



Phytochemicals and pharmacological activities of Anacardiaceae family: A review

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Abstract

It is well known that, India is extremely rich in medicinal plant diversity distributed in various geographical and environmental conditions and associated with much tribal and folklore knowledge, the people who are living in the remote villages and forests, totally dependent upon the medicinal plants for the survival of their ethnic communities. We found that, Family Anacardiaceae (cashew or sumac family) comprises flowering plants under 83 genera and approximately 860 species ^[1] Some of these plants bear fruits that are sources of drugs and in some cases producing urushiol, which is an irritant. Anacardiaceae includes numerous genera with considerable economic importance. The family *Anacardiaceae* is subdivided into five tribes, namely *Anacardiaceae*, *Rhoaceae*, *Spondiadeae*, *Semecarpeae*, and *Dobineae*, based on morphological characteristics.

Keywords: Anacardiaceae family, phenolic lipids, flavonoids, biflavonoids and pharmacological activities

1. Introduction

Trees or shrubs, each has inconspicuous flowers and highly poisonous, sometimes foul-smelling resinous or milky sap. Resin canals located in the inner fibrous bark of plants' fibrovascular system found in the stems, roots, and leaves are characteristic of all members of this family; resin canals located in the pith are characteristic of many of the cashew family species and several species have them located in the primary cortex or the regular bark. Tannin sacs are also widespread among the family.

The wood of the Anacardiaceae has the frequent occurrence of simple small holes in the vessels, occasionally in some species side by side with scalariform holes (in *Camposperma*, *Micronychia*, and *Heeria argentea* (*Anaphrenium argenteum*). The simple pits are located along the vessel wall and in contact with the parenchyma.

Leaves are deciduous or evergreen, usually alternate (rarely opposite), estipulate (without stipule) and imparipinnate (rarely paripinnate or bipinnate), usually with opposite leaflets (rarely alternate), while others are trifoliolate or simple or unifoliolate (very rarely simple leaves are palmate). Leaf architecture is very diverse. Primary venation is pinnate (rarely palmate). Secondary venation is Eucamptodromous, Brochidodromous, Craspedodromous or

Cladodromous (rarely reticulodromous) Cladodromous venation, if present is considered diagnostic for Anacardiaceae.

Flowers grow at the end of a branch or stem or at an angle from where the leaf joins the stem and have bracts. Often with this family, bisexual and male flowers occur on some plants, and bisexual and female flowers are on others, or flowers have both stamens and pistils (perfect).

A calyx with three to seven cleft sepals and the same number of petals, occasionally no petals, overlap each other in the bud. Stamens are twice as many or equal to the number of petals, inserted at the base of the fleshy ring or cup-shaped disk, and inserted below the pistil(s). Stamen stalks are separate, and anthers are able to move. Flowers have the ovary free, but the petals and stamen are borne on the calyx. In the staminate flowers, ovaries are single-celled. In the pistillate flowers, ovaries are single or sometimes quadri- or quinticelled. One to three styles and one ovule occur in each cavity.

Fruits rarely open at maturity and are most often drupes. Seed coats are very thin or are crust-like. Little or no endosperm is present. Cotyledons are fleshy. Seeds are solitary with no albumen around the embryo.

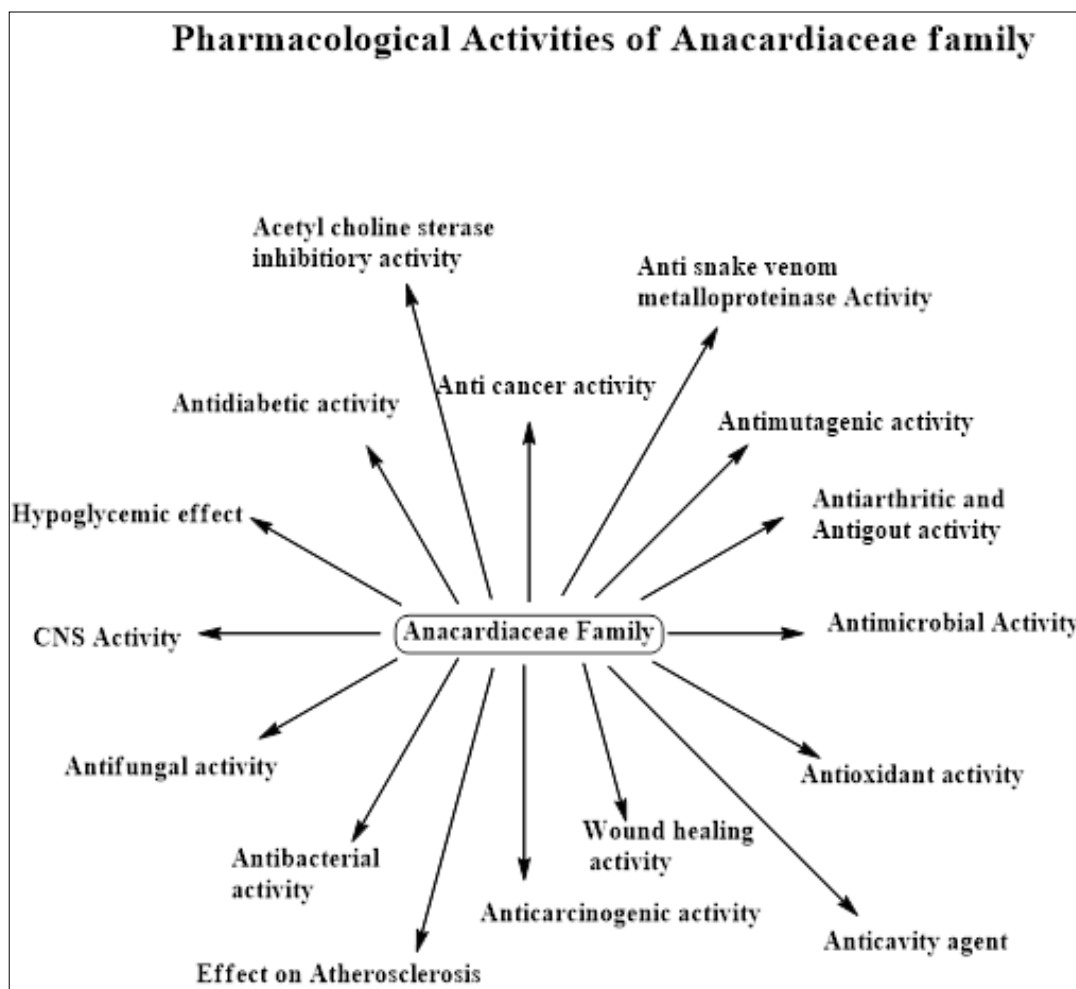


Fig 1: Pharmacological activity of Anacardiaceae family.

Description of Anacardiaceae family

Table 1: Anacardiaceae family description

Tribe	Affiliated genera
<i>Anacardiaceae</i>	<i>Anacardium, Androtium, Bouea, Buchanania, Fegimanra, Gluta (including Melanorrhoea), Mangifera, Swintonia</i>
<i>Spondiadeae</i>	<i>Allospodias, Antrocaryon, Choerospondias, Cyrtocarpa, Dracontomelon, Haematostaphis, Haplospodias, Harpephyllum, Koordersiodendron, Lanna, Operculicarya, Pegia, Pleiogynium, Poupartia, Pseudospodias, Sclerocarya, Solenocarpus, Spondias, Tapirira</i>
<i>Semecarpeae</i>	<i>Drimycarpus, Holigarna, Melanocytes, Nothopegia, Semecarpus</i>
<i>Rhoeae</i>	<i>Abrahamia ined, Actinocheita, Amphipterygium, Apterokarpus, Astronium, Baronia, Blepharocarya, Bonetiella, Campnosperma, Cardenasiodendron, Comocladia, Cotinus, Euroschinus, Faguetia, Haplorhus, Hrrria, Hermogenodendron, Laurophyllum, Lithrea, Loxopterygium, Loxostylis, Malosma, Mauria, Melanococca, Metopium, Micronychia, Mosquitoxylum, Myracrodruon, Ochoterrenaea, Orthopterygium, Ozoroa, Pachycormus, Parishia, Pentaspadon, Pistacia, Protorhus, Pseudosmodingium, Rhodosphaera, Rhus, Schinopsis, Schinus, Searsia, Smodinaium, Sorindeia, Thyrsoodium, Toxicodendron, Trichoscypha</i>
<i>Dobineae</i>	<i>Campylopetalum, Dobinea</i>

Phytochemistry of Anacardiaceae

Phenolic lipids were isolated from *Anacardium occidentale*, *Lannea edulis*, *Campnosperma auriculata*, *Lannea welwitschii*, *Lithraea caustica*, *Gluta renghas*, *Lithaea molleoides*, *Lannea edulis*, *Melanorrhoea usitate*, *Mtopium*

brownie, *Pistachia vera*, *Rhus semeliata*, *Rhus succedanea*, *Rhus vernicifera*, *Schinopsis brasiliensis*, *Semecarpusgardneri*, *S. obscura*, *S.petaltae*, *S. walkeri*, *Semecarpus anacardium*, *Spondias mombin*, *Tapirira guianensis*, *Tapirira obtuse* (Figures 2-6).

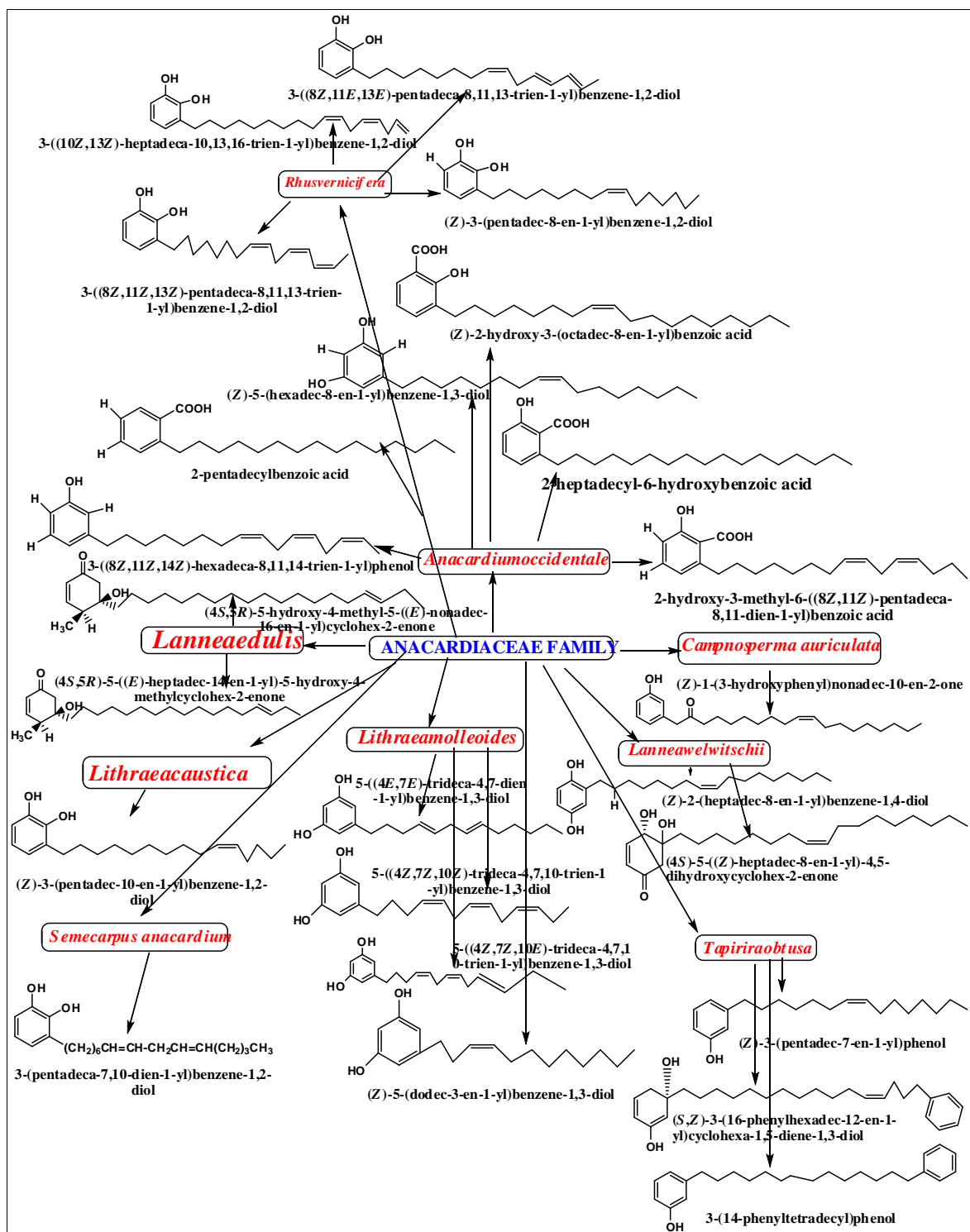


Fig 2: Various phenolic lipids isolated from *Anacardiaceae* family.

3-((8Z,11E,13E)-pentadeca-8,11,13-trien-1-yl)benzene-1,2-diol, (Z)-3-(pentadec-8-en-1-yl)benzene-1,2-diol, 3-((8Z,11Z,13Z)-pentadeca-8,11,13-trien-1-yl)benzene-1,2-diol, 3-((10Z,13Z)-heptadeca-10,13,16-trien-1-yl)benzene-1,2-diol [*Rhus vernicifera*], (Z)-2-hydroxy-3-(octadec-8-en-1-yl)benzoic acid, 2-heptadecyl-6-hydroxybenzoic acid, 2-hydroxy-3-methyl-6-((8Z,11Z)-pentadeca-8,11-dienyl)benzoic acid, 3-((8Z,11Z,14Z)-hexadeca-8,11,14-trien-1-yl)phenol, 2-pentadecylbenzoic acid, (Z)-5-(hexadec-8-en-1-yl)benzene-1,3-diol [*Anacardium occidentale*], (Z)-2-(heptadec-8-en-1-yl)benzene-1,4-diol [*Campnosperma auriculata*], (4S,5R)-5-((E)-heptadec-14-en-1-yl)-5-hydroxy-4-methylcyclohex-2-enone, (4S,5R)-5-((Z)-heptadec-8-en-1-yl)-4,5-dihydroxycyclohex-2-enone, (Z)-3-(pentadec-10-en-1-yl)benzene-1,2-diol, (Z)-3-(pentadec-7-en-1-yl)phenol [*Semecarpus anacardium*], (Z)-5-(dodec-3-en-1-yl)benzene-1,3-diol, 5-((4E,7E)-trideca-4,7-dien-1-yl)benzene-1,3-diol, 5-((4Z,7Z,10Z)-trideca-4,7,10-trien-1-yl)benzene-1,3-diol, 5-((4Z,7Z,10E)-trideca-4,7,10-trien-1-yl)benzene-1,3-diol, (Z)-5-(dodec-3-en-1-yl)benzene-1,3-diol [*Lithraea molleoides*], (4S,5R)-5-((E)-heptadec-14-en-1-yl)-5-hydroxy-4-methylcyclohex-2-enone, (4S,5R)-5-((Z)-heptadec-8-en-1-yl)-4,5-dihydroxycyclohex-2-enone, (Z)-3-(heptadec-7-

en-1-yl)phenol, (S,Z)-3-(16-phenylhexadec-12-en-1-yl)cyclohexa-1,5-diene-1,3-diol, 3-(14-phenyltetradecyl)phenol [*Tapirira obtusa*], 5-((4E,7E)-trideca-4,7-dien-1-yl)benzene-1,3-diol, 5-((4Z,7Z,10Z)-trideca-4,7,10-trien-1-yl)benzene-1,3-diol, 5-((4Z,7Z,10E)-trideca-4,7,10-trien-1-yl)benzene-1,3-diol, (Z)-5-(dodec-3-en-1-yl)benzene-1,3-diol [*Lithraea molleoides*], 3-(pentadeca-7,10-dien-1-yl)benzene-1,2-diol [*Semecarpus anacardium*], (Z)-3-(pentadec-10-en-1-yl)benzene-1,2-diol [*Lithraea caustica*], (4S,5R)-5-((E)-heptadec-14-en-1-yl)-5-hydroxy-4-methylcyclohex-2-enone, (4S,5R)-5-hydroxy-4-methyl-5-((E)-nonadec-16-en-1-yl)cyclohex-2-enone [*Lannea edulis*].

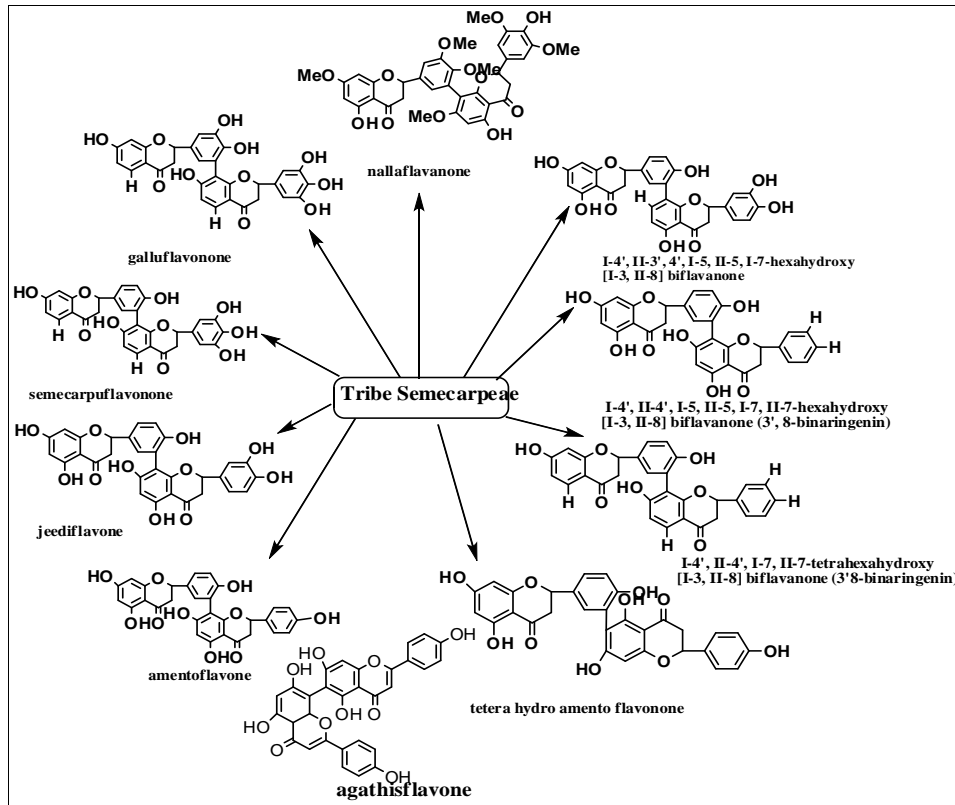


Fig 3: Eleven flavonoids isolated from *Anacardiaceae* family of tribe Semecarpeae.

amentoflavone, I-4',II-3',4',I-5,II5,I7-hexahydroxy [I3,II8] biflavonone, I-4',II-4',I-5,II-5,I-7, II-7-hexahydroxy [I-3,II-8]biflavonone (3',8-binaringenin), I-4',II-4',I-7,II-7-tetrahexahydroxy [I-3,II-8] biflavonone (3',8-billiquiritigenin), (E)-3- (pentadec-8-enyl) benzene-1,2-

diol(Figure 21), 3-((7E,10E)-pentaca-7,10-dienyl)benzene-1,2-diol(Table 2), tetrahydroamentoflavone, agathisflavone, jeediflavone, semecarpuflavanone, galluflavanone and nallaflavanone.

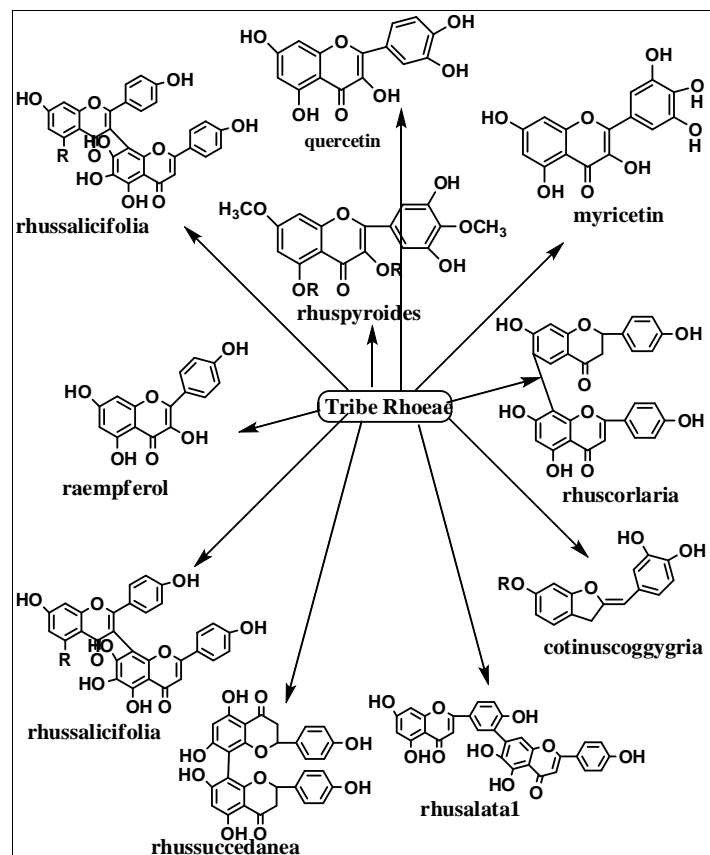


Fig 4: Ten flavonoids isolated from *Anacardiaceae* family of *Spondiadeae* tribe Rhoaeae

Quercetin (e), miricetina (myricetin, rhuscorlaria, cotinusocgygia, rhusalatal, rhussucedanea, rhussalicifolia, kaempferol, rhussalicifolia, rhuspyroides.

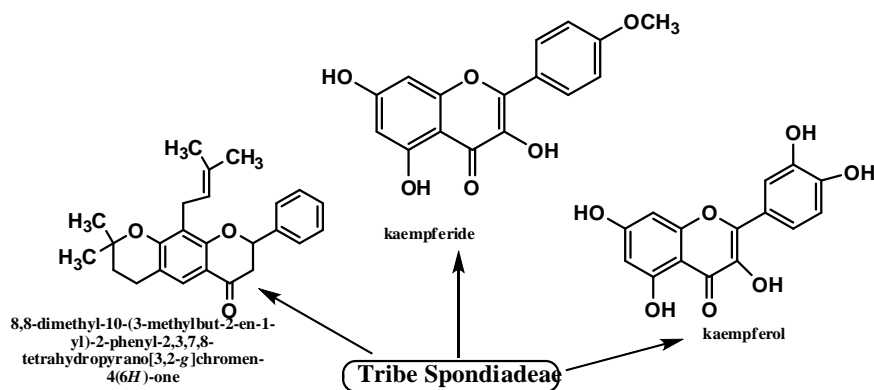


Fig 5: Flavonoids isolated from *Anacardiaceae* family of tribe Saponiadeae.

Kaempferol, kaempferide, 8, 8-dimethyl-10-(3-methylbut-2-en-1-yl)-2-phenyl-2,3,7,8-tetrahydropyrano[3,2-g]chromen-4 (6H)-one.

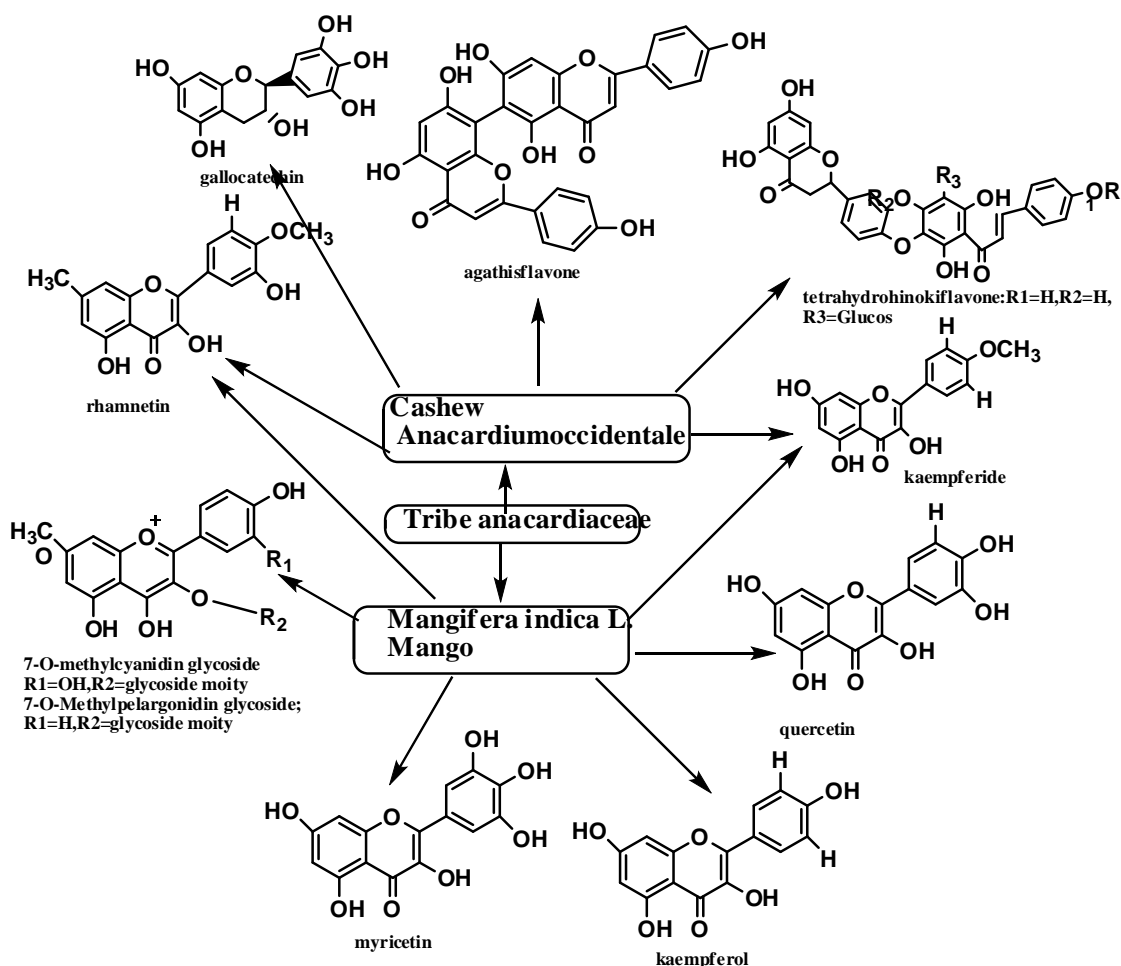


Fig 6: Some of the chemical constituents recently isolated from various tribes.

agathisflavone, quercetin, miricetina (myricetin, kaempferol, kaempferide, tetrahydrohinokiflavone, 7-O-methylpelargonidin glycoside, 7-O-methylcyanidin glycoside, rhamnetin, gallocatechin.

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