CHEMICAL CONSTITUENTS OF SOME PLANT SPECIES OF THE FAMILIES GUTTIFERAE, FLACOURTIACEAE AND SAPOTACEAE OF SRI LANKA

PRESENTED BY

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Synopsis

In this programme the extractives of twenty two plant species belonging to the families Guttiferae, Flacourtiaceae and Sapotaceae have been studied. About 95 plant species of the family Guttiferae that had been chemically studied have shown to contain xanthones, coumarins, biflavanoids, benzophenones, bark acids, terpenoids and steroids.

The relative abundance, structural variation and distribution of these plant products are reviewed in the introduction .

Extractives of Calophyllum cordato-oblongum Thw.

Friedelin, β-sitosterol and cordato-oblongic acid have been isolated from the bark. The timber of this plant gave 1,6-dihydroxy-5-methoxyxanthone, 4-hydroxyxanthone, 3-hydroxy-4-methoxyxanthone, scriblitifolic acid, cordato-oblonguxanthone, 1,5,6-trihydroxyxanthone and jacareubin

Extractives of Calophyllum soulattri Burm.f.

From the bark, soulattri alcohol, taraxerone, taraxerol and β-sitosterol were isolated.

1,3,5-Trihydroxy-2(3-methylbut-2-enyl)-xanthone, 1-hydroxy-5-methoxyxanthone, 1,7-dihydroxyxanthone, 6-deoxyjacareubin and 1,5-dihydroxy-6-methoxyxanthone were isolated from the timber.

Extractives of Calophyllum cuneifolium Thw.

Isocapetalic acid was isolated from the acidic fraction of the bark extract.

Extractives of Mesua myrtifolia

Simiarenone, simiarenol, taraxerol, β-sitosterol, betulinic acid and myrtifolic acid were isolated from the bark. The timber of this plant gave oleanolic acid, myrtifolic acid and jacareubin.

Extractives of Mesua salicina Pl. and Tr.

From the timber 3-hydroxy-4-methoxyxanthone, 1-hydroxy-5-methoxyxanthone, 1-hydroxy-7-methoxyxanthone, 4-hydroxyxanthone, 1,3,7-trihydroxy-5,6-dimethoxyxanthone and 3,7-dihydroxy-1,5,6,-trimethoxyxanthone were isolated in addition to the five xanthones already known from this plant.

Extractives of Kayea stylosa Thw.

The phenolic fraction of the bark gave 10-O-methylmacluraxanthone and kayeaxanthone

Extractives of Pentadesma butyracea Sabine

β-amyrin acetate, β-amyrin, β-sitosterol, 2-methoxy-1,3,5-trihydroxyxanthone and pentadesmaxanthone were isolated from the bark. The timber gave β-amyrin, β-sitosterol, osajaxanthone and unknown 1,3,7,8-tetraoxygenated xanthone.

Extractives of Garcinia hermonii Kosterm

Hermonionic acid was isolated from the bark and the timber gave β-sitosterol, 1,5-dihydroxyxanthone, 1,7-dihydroxyxanthone, 1,3,7-trihydroxy-2-(3-methylbut-2-enyl) xanthone and 1,3,6,7-tetrahydroxyxanthone.

The relative abundance of xanthones, biflavanoids, coumarins, benzophenones and bark acids and their significances in the sub family and genera level is reviewed in the chemotaxanomic correlation.

Flacourtiaceae

The chemical investigation by the earlier worker on the non endemic species and the work done on the endemic species in this Department of the family Flacourtiaceae with special references to the distribution and its significances are discussed in the introduction.

Extractives of Trichadenia zeylanica Thw.

The bark extracts gave acetyl trichadenal and trichadenal in addition to the compounds already isolated from the plant.

Extractives of Erythrospermum zeylanicum (Gaertn)Alston

Friedelin, betulinic acid, ursolic acid and β-sitosterol were isolated from the bark extracts while the timber extract gave only β-sitosterol.

Extractives of Casearia thwaitesii Briq.

The bark and the timber extracts gave β-sitosterol and friedelin

Extractives of Scolopia schrebari J.F.Gmel

The bark extract gave β-sitosterol, friedelin, β-amyrin and epifriedelinol while the timber extracts gave β-sitosterol and friedelin.

Extractives of Chlorocarpa pentachista Alston

The bark and timber extracts gave cycloartenone, cycloartenol and β-sitosterol.

Sapotaceae

The plant species, studied, compounds isolated , their relative abundance structural variations and the chemotaxanomic significances are reviewed in the introduction.

Extractives of Madhuca neriifolia (Thw) H.J.Lam

β-amyrin decanoate, β-amyrin acetate, friedelin, isoarborenol and betulinic acid have been isolated from the bark extractives. From the timber extracts β-amyrin decanoate, β-amyrin acetate, β-amyrenone, β-amyrin, α-spinasterol, α-spinasterol-β-D-glucoside, friedelin and hederagenin were isolated.

Extractives of Madhuca moonii (Thw.)H.J.Lam

From the bark extracts β-amyrin acetate, β-amyrin cinnamate and β-amyrin have been isolated and from the timber extracts β-amyrin acetate and β-amyrin were isolated.

Extractives of Madhuca fulva (Thw.)J.F.Macbr.

β-amyrin decanoate, β-amyrin acetate, β-amyrenone, β-amyrin and

α-spinasterol have been isolated from the bark extractives. The timber extract gave β-amyrin cinnamate and all above compounds except β-amyrin decanoate.

Extractives of Madhuca microphylla (Hook)Alston

β-amyrin acetate, β-amyrenone, β-amyrin and betulinic acid were isolated from the bark while the timber extracts gave β-amyrin as the only compound.

Extractives of Palaquium canaliculatum (Thw) Engl.

From the bark β-amyrin decanoate, β-amyrin acetate, β-amyrenone, β-amyrin, α-spinasterol and ursolic acid have been isolated. The timber extract gave all above compounds except β-amyrindecanoate and β-amyrenone.

Extractives of Palaquium grande (Thw.)Engl.

β-Amyrin decanoate, β-amyrin acetate, β-amyrenone, β-amyrin, α-spinasterol, betulinic acid and ursolic acid have been isolated from the bark and β-amyrin acetate, β-amyrin and α-spinasterol have been isolated from the timber.

Extractives of Palaquium laevifolium (Thw.)Engl.

From the bark β-amyrin cinnamate, β-amyrin acetate, β-amyrenone and β-amyrin have beenisolated. The timber extracts gave β-amyrin acetate, β-amyrin and α-spinasterol.

Extractives of Palaquium rubiginosum (Thw.)Engl.

β-amyrin acetate, β-amyrenone and β-amyrin have been isolated from the bark and timber extracts.

Extractives of Palaquium petiolare (Thw.)Engl.

From the bark extractives β-amyrin cinnamate, β-amyrin acetate, β-amyrenone and β-amyrin have been isolated. Similarly the timber extracts gave all above compounds and α-spinasterol.

Out of 51 compounds isolated from these plants 50 have been characterised. The following naturally occurring compounds are reported for the 1st time.

1. Cordato oblongic acid; 3-(6,7-Dihydro-5-hydroxy-2,2-trans-7,8-tetramethyl-6-oxo-2H,8H-benzo [1,2-b, 5,4-b'] -dipyran-10-yl) butyric acid

2. 3-Hydroxy-4-methoxyxanthone

3. Cordato-oblonguxanthone; 1,2-Dihydro-6-hydroxy-3,3-dimethylpyrano-[2,3-a] xanthen -12(3H)-one

4. Soulattri alcohol; Trans-10-11-dihydro-cis-11,12-12α-hydroxy-6,6,10,11-tetramethyl-4-phenyl-2H,6H,10H-benzo [1,2-b, 3,4-b' 5,6-b''] tripyran-2-one

5. 1-Hydroxy-5-methoxyxanthone

6. Myrtifolic acid; 3α-Hydroxy-bauer-7-en-28-oic acid

7. 1,3,7-Trihydroxy-5,6-dimethoxyxanthone

8. 3,7-Dihydroxy-1,5,6-trimethoxyxanthone

9. 10-O-Methylmacluraxanthone; 12-(1,1-Dimethylprop-2-enyl)-5,9-dihydroxy-10-methoxy-2,2-dimethyl-2H-pyrano [3,2-b] xanthen-6-one

10. Kayeaxanthone; 11-(1,1-Dimethylprop-2-enyl)-9-hydroxy-8,10-dimethoxy-2,2-dimethyl-2H-pyrano [2,3-d] xanthen-7-one

11. Pentadesmaxanthone; 3,3-Dimethyl-6,8-Di-(3,3-dimethylprop-2-enyl)-5,9-11-trihydroxy-3H,12H-pyrano-[3,2-a] xanthen -12-one

12. Hermonionic acid; 5,6'-Dihydroxy-3',4'-dimethoxy-5'-(3,7-dimethyloct--2,6-dienyl)-4,4-di-(3-methylbut-2-enyl)-3-oxo-3,4-dihydrobiphenyl -6-carboxylic acid

13. Acetyl trichadenal; 3β-Acetoxyfriedelan -26-al

14. Trichadenal; 3β-Hydroxyfriedelan-26-al

15. β-amyrindecanoate

In addition the following new derivatives of the new naturally occurring compounds have been prepared and characterised.

1. Acetylcordato-oblongic acid
2. Methylcordato-oblongate
3. 3,4-Dimethoxyxanthone
4. 3-O-Acetyl-4-methoxyxanthone
5. (-) Trans dihydroinophyllolide acetate
6. (-) Trans dihydroinophyllolide methyl ether
7. Methyl myrtifolate
8. Myrtifonic acid
9. Myrtifolol
10. Myrtifonal
11. Bauerenone
12. 1,3,7-Triacetoxy-5,6-dimethoxyxanthone
13. 3,7-Diacetoxy-1,5,6-trimethoxyxanthone
14. 5,9-Di-O-acetyl-10-O-methylmacluraxanthone
15. Tetrahydro-10-O-methylmacluraxanthone
16. O-Methylkayeaxanthone
17. Tetrahydrokayeaxanthone
18. O-Methyldehydro cycloguanandin
19. Pentadesmaxanthonetriacetate
20. Pentadesmaxanthone dimethyl ether
21. Hexahydropentadesmaxanthone
22. Methylhermonionate
23. Methylhermonionate monomethyl ether
24. Methylhermonionate dimethyl ether
25. Octahydrohermonionic acid

27. Methyl hermonionate diacetate

28. Hermonionol dimethyl ether

29. Hermonione

30. Hermoniolic acid lactone

31. Hermoniolic acid lactone monomethyl ether

32. Hermoniolic acid lactone dimethyl ether

33. Trichadonal

34. Trichadenol

In Sri Lanka there are over 3300 species of flowering plants belonging to about 1300 genera and 192 families.[1] Of these about 830 species are endemic and are distributed in 342 genera and in 94 families.[2] The programme in this Department on chemical investigation of endemic plants envisaged the study of the extractives of mainly the bark and timber of these plants.

The purpose of these studies were (a) to determine the structure of the compounds (b) to obtain information on chemical taxanomy and biogenesis and c) to examine the pharmacological properties of the extracts and the new compounds isolated. Species endemic to Sri Lanka have found little use in the Ayurvedic medicine although several related non-endemic plants are extensively used.

As part of the programme chemical study of some species belonging to the families Guttiferae, Flacourtiaceae and Sapotaceae were undertaken. The names of the species and the parts examined in the present study is given in the table (1).