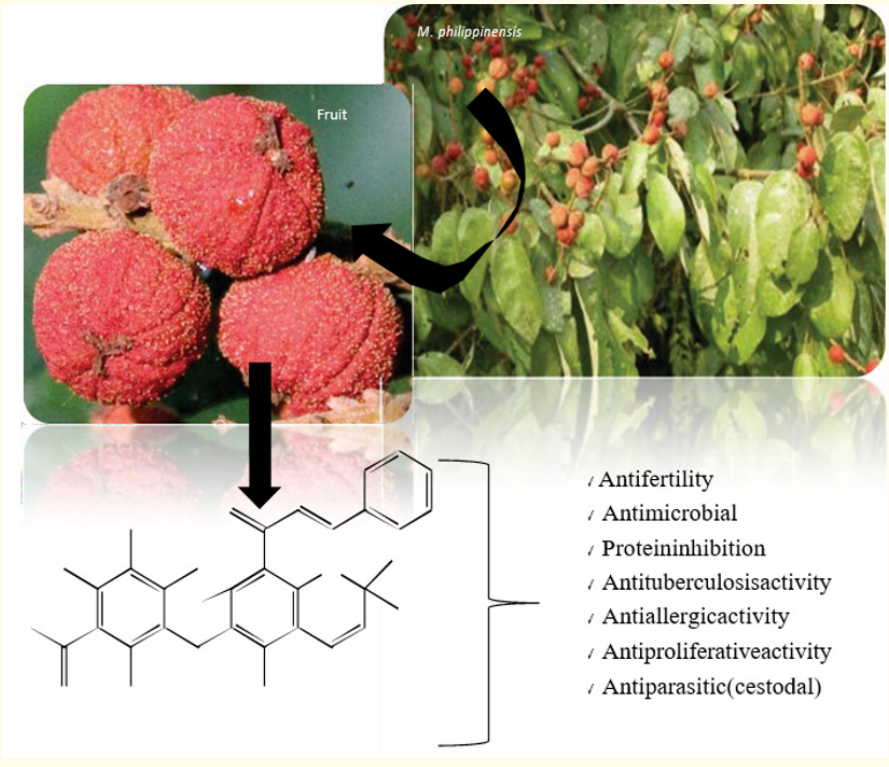


Figure c

Two new chalcone compounds from *M. philippinensis* (flavonoids) were identified, known as kamalachalcones A and B These substances have a unique ring structure as a result of a phenoxyl group and a dimethylchromene ring dimerizing [16].

M. philippinensis was used to isolate rottlerin, iso rottlerin, and four phloroglucinol derivatives (kamalins) [16]. *M. philippinensis* was also reported to contain iso rottlerin [18].

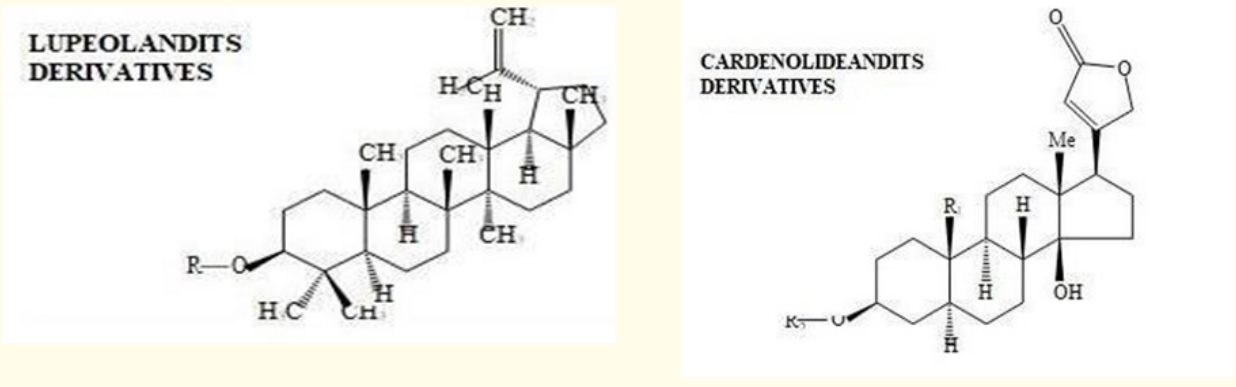


Figure d

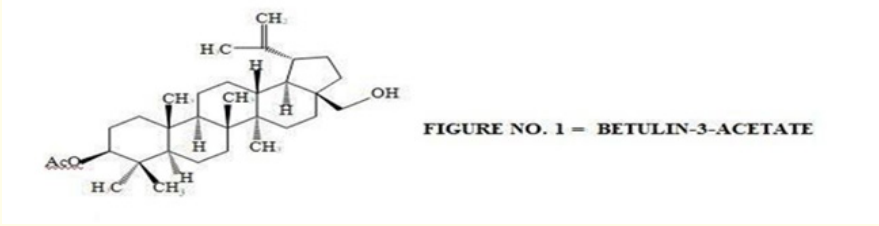
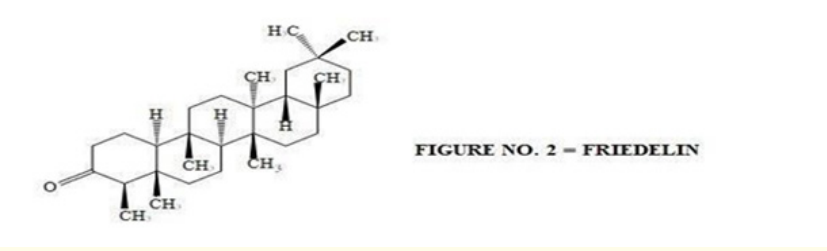


Figure 1



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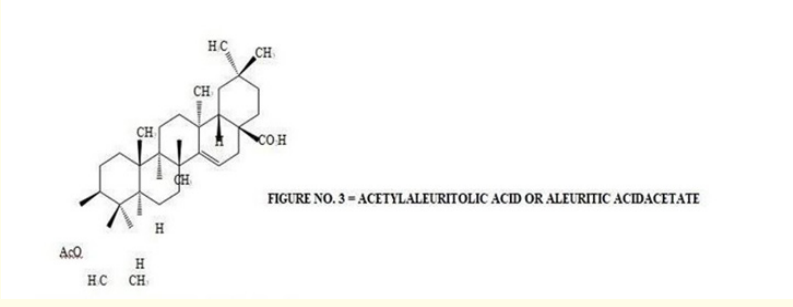

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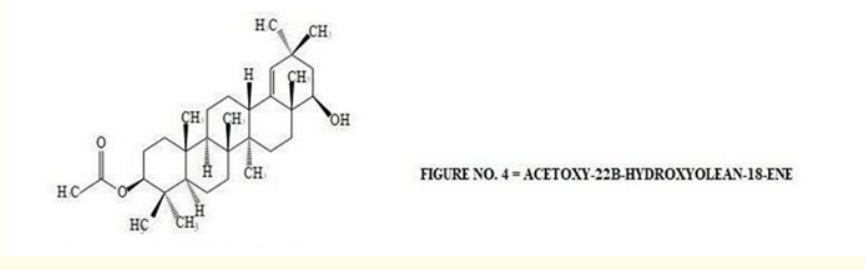

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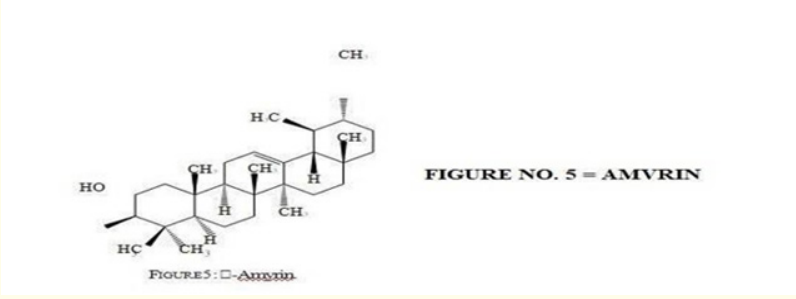
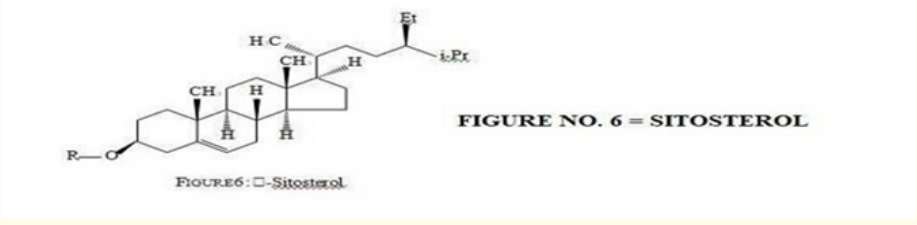


Figure 5



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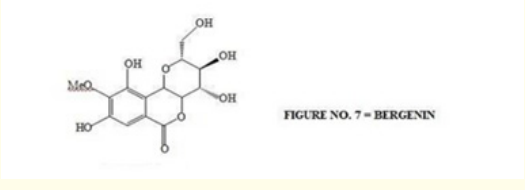
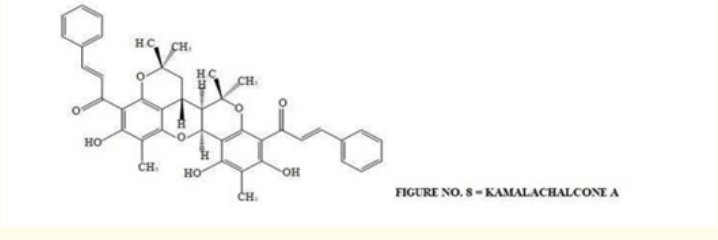


Figure 7



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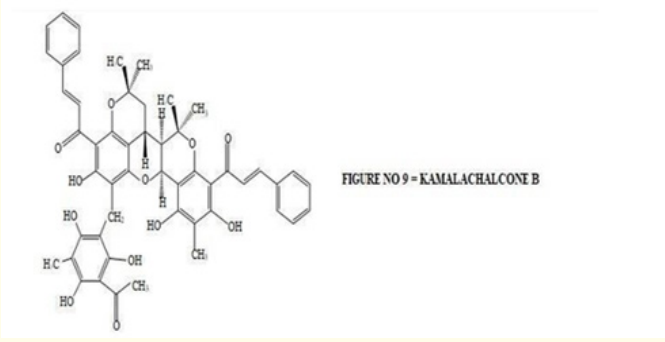

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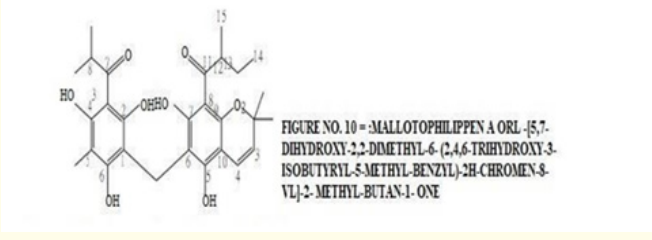

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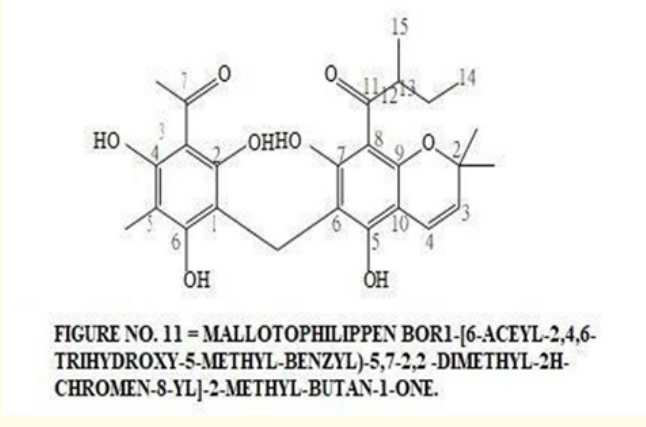

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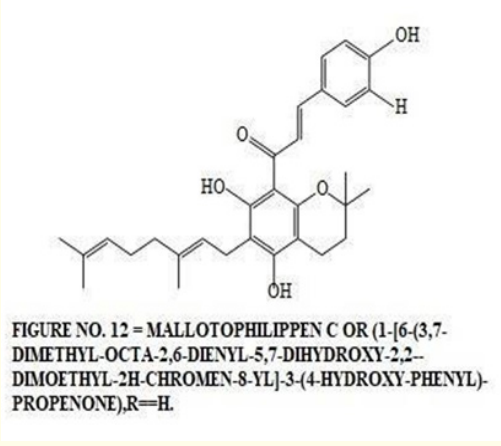

FIGURE NO. 12 = MALLOTOPHILIPPEN C OR (1-[6-(3,7-DIMETHYL-OCTA-2,6-DIENYL-5,7-DIHYDROXY-2,2--DIMOETHYL-2H-CHROMEN-8-YL]-3-(4-HYDROXY-PHENYL)-PROPENONE),R==H.

Figure 12

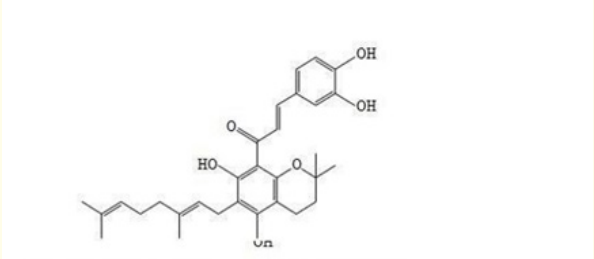

FIGURE NO. 13 = MALLOTOPHILIPPEN DOR3-(3,4-DIHYDROXY-PHENYL)-1-[6-(3,7 -DIMETHYL-ACTA-2,6-DIENYL)-5,7-DIHYDROXY-2,2-DIMETHYL-2H-CHROMEN-8-YL]-PROPENONE R =OH

Figure 13

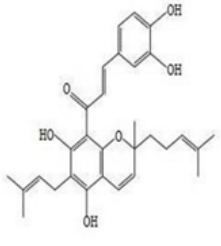

FIGURE NO. 14 = MALLOTOPHILIPPEN E OR 1-[5,7-DIHYDROXY-2-METHYL-6-6(3-METHYL-BUT-2-ENYL)-2-(4-METHYL-PENT-3-ENYL)-2H-CHROMEN-8-YL]-3-(3,4-DIHYDROXY-PHENYL)-PROPENONE

Figure 14

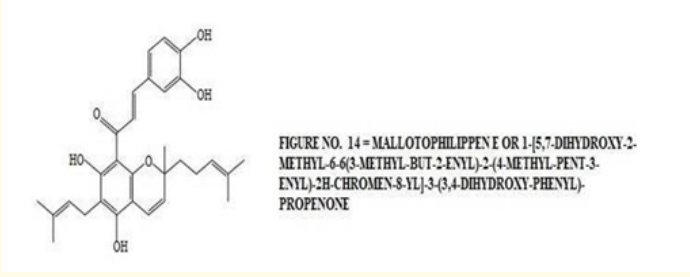

FIGURE NO. 14 = MALLOTOPHILIPPEN E OR 1-[5,7-DIHYDROXY-2-METHYL-6-6(3-METHYL-BUT-2-ENYL)-2-(4-METHYL-PENT-3-ENYL)-2H-CHROMEN-8-YL]-3-(3,4-DIHYDROXY-PHENYL)-PROPENONE

Figure 14

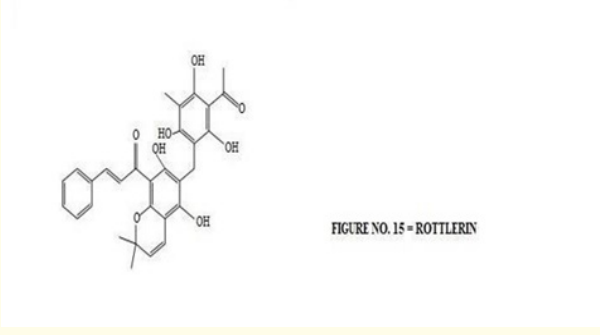

FIGURE NO. 15 = ROTTLERIN

Figure 15

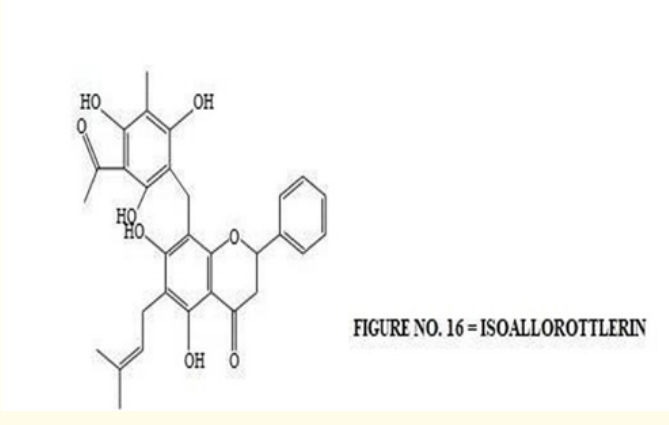

FIGURE NO. 16 = ISOALLOROTTLERIN

Figure 15

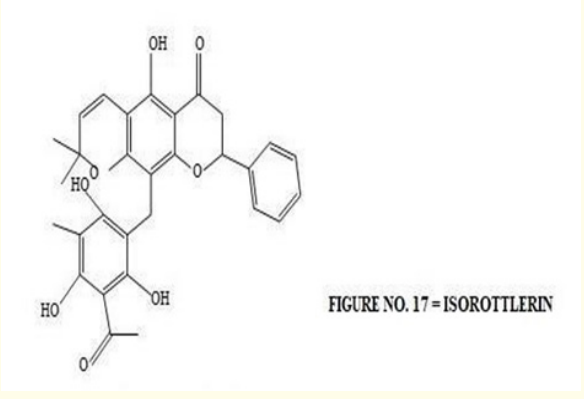

Figure 17

Conclusion and Future Perspective

Over the past few decades, there has been a significant global surge in interest in the therapeutic use of medicinal plants, and media citations of these formulations have been growing. Many patients' daily usage of natural goods and their formulations has caused scientists to seriously investigate the items' safety and efficacy. Natural goods are regulated in many countries as both medical items and food supplements due to their widespread usage and advantages; they are frequently referred to as herbal supplements obtain from natural sources.

Mallotus philippensis and its other species are in high demand due to its traditional use, which prompted the compilation of this overview and commentary on the state of informationnow obtainable from studies on the plant's effects, both preclinical and clinical.

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