ETHNO-PHARMACOLOGY AND PHYTO-CHEMISTRY OF *MALLOTUS PHILIPPINENSIS* (EUPHORBIACEAE):A REVIEW

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Abstract

The Euphorbiaceae(MallotusphilippinensisMuell. Arg) perennialshrub or small tree hasextensivepharmacologicalactivityintheouterHimalayasbelow1,000m.Mallotusphilippinensisphenolicsareantibacterial,antiviral,cytotoxic,immunoregulatory,andanti-inflammatory. Bergenin, mallotophilippinens, and rottlerin have anti-inflammatory and immune-regulating properties. Pharmacological, toxicological, and biological properties are flawless.Thisstudysupportstheuseof Mallotusphilippinensisinmodernmedicineasasourceofmedicinallyrelevantnaturalcompounds. Mallotusphilippinensis,itssteam,leaf,andfruitarepoorlyunderstood.Thetoxicityofcrudeextractsortheirpurecomponentsmustalsobestudied.Basedon this study, moreresearchis neededonEuphorbiaceae.

Keywords: MedicinalPlant,PharmacologicalActivity,MallotusPhilippinensis,ChemicalConstituents.

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1.1. Introduction

India has unique medicinal herbs [1]. Herbs cure people and animals. Phytochemicals can betherapeutic. Tannins, flavanoids, terpenoids, alkaloids, glycosides Ayurveda heals with plantparts. Leaves, seeds, bark, flowers, roots, etc. were utilised as medicine. This natural, less-dangerous method is preferred [3]. India possesses 20 of Mallotus' 150 species [4]. Mallotusphilippensis is called kamala and kukkum.25-m Euphorbiaceae,Studies show it heals. Bark fortyphoid and meningitis, organ and hairs for intestinal worms and laxative, oil for skin problemsand non-healing wounds, leaves for skin infections and injuries. Whole plat and other chemicalstreat parasites. [8]. Mallotusphilippensis grows in China, India, Myanmar, Thailand, Cambodia,Laos, Vietnam, Malaysia, Indonesia, Philippines, Australia, and Solomon Islands. Evergreens arecommon.Humanactivitydominatessecondaries.Kumkumgrowsinrockysoil[9].25 mKumkum trees with 40cm trunks. Uneven trunk, grey bark, greyish brown branches, rusty hairs.It hasa 50-centimeter bole. Reddish, glandularbranches. Pointy, 4-12 cm long leaves.Lowerleaf surfaces are pale grey and hairless. 3-nerved, glandular leaves. Tree blooms yellow-brownunisexually.Separateplantsproducemaleandfemaleblooms.Maleflowerstermi nalandaxillary. 2-10cm spiky blooms. Flower stamens and hairs. Ovary stigmas number 3. 3 lobed, 5-7mm broad capsules are powdered. Three seeds are

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in each orange capsule. Subglobose, 4-mmseeds[11].In March-April, Mallotusphilippensisblooms andbearsfruit [12].

1.2. GeographicalDistribution

ItgrowsinPunjab,Uttar-Pradesh,Bengal,Assam,Burma,Singapore, Sind,Mumbai,andCeylon.China,Malaya,Australia,Pakistan,andAndamanIslandsincrease.(13)Therainyseason germinates hot-season seeds. Artificially sowing seeds in April. Stronger seedlings can betransplanted the first year, while smaller ones may need another. Root suckers grow slowly.Frost-,drought-,andshade-hardy.Fomesconchatus,I.rimosus,E.caryophylli,Hexagoniadiscopoda,Polyporusadustus,Stereumhirsutum,etc.attackthetree.In India,averagegirthgrowth is 0.65 cm per year and less than 15 cm after 16 years. M. philippensis trees grow 1.4 cmannually in the Philippines. M. philippensis is frost-hardy, drought-resistant, and coppices well inIndia.M. philippensis isfire-resistant. (10)

Fig:1 GeographicalDistributionof*Mallotusphilippensis*

1.3. ChemicalConstituents

Includesphenols, diterpenoids, steroids, flavonoids, cardenolides, triterpenoids, coumarin, andisocoumarin. Its phytochemistry and biology are unknown. Researchers have identified activeelements. Chemical structure, biological effects, and other phytochemicals of rottlerin. Mallotusapelta, M. metcalfianus, M. philippinensis, M. paniculatus, M. repandus have been investigated.Mallotuscontainsditerpenoids,triterpenoids,steroids,benzopyranes,flavonoids,andcoumarinolignoids.Otherplantsareunknown.Somestudiesisolateafuranocarboxamidefrom M. cuneatus,scopoletin from M. resinosus, phloroglucinolderivativesfrom M. pallidus, ortriterpenoidsand casbane-typediterpenoid lactonesfrom M. hookerianus.

1. Cardenolides

Pilipino seeds contain cardenolides. After fermentation, M. philippinensis seeds contained fourcardenolides,two of which werenovel.

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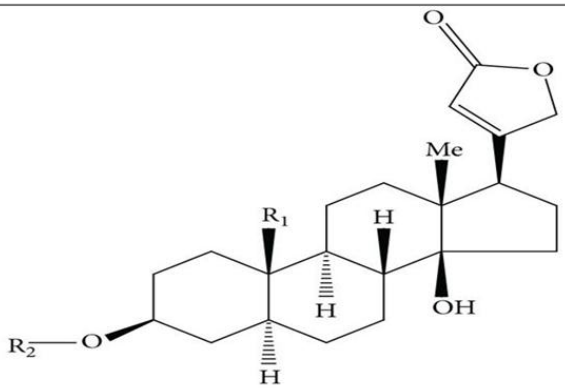
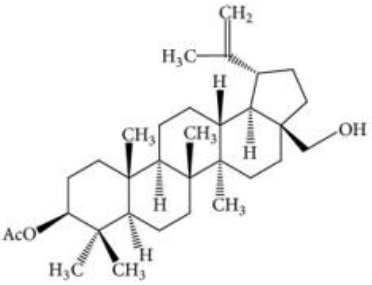
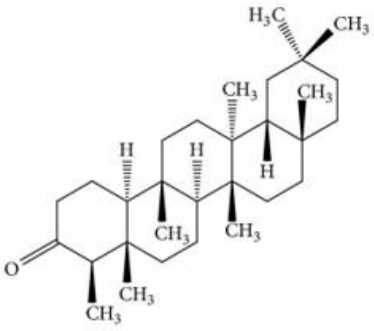


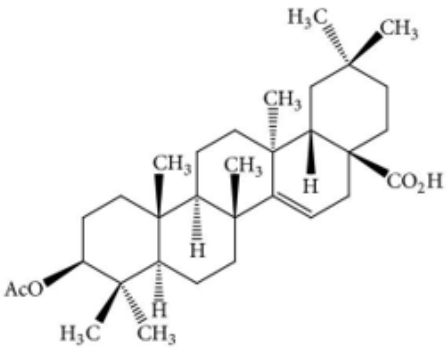
No.	Name	R1	R2	References
1	Coroglaucigenin	CH_2OH	H	[8]
2	Coroglaucigenin L-rhamnoside	CH_2OH	L-rham	[8]
3	Corotoxigenin	CHO	H	[8]
4	Corotoxigenin L-rhamnoside	CHO	L-rham	[8]

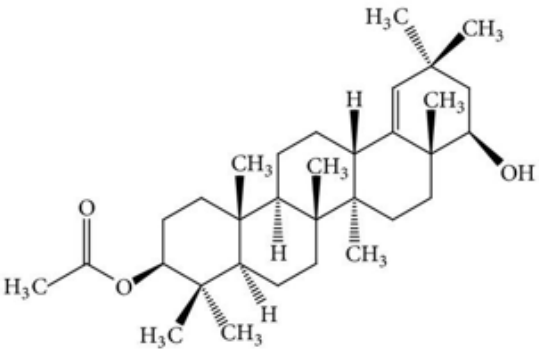
2. Tri-terpenoids

Mallotus has 6/6/6/6/5 triterpenoids. Triterpenoids were found in M. philippinensis heartwoodextract[9].MallotustriterpenoidsareFriedelane-type.M.philippinensisstembarkyieldedfriedelin [10]. Drypetes and Celaenodendron are Euphorbiaceae genera that contain friedelin.Friedelin is widespread. Figure 4 shows acetylaleuritolic acid found in M. philippinensis barkextracts. First C-22-oxidized olean-18-ene triterpene was found in M. Philippinensis stem bark[10].A-amyrin is anursane-typetriterpenoid fromM.philippinensis bark [9].









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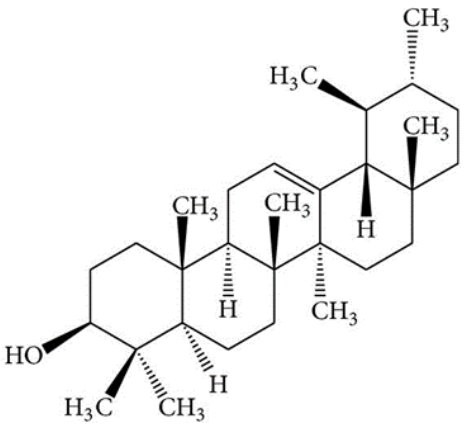
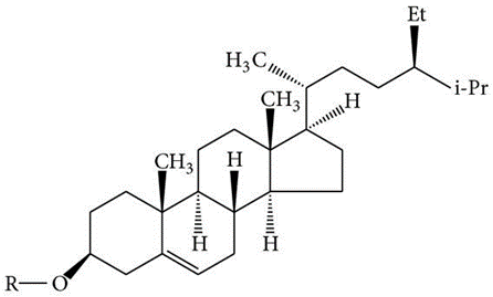


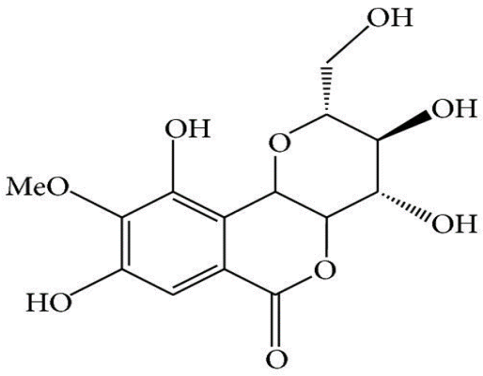
3. Steroids

B-sitosterolwasisolatedfromM.philippinensisheartwoodandbark(Fig.6).Duacosterolwasmadefrom M. philippinensis bark ether[9].



4. PhenolicCompounds

1972foundBergenininM. philippinensisheartwood.Bark and leavesof M.philippinensis[9].



5. OtherCompounds

Kamala (M. philippinensis) seed oil includes glyceride and unsaturated fatty acids [21]. Rottlerinandisorottlerincolourresin.Itcomprises50%redrole,5%yellowrole,2%manure,volatileoils,tannin, gum, citricacid, and oxalicacid.

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1.4. PharmacologicalProfile

1. Anti-FalarialActivity:

Extracts of M. philippensis stimulate S. cervi contractions. Small doses cause paralysis. Achextracts paralysed entire worms and n.m. preparations. DEC-like (31). M. Philippensis and DECreact similarly to in vitro Setaria preparations, however M. philippensis may be antifilarial. Needin-vivo antifilarial testing. In vivo worm paralysis only occurs in the peritoneal cavity for Setariaandlymphatics.

2. Anti-fertilityActivity:

TZM-bl cells inhibited lab-adapted and primary HIV-1 (3.6–118 g/ml). HIV-1 was inhibited inTZM-bl cells by Strychnospotatorum, Ficus infectoria, and Annona squamosa extracts. MallotusextractsinhibitedHIV-1inPM1cells.HIV-inactiveextractsincludeTridaxprocumbens,Mallotusphilippinensis,Annonareticulate, aqueousFicusbenghalensis,andhydroalcoholicAlbizzialebbeck. 500g/ml methanolicM.philippensis extract proved non-toxic.

3. Anti-microbial&Anti-fungalActivity:

Infection-killinghexaneandethanol.Flavonoids,phenolicgroups,andsteroidsmayberesponsible for the highest zone of inhibition against gram-negative bacteria like E. coli, P.vulgaris, P. aeruginosa, S. typhi, and V. parahaemolyticus and fungus like A. flavus and C.albicans. [25,26,27]. Phenolic and steroidal compounds inhibit fungi.[26,28,29]. Phenols, lysol,andcresols disinfect hospitals. Antimicrobial activity against P. aeruginosa, P. vulgaris, S. typhi, V.parahaemolyticus and V. vulnificus revealed hexane and ethanol extracts' medicinal potentialagainstabdominalpain,diarrhoea,fever,nausea,septocaemia,urinarytractinfectionsandvomitingcausedbyE. coli, hospital-acquired wound infections,septicaemia, and urinary.

4. Anti-inflammatory&immune-regulatory:

Three mallotophilippens chalcones from M. philippinensis reduced NO production and iNOSgene expression in a murine macrophage-like cell line (RAW 264.7). (IFN-). DownregulatedCOX-2, IL-6, and IL-1. Immunoregulatory, anti-inflammatory. Analgesic and anti-inflammatoryactivitiesofM.repanduswere investigatedwithaceticacid-inducedwrithing,xylene-inducedear edoema, cotton pellet-induced granuloma, and tail immersion at 500, 1000, and 2000mg/kgbody weight. Four pain models were relieved by M. repandus extract. The extract worked withacetic acid, xylene, and cotton pellet granulomas. Antinociceptive and anti-inflammatory werefoundinthisherb.studiedM.philippinensisfruitextractin2016.Anti-inflammatoryandanalgesic M. Philippinensis extract brought malloconspur A and B from M. conspurcatus ethanolextract.MalloconspurBloweredNOby10.47Mand9.32M.258,259,and260reduceRAW264.7 PGE2and TNF-. 249, 250 reduceiNOS, NF-B/p65, and COX-2. [30]

5. Anti-oxidant&Anti radicalActivity:

Mallotus bark phenolic RP-HPLC chromatograms Fraction V has three peaks, fractions I and IIIhave two. II, IV, and VI had a single summit. Non-flat portions V and VI confirm condensedtannins.Mallotusphilipinensisis antioxidative.Aftertoxicologicalstudiesonextractorfractions, we recommend using

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this substance as a natural antioxidant for food, functional foods,or nutraceuticals. Mallotusphilippinensis bark contains condensed tannins, requiring sensorytesting. [31]

6. ProteinandAnti-tumorActivity:

rottlerininhibitsPKCandCaM-kinaseIII.100gM.philippensisyielded640gprotein.Ammoniumsulphateprecipitationincreasedthecrudeprotein'sweightby2.25-foldto1440gand added 12 protein bands ranging from 14 to 60 kDa. MTT IC50 values for A549, SW480, andMCF-7 were 4.18, 1.09, and 8.99, 1.52 g. Crude seed protein killed colon and lung cancer cellsbut not breast. AO/EtBr showed damaged nuclei and chromatin. Hoechst 33,258 condensed,stained, and broke. M. philippensis seed protein fights cancer. Positive results could lead to ananticancerprotein. [32]

7. Anti-tubercularActivity:

Anti-tubercular activity was investigated against virulent (H37Rv) and avirulent (H37Ra) M.tuberculosis strains. Finally, BACTEC 460 TB was used. BACTEC-active extracts were onlyfromM.philippensis.VirulentandavirulentM.tuberculosisstrainsweresuppressed. Twotraditionalherbs wereeffectiveat 10 mgml1against M. smegmatisbut not M. tuberculosis.[33]

8. Anti-AllergicActivity:

Allergies are mediated by allergen-specific, high-affinity IgE receptors.Anti-helminthic andanti-allergic. This study examined rottlerin's anti-allergic effects in IgE-dependent anaphylaxismodels and mast cells. Anti-allergic effects of rottlerin were tested using passive cutaneous andsystemic anaphylaxis mouse models and guinea pig bronchial rings. Stabilized RBL-2H3 mastcells.Mastcellsshowedanti-allergicrottlerinsignalling.Rottlerinreduces IgE-mediatedcutaneousextravasation,hypothermia,andplasmahistamine.rottlerininhibitedguineapigovalbumin-inducedbronchoconstriction.RottlerinpreventedIgE-inducedRBL-2H3-hexosaminidase release.[34] Rottlerin decreases IgE-induced PLC1, Akt, IP3, and cytosolic Ca2+.First, rottlerin reduces IgE-induced mast cell degranulation, paving the door for treating allergicasthmaand othermast cell-mediated disorders.

9. WoundHealingActivity:

In this study, we tested EMPB on MSC proliferation, migration, and wound healing in vitro andin a mouse model. EMPB is an MSC chemoattractant, and its main chemotactic action may becinnamtannin B-1. EMPB-injected mice's peripheral blood mononuclear cells revealed enhancedMSC mobilisation. EMPB improved MSC homing to wounds using bioluminescent imaging.EMPBincreasedMSCmigrationmorethanotherskincelltypesindiabeticmice.Histopathologically,EMPBmimickedMSC-inducedtissuerepair.EMPBstimulatedMSC mobilisation and homingto wounds, which maypromote wound healing.[35,36]

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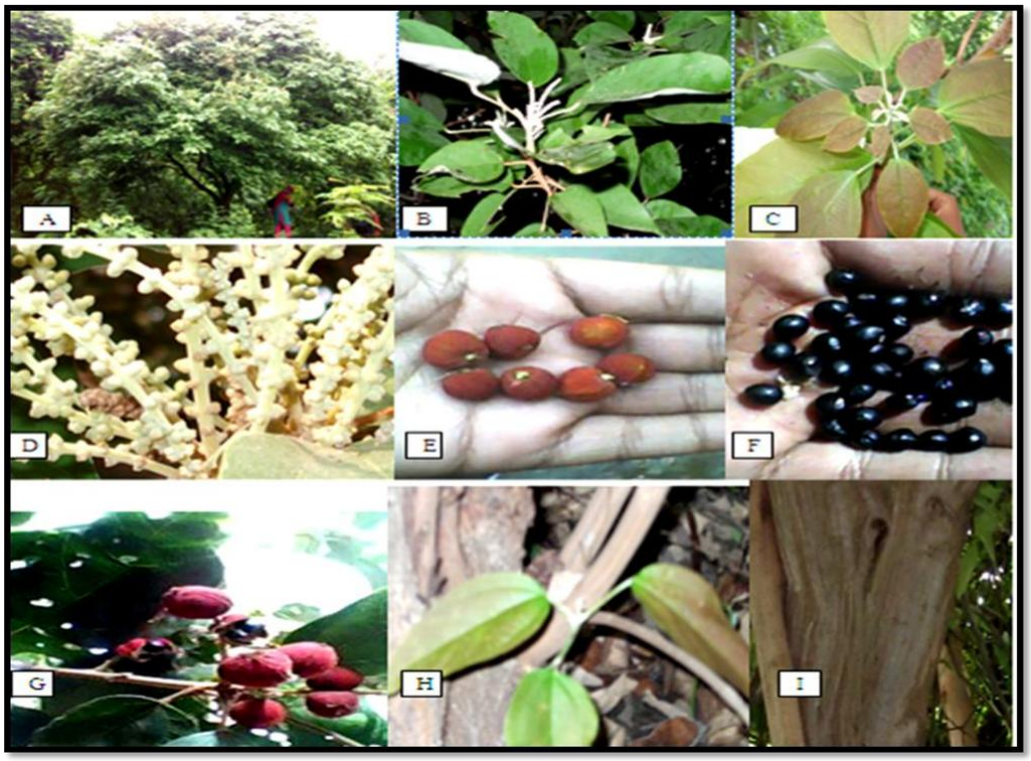

Fig: 2 (a) Mature plant of MallotusPhilippnsis (LAM.) (b) Flower Twig (c) Apical twig (d)seed Condition (e) Fully Mature fruit (f) fully mature seed (g) Fruiting twig (h) leaves (i)Stemwith bark

Conclusion

Medicinal plant compositions are frequently referenced in the media. Due to their extensive use,scientists worry about natural products' efficacy and safety. Natural products are regulated asmedications and food supplements in several countries due to their widespread use.

TraditionaluseandgrowingdemandforMallotusphilippinensisand otherspeciesmotivated thisreview.

Indian medicine uses Mallotusphilippinensis. This herb is used to cure intestinal worms indomesticandgrazinganimalsinayurveda. Fewreportsexistonthisplantanditsparts,necessitatinggreaterinvestigation.Explorethisplant'spotentialformedicalandpharmaceuticalapplications. It's anti-inflammatory, antioxidant, antiradical, protein-inhibiting, hepatoprotective,antiallergic, and anti-HIV. This plant's phytochemicals include phenol derivatives and othercompounds. All plant sections contain phenols, diterpenoids, steroids, flavonoids, cardenolides,and triterpenoids. Biologically active phenolic compounds are also isolated from this species.This plant's extracts and compounds are antioxidant, antibacterial, anti-inflammatory, cytotoxic,andimmunomodulatory.Tannins protectfruitandbark.M.philippinensisfruit syieldedMallotophilippensC,D,andE.AntitumormallotoxinRottlerinischemotherapeuticandanticancer.Rottlerinimpactsapoptosis,survival,andautophagyinmalignantcells.Thisindicates chemotherapeutic potential. This medicinal plant has pharmacological uses, includinganticancer,althoughfurtherresearchisneededonthetoxicityandefficacyofpurephytochemicals derived from different plant parts. Due to a lack of awareness regarding itsadverse effects and methodological correctness, preclinical and clinical research on humans isneeded to clarify its potency and safety. Mallotusphilippinensis phytochemicals

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and extract needmoreresearch.ThisreviewvalidatesMallotusphilippinensis.Mallotusplantsandtheirmedicinal benefits are poorly understood, thus more research is needed. Natural product moietyisolationand structural investigation will befascinating.

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