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Research Article

Biological Importance of Phytochemical Constituents Isolated from the Genus *Mesua*

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ABSTRACT

Mesua is a small genus of flowering plants. It is belongs to Calophyllaceae family, native to tropical southern Asia. Common names include iron wood and rose chestnut. They are evergreen shrubs or small trees growing to 13 m tall, with leaves arranged in opposite pairs. The compounds generally associated with this genus are alkaloids, saponins, terpenoids, phenolics, tannins etc. These compounds exhibit Antibacterial, anticancer, cytotoxic activity. We have systematically reviewed Mesua genus as it may be helpful to pharmaceutical industry as well as biologists, pharmacologists and phytochemists.

Keywords: Genus Mesua, Calophyllaceae, triterpenoids, tannins, alkaloids, saponins, biological activities.

INTRODUCTION

M*esua ferrea* belongs to the family : Clusiaceae : Guttiferae. It is commonly known as ' Naagkesar' (Bengali, Hindi and Punjabi), ' Naagchampa' (Gujarat, Kon. and Mar) and 'Naagakeshara' (Sanskrit).It is a medium to lager evergreen tree which flourishes mostly in mountains and plains of Bengal and Assam, in eastern Himalayas as well as in western & western parts of south India, the most popular name is Ironwood, the mesua seeds is oval and average size is 2.5 cm in length & 1.2 cm thick. The oil content in seed was reported to be 52.5%[1,2,3]. Its various parts having tremendous use in the Indian traditional system of medicine for the treatment of various diseases. The barks are used as astringent and in combination with ginger as a sudorific. The leaves and flowers are used in snake bite and scorpion strings, flower buds are used in dysentery, flowers are used as astringent, stomachic and expectorant, unripe fruits have sudorific effects, seed oil is used externally for cutaneous affections as an embrocation in rheumatism[4,5]. The seed oil contains number of medicinally active compounds belonging to 4-penl coumarin derivatives. The crude native oil showed significant antispasmodic, antibacterial and hypotensive activity[6].

Table 1: Phytoconstituents isolated from genus Mesua and their pharmacological activities

Plant/Part	Name of Compounds	Biological activity	Ref.
M. ferreaL., M. daphnifolia(Heartwood, seed oil and stem bark)	1)1,3-Dimethoxy-5,6-dihydroxyxanthone 2)1,3,5,6-Tetramethoxyxanthone 3)1,3,6-Trimethoxy-5-hydroxyxanthone 4)1,3-Dimethoxy-5,6-diacetoxyxanthone 5)Euxanthone 6)1,5-Dihydroxy-3-methoxyxanthone (Mesuaxanthone A) 7)1,5.6-Trihydroxyxanthone(Mesuaxanthone B) 8)1,5- Dihydroxyxanthone 9)Euxanthone-7-methyl ether 10) Cudraxanthone G 11) Ananixanthone 12)1,3,5-Trihydroxy-4-methoxyxanthone	Cytotoxic	20-25
M. ferreaL. , M. elegans, M. racemosa(Seed	13)5,7-Dihydroxy-6-(isobutyryl)-8-(3-methylbut-2-enyl)-4-phenyl-2H-chromen-2-one (Mesuol) 14) Methyl ether mammeigin 15) 4-Phenyl-5,7-dihydroxy-6-isovalerylcoumarin	Antibacterial, Acetylcholine sterase inhibitory	16, 25-29

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oil,bark, fruits and blossoms)	16) 5,7-Dihydroxy-6-(3-methylbutanoyl)-8-(3-methylbut-2-enyl)-4-phenyl-2H-chromen-2-one(Mammeisin) (Mammea A/AA) 17) 5-Hydroxy-8,8-dimethyl-6-(2-methylbutanoyl)-4-phenyl-2H-pyrano [2,3-h]chromen-2-one(Mammeigin) (Mammea A/AB) 18) 5-Hydroxy-6-isobutyryl-8,8-dimethyl-4-phenyl-2H-pyrano [2,3-h]chromen-2-one) (Mesuagin) (Mammea A/AD cyclo D) 19) Mesuabixanthone A 20) Mesuabixanthone B 21) Mesuaferrol 22) Mesuaferrone A 23) Mesuaferrone B 24) Mesuanic acid 25) 5-Hydroxy-6-isobutyryl-8-methyl-8-(4-methylpent-3-enyl)-4-phenyl-2H-pyrano[2,3-h]chromen-2-one 26) 5,7-Dihydroxy-8-(2-methylbutanoyl)-6-[(*E*)-3,7-dimethylocta-2,6-dienyl]-4-phenyl-2H-chromen-2-one 27) 5,7-Dihydroxy-6-(2-methylbutanoyl)-8-[(E)-3,7-dimethylocta-2,6-dienyl]-4-phenyl-2H-chromen-2-one 28) 5,7-dihydroxy-8-(2-methylbutanoyl)-6-(3-methyl-but-2-enyl)-4-phenyl-2H-chromen-2-one (MammeaA/BB) (Isomammeisin) 29) 8,9- Dihydro-5-hydroxy-6-(2-methylbutanoyl)-4-phenyl-8- (prop-1-en-2-yl) furo[2,3-h]chromen-2-one 30) 5,7-Dihydroxy-4-(1-hydroxypropyl)-8-(2-methyl-butanoyl)-6-(3-methylbut-2-enyl)-2H-chromen-2-one(Assamene) 31) 8,9- Dihydro-5-hydroxy-8-(2-hydroxypropan-2-yl-6-isobutyryl-4-phenylfuro[2,3-h]chromen-2-one (Mammea a/AD cyclo F) 32) 5,7-Dihydroxy-8-(3-methylbutanoyl)-6-[(*E*)-3,7-dimethylocta-2,6-dienyl]-4-phenyl-2H-chromen-2-one 33) Mammea A/BA cyclo F 34) Mammea A/BA 35)Mesuagenin A 36)Mesuagenin B 37)Mesuagenin C 38)Mesuagenin D 39)Isomammeigin 40) 6-[(2*E*)-3,7- Dimethylocta- 2,6- dien-1-yl]- 5,7-dihydroxy- 8- (2- methylbutanoyl)-4- phenyl-2*H*-chromen-2-one-6-[(2*E*)-3,7- dimethylocta-2,6- dien-1-yl]-5,7-dhydroxy-8-(3-methylbutanoyl)-4-phenyl-2*H*-chromen-2-one (1/1) 41)) 5,7-Dihydroxy-8-(2”-hydroxy-3”-methylbut-3”-ene)-6-(1”-oxobutyl)-4-phenyl-2*H*-benzo [b] pyran-2- one (Racemosol) 42) Mammea A/AC cyclo F 43) Mammea A/AC 44) Mammea A/AC cyclo D		
M. ferreaL.(Leaves)	45)12, 13- Furano-8- hydroxyl napthyl -6- *O-β*-2’, 3’, 4’, 6’ tetrahyroxy-5’, 5’ dimethyl cyclohexyl ether		30
M. ferreaL., M. beccariana, M.	46) Friedelin 47) Friedelan-1,3- dione	Antibacterial, Anticancer	12, 15, 31-35

*congestiflora, M. daphnifolia*and*M. nagassarium* (Burm.f.) (*M.kunstleri* King) (Kosterm)(Heartwood, Stems, Stem bark, Root bark)		
	48)*α*- Amyrin 49)*β*- Amyrin 50)Lupeol 51)*β*- Sitosterol 52) Betulinic acid 53) 1,8 –Dihydroxy -3- methoxy -6- methyl-anthraquinone 54) Lup-20 (29)-en-3β-ol 55) Stigmasterol 56) 10 [2,4,6-Tris-(14,24,35-enyl)-(3, 17, 5, 28) terphenyl-1-yloxy]-butyric acid methyl ester 57) 6-(19-hydroxy-20-oxo-19-phenyl-propyl)-3-methyl -8,8-bis- (11,16-methyl-but-10, 15-enyl)-2,5H-napthalene-1,4,7-trione 58) Mesuarianone 59) Mesuasinone 60) Mesuadione 61) Beccamarin 62) Mesuaferrin A 63) Mesuaferrin B 64) Mesuaferrin C 65) Congestiflorone (*rac*-[3-Hydroxy-6,9-dimethyl-6-(4-methylpent-3-en-1-yl)-6a,7,8,9,10a-hexa-hydro-6H-1,9-epoxybenzo [c] chromen-4-yl] (phenyl) methanone) 66) 6-Deoxyjacareubin 67) 4-Methoxy-1,3,5-trihydro anthraquinone 68) 2,5-Dihydroxy-1,3,4-trimethoxy-anthraquinone 69) Caloxanthone C 70) Macluraxanthone 71) 1,5- Dihydroxyxanthone 72) Tovopyrifolin 73) α-Mangostin 74) 1,8-Dihydroxy-3-methoxy-6-methylanthraquinone 75) 3*β*-Friedelanol 76) 3-Oxo-betulin 77) Spinasterol 78) 6- [(*E*)-3,7- Dimethylocta-2,6-dienyl]-5,7- dihyroxy-8-(2-methylbutanoyl)-4-phenyl-2H-chromen-2-one	
M. lepidota(Fruits)	79)Lepidotol A 80)Lepidotol B 81)Lepidotol C 82)Lepidotol D 83)Lepidotol E	36

The drug nagakeshara is found as an ingredient in many of the Ayurvedic formulations[7] especially as prakshepa in various avalehakalpanas like vyaghrihareetaki avaleha[8]etc and sandhanakalpanas like dasamoolarishta[9]etc and as an ingredient in various other dosage forms like churnas[10,] vati, rasa preparations like mahakaleshwara rasa[11] etc.

Extensive chemical examinations of this plant have been carried out and several constituents were isolated such as lignans, alkaloids, flavonoids, tannins, phthalic acid, gallic acid, terpenoids[12-14], steroids, glycosides, coumarins, xanthones, triglycerides and resins.Mesuol, mammeigin and mammeisin were isolated from the seed oil[15-17] Mesuol and mesuone showed antibacterial activity against S.aureus and Mycobacterium phlei[18]. Mesuol also showed immunomodulatory activity[19].

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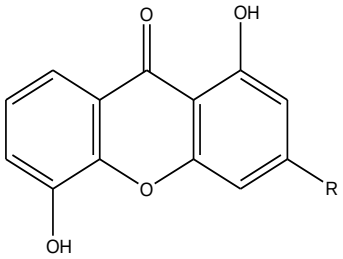
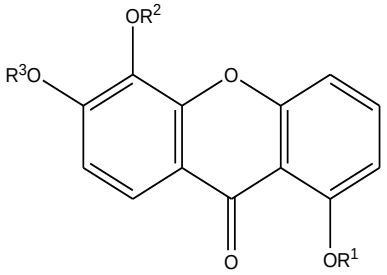
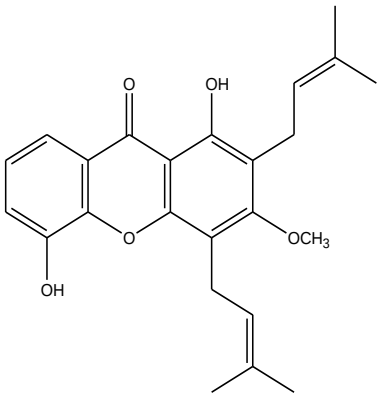


6. R= OCH_3



7. $R^1 = R^2 = R^3 = H$

8. R= H



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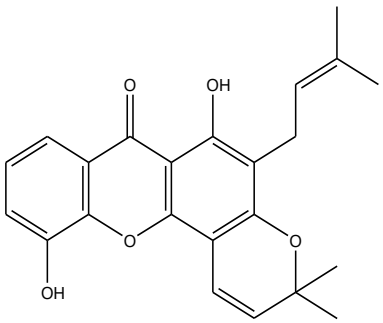

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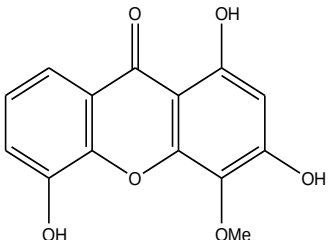

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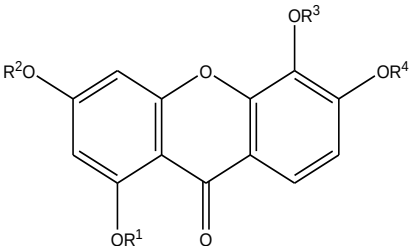
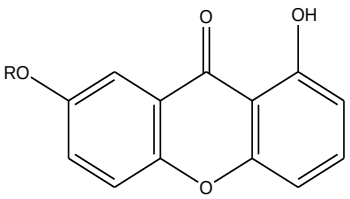
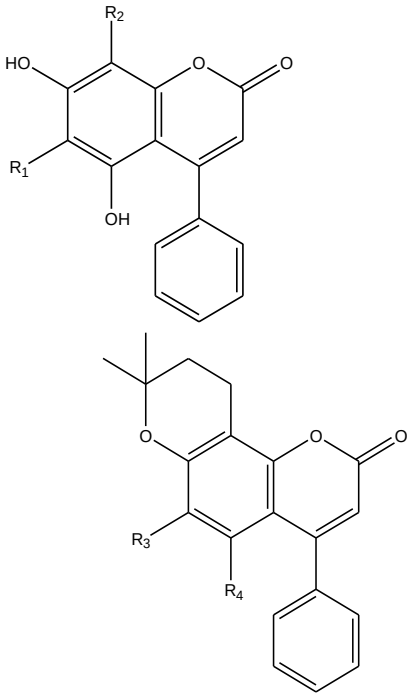


1. $R^1 = R^2$= Me, $R^3 = R^4$= H
2. $R^1 = R^2 = R^3 = R^4$ = Me
3. $R^1 = R^2 = R^4$ = Me, R^3 =H
4. $R^1 = R^2$ = Me, $R^3 = R^4$ =Ac



5. R= H
9. R= CH_3



13. R_1= A; R_2= C

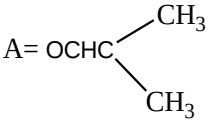
16. R_1= B; R_2= C

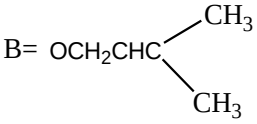
15. R_1= B; R_2= H

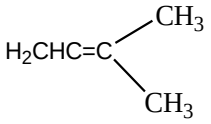
18. R_3= A; R_4= OH

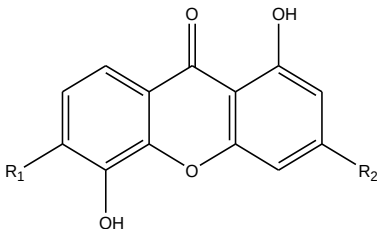
17. R_3= B; R_4= OH

14. R_3= B; R_4= OCH_3

A= 

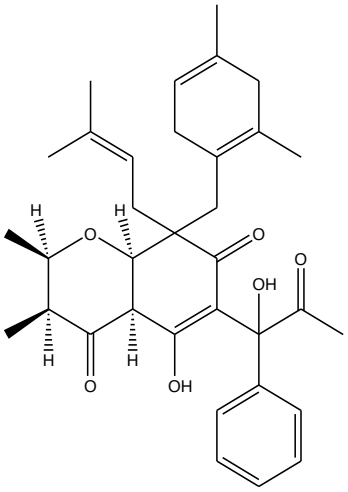
B= 

C= 



19. R_1= H; R_2= OMe

20. R_1= OH; R_2= H



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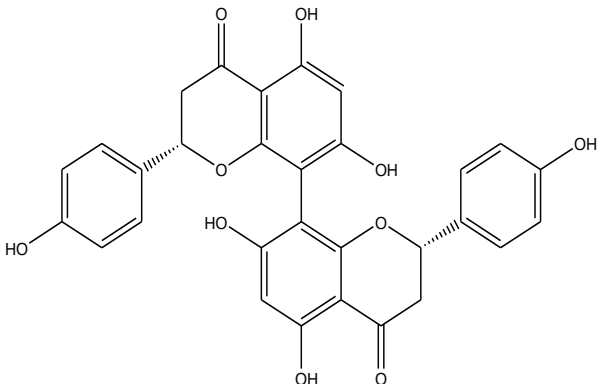

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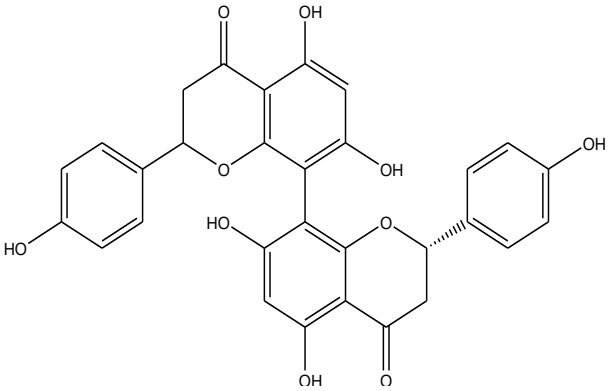

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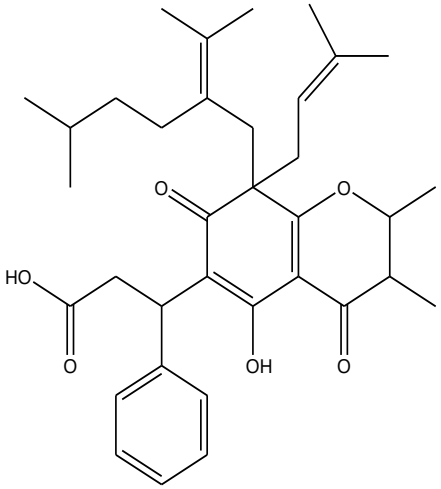

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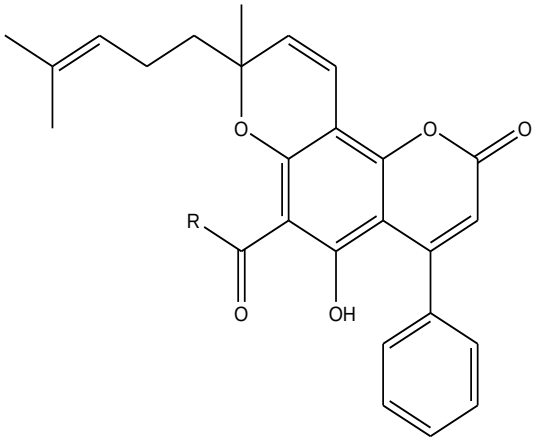
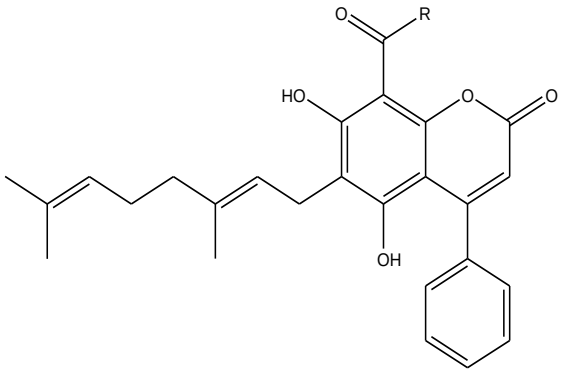
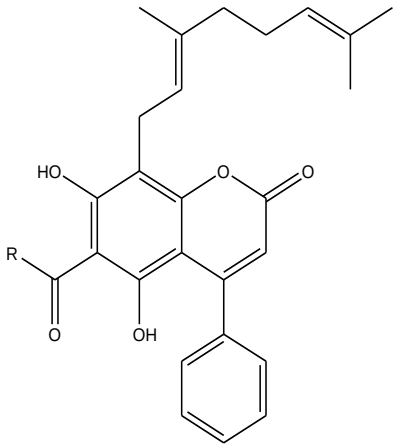


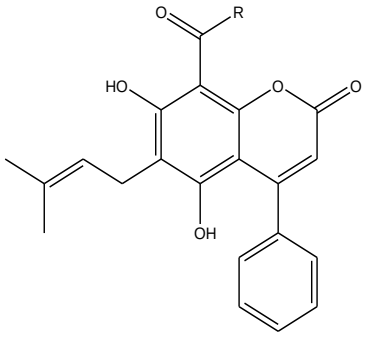
25. R= CH $(CH_3)_2$



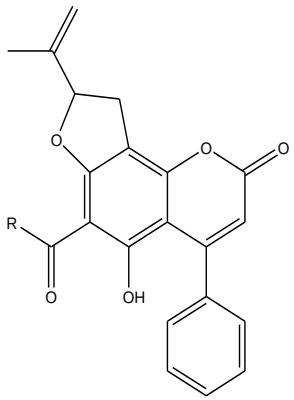
26. R= $CH_2CH(CH_3)_2$
32. R= $CH(CH_3)CH_2CH_3$
37. R= $CH(CH_3)_2$



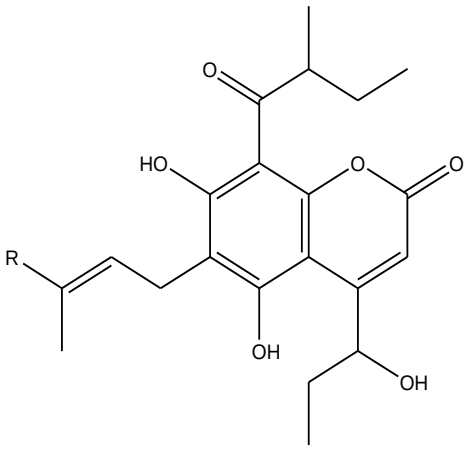
27. R= $CH(CH_3)CH_2CH_3$



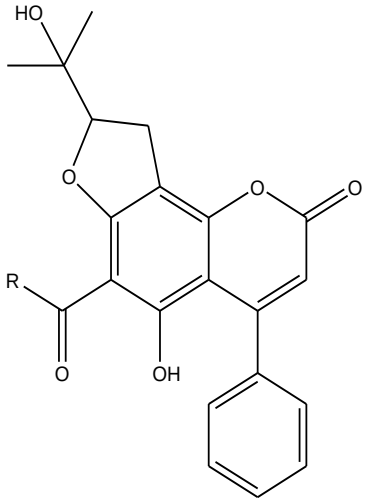
28. R= $CH(CH_3)CH_2CH_3$



29. R= $CH(CH_3)CH_2CH_3$



30. R= CH_3



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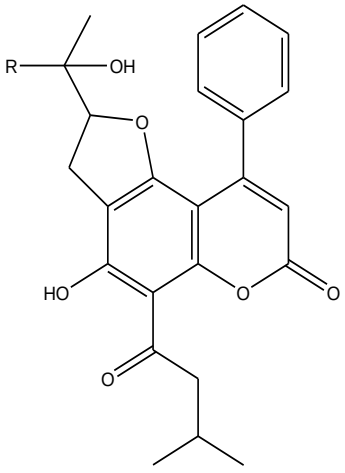
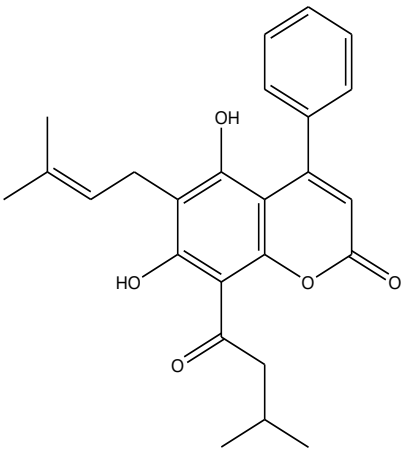
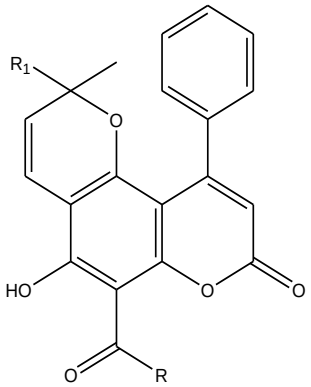


33. R= CH_3



34.

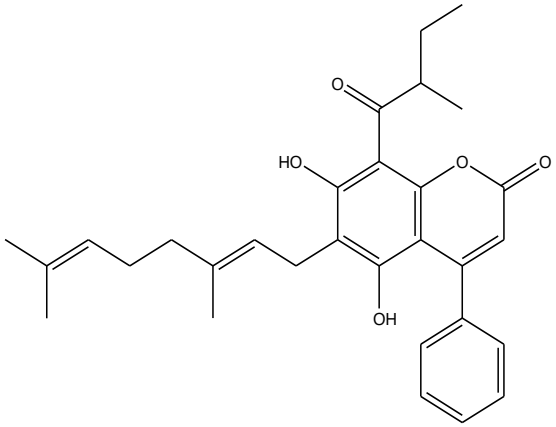
38. R= $(CH_2)_2CHC(CH_3)_2$



35. R= $CH_2CH(CH_3)_2$,R_1 = $(CH_2)_2CHC(CH_3)_2$

36. R= R= $CH(CH_3)CH_2CH_3$, R_1= $(CH_2)_2CHC(CH_3)_2$

39. R= $CH_2CH(CH_3)_2$,R_1= CH_3



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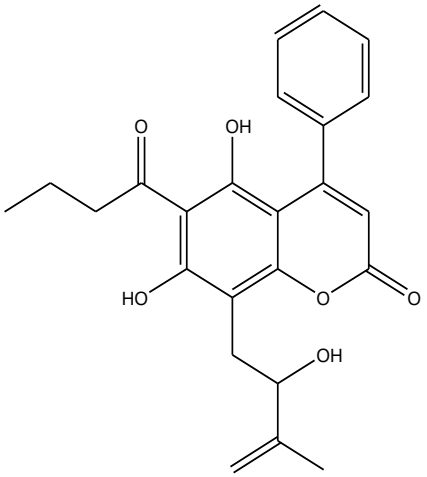

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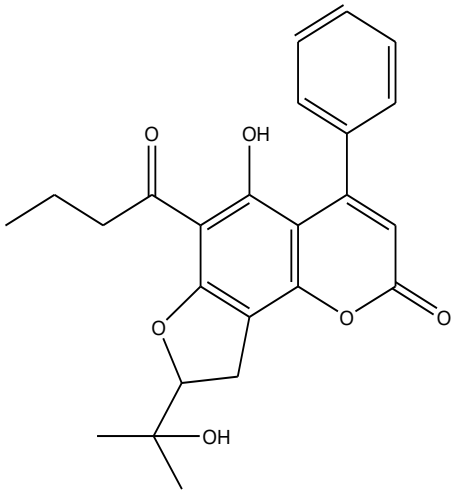

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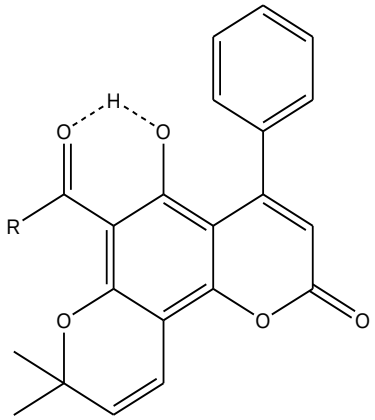
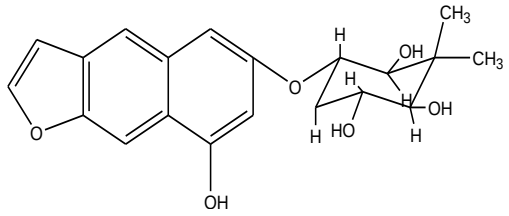


44. R= $CH_3CH_2CH_2CH_3$



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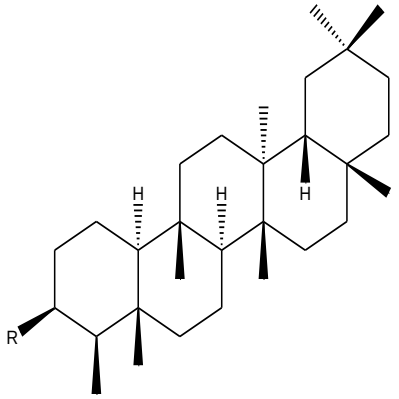
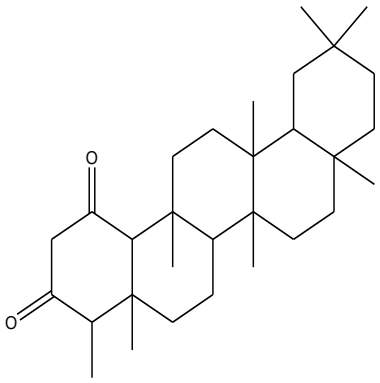


46. R =O

75. R -OH



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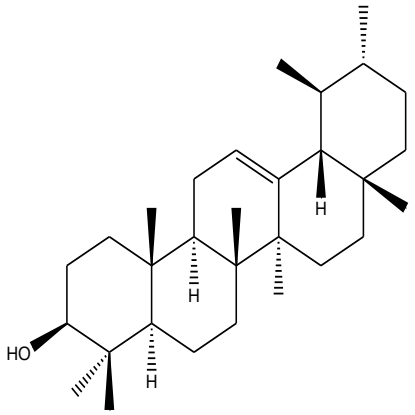

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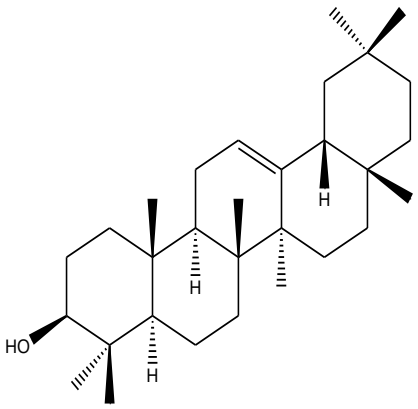
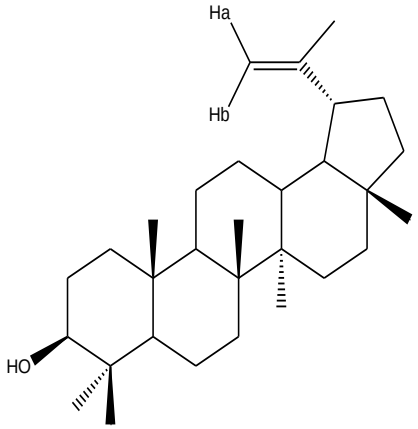


49.



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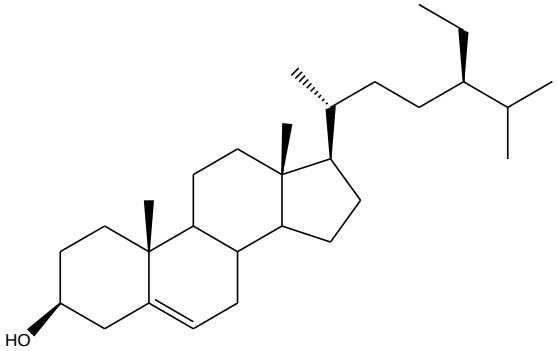

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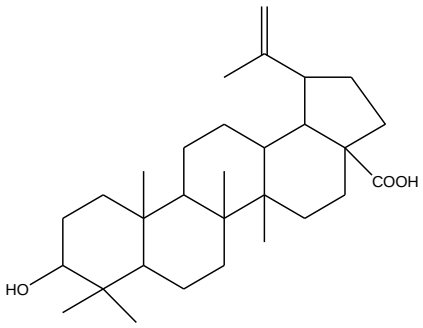

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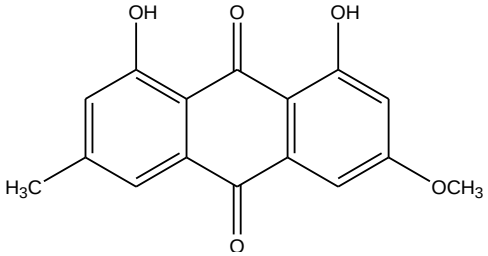

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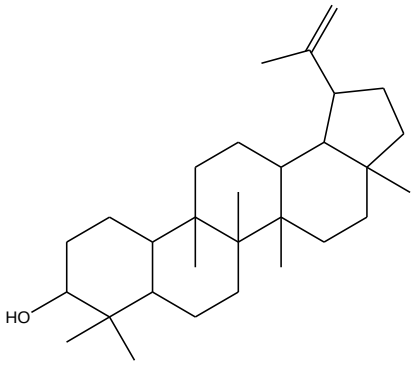

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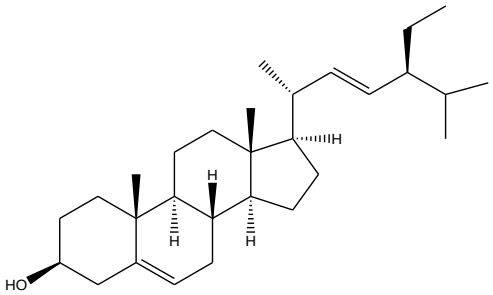

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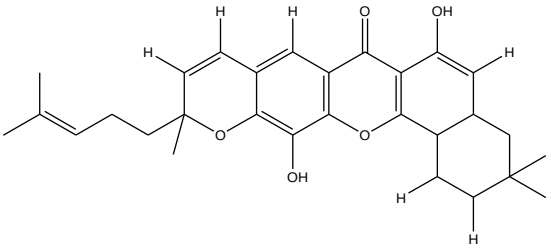

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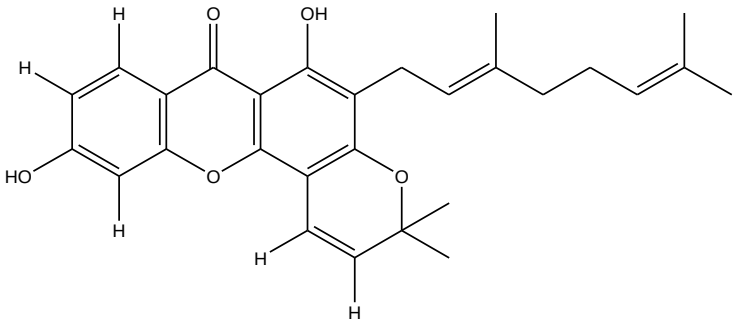

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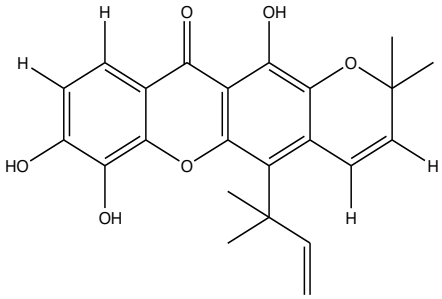

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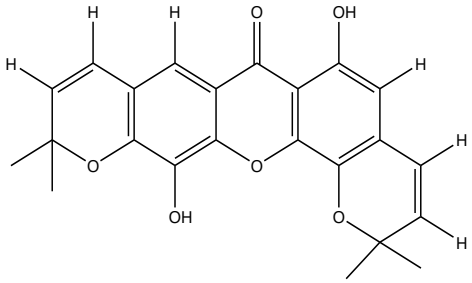

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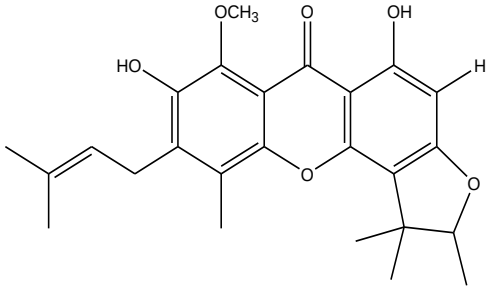

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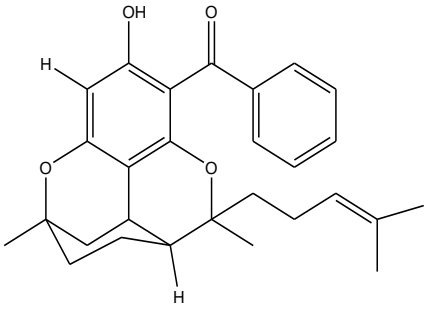

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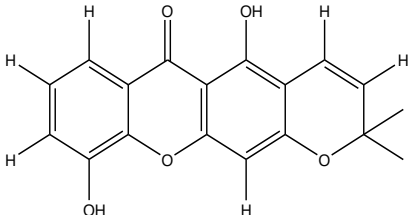

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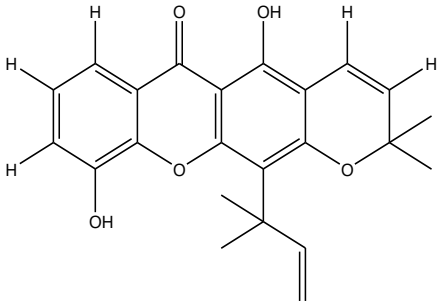

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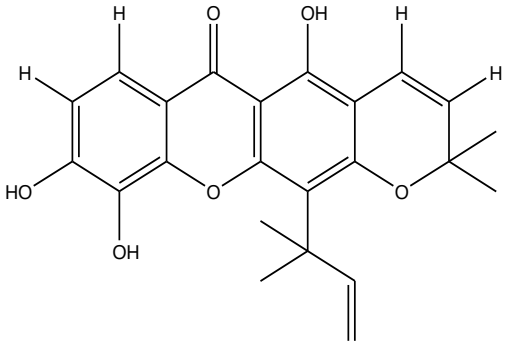

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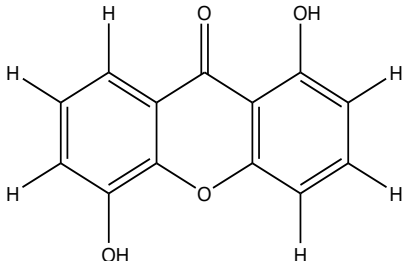

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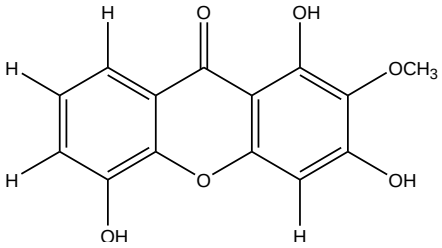
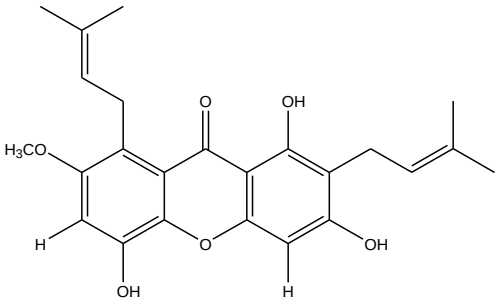
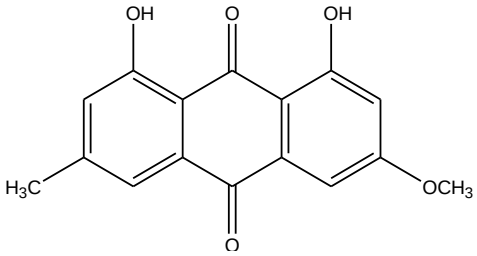

H
O
OH
H
OCH3
H
O
OH
OH
H

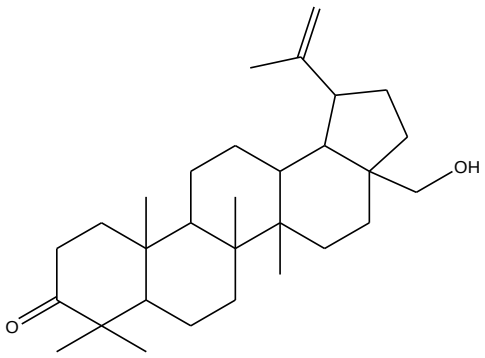
72.


O
OH
H3CO
H
O
OH
OH
H

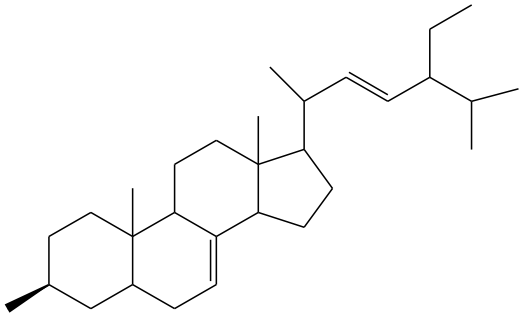
73.


OH
O
OH
H3C
OCH3
O

74.


OH
O

76.



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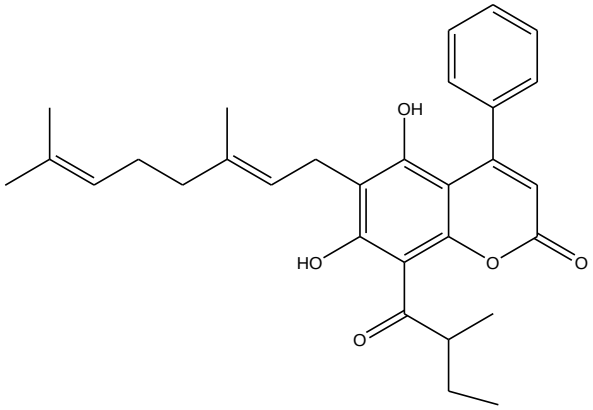
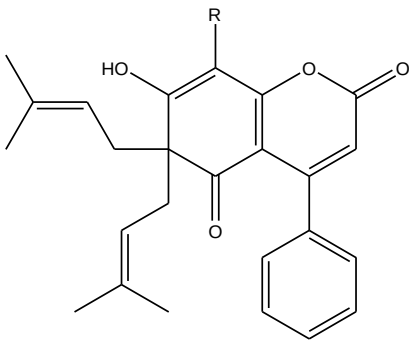
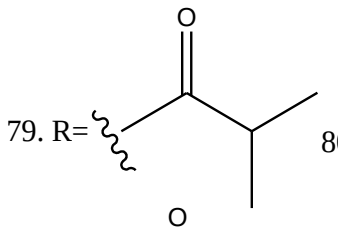
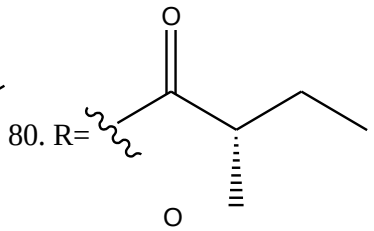
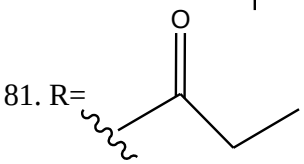

OH
HO
O
O
O

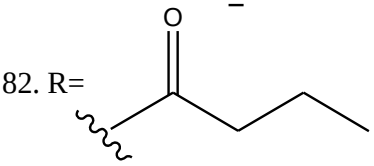

R
HO
O
O
O

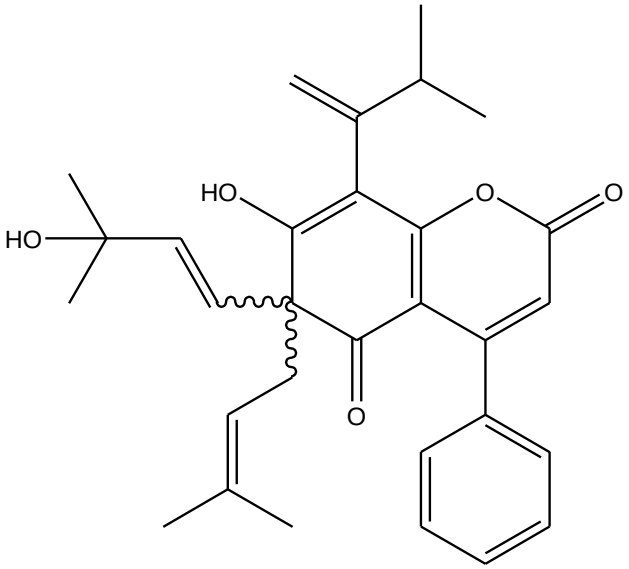
78.











83.

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