Present work. The different tissues were exhaustively extracted in a Soxhlet with light petroleum (60–80°) and then EtOH. The different alkaloids were isolated by a combination of column chromatography, preparative TLC and fractional crystallisation according to Henry[3] and Ledouble.[2] The alkaloids were identified by co-chromatography with alkaloid standards employing different solvent systems.[2] The isolated alkaloids were further identified by m.p. and m.m.p., IR and MS. The results are summarized in Table 1. It is noteworthy that no alkaloids could be detected in leaves, although earlier reports indicate that leaf samples from the Ivory Coast contain alkaloids.[2] The alkaloid contents of mature and immature seeds are seen to be qualitatively the same. The content of akuammicine was found to be higher in mature seeds than in immature seeds. On the other hand, pseudo-akuammigine was found to be present in a higher concentration in immature seeds. This probably indicates a transformation of pseudo-akuammigine to akuammicine during the ripening of fruits.

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ARACEAE, etc.

CONSTITUENTS OF *COLOCASIA FORMICATA, SAGITTARIA SAGITTIFLORIA, ARNEBIA NOBILIS, IPOMOEA PANICULATA RHODODENDRON NIVEUM, PASPALUM SCROBICULATUM, MUNDULEA SERICEA* AND *DUABANGA SONNERATIODES**

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Key Word Index—Araceae, Alismaceae; Boraginaceae Convolulaceae; Ericaceae; Gramineae, Leguminosae, Lythraceae; sterols, flavonoids.

Plant. Colocasia formicata (Araceae). *Occurrence.* In many parts of India up to an elevation of 8000 ft.

Rhizome. Light petrol and benzene fraction of EtOH extractive (chromatographed over alumina) gave *hentriacontane* $C_{31}H_{64}$† m.p. 68° (m.m.p. and IR), *hentriacontanol* $C_{31}H_{64}O$ m.p. 85° (m.m.p. and acetate), *hentriacontanone* $C_{31}H_{64}O$ m.p. 82° (m.m.p., IR and oxime), *taraxerol acetate* $C_{32}H_{52}O_2$ m.p. 294° $[\alpha]_D$ + 10° (m.m.p., IR, TLC, NMR and MS). Deacetylation furnished taraxerol $C_{30}H_{50}O$ m.p. 265° $[\alpha]_D$ + 5°; benzoate $C_{37}H_{54}O_2$ m.p. 284° $[\alpha]_D$ + 35°. *Lignoceric acid* $C_{24}H_{48}O_2$ m.p. 84°; methylester $C_{25}H_{50}O_2$ m.p. 58° (m.m.p. and TLC). *Sitosterol* $C_{29}H_{50}O$ m.p. 136° $[\alpha]_D$ − 35°; acetate $C_{31}H_{52}O_2$ m.p.

* Communication No. 1739 from Central Drug Research Institute, Lucknow, India.

† Satisfactory analysis, IR determined in KBr, $[\alpha]_D$ in $CHCl_3$ and 60 Mcs NMR in $CDCl_3$ with TMS as internal standard.

132° $[\alpha]_D$ − 38° and *sitosterol-β-D-glucoside* $C_{35}H_{60}O_6$ m.p. 294° $[\alpha]_D$ − 48° (pyridine) (m.m.p., acetate and NMR). Acid hydrolysis afforded sitosterol (m.p., m.m.p., $[\alpha]_D$ and acetate) and glucose (PC).

Plant. Sagittaria sagittifolia Linn. (Alismaceae). *Occurrence.* Throughout the plains of India. *Plant.* Light petroleum fraction of EtOH extractive (chromatographed over alumina) afforded *hentriacontanone* (m.p., m.m.p. and oxime) and *sitosterol.*

Plant. Arnebia nobilis Rachinger (Boraginaceae). *Occurrence.* Afghanistan. *Previous work.* Root.[1,2]

Root. Light petroleum extract (chromatographed over silica) furnished a *wax* $C_{53}H_{106}O_2$ m.p. 82°. Alkaline hydrolysis furnished *hexacosanol* $C_{26}H_{54}O$ m.p. 78–79°; acetate $C_{28}H_{56}O_2$ m.p. 65° (m.m.p. and TLC) and heptacosanic acid $C_{27}H_{54}O_2$ m.p. 81°; methyl-ester $C_{28}H_{56}O_2$ m.p. 65° and *sitosterol* (m.p., m.m.p., $[\alpha]_D$, NMR and acetate).

Plant. Ipomoea paniculata R.Br. (Convolvulaceae). *Occurrence.* Tropical India in moist regions.

Rhizome. Benzene extract of EtOH extractive (chromatographed over alumina) gave *taraxerol acetate* (m.m.p., m.p., TLC and NMR). Deacetylation furnished taraxerol (m.p., m.m.p., TLC, NMR and benzoate) and *sitosterol* (m.p., m.m.p. and acetate).

Plant. Rhododendron niveum Hook f. (Ericaceae). *Occurrence.* North Himalaya and NEFA. *Previous work.* Plant.[3]

Plant. Light petroleum soluble fraction of the EtOH extractive (chromatographed over silica) afforded *hentriacontane* (m.p. and m.m.p.), *hentriacontanol* (m.p., m.m.p. and acetate), *α-Amyrin* $C_{30}H_{50}O$ m.p. 180° $[\alpha]_D$ + 83°; acetate $C_{32}H_{52}O_2$ m.p. 222° $[\alpha]_D$ + 76°; benzoate $C_{37}H_{54}O_2$ m.p. 192–94° $[\alpha]_D$ + 92° (m.m.p., IR, MS and NMR), *epifriedelinol*[4] $C_{30}H_{52}O$ m.p. 282–283° $[\alpha]_D$ + 24°; acetate $C_{32}H_{54}O_2$ m.p. 290–92° $[\alpha]_D$ + 45° (m.m.p., IR, TLC and MS). Acetone soluble fraction (chromatographed over silica) gave *quercetin-3-galactoside* $C_{21}H_{20}O_{12}$ m.p. 225–227° and *quercetin-3-glucoside* $C_{21}H_{20}O_{12}$ m.p. 250–252° (UV and m.m.p.). Acid hydrolysis furnished galactose and glucose respectively (PC) and quercetin $C_{15}H_{10}O_7$ m.p. 312° (m.m.p., UV, IR and pentaacetate and pentamethylether). Methylation followed by hydrolysis gave 5,7,3′,4′-tetramethyl quercetin thus confirming the attachment of sugars at position 3 in the flavonoid ring.

Plant. Mundulea sericea (Willd). Greenway syn. *M. suberosa* Benth. (Leguminosae). *Occurrence.* Konkan, Deccan, Circars, up to 4000 ft on the rocky hills. *Previous work.* Bark,[5,6] root bark.[7–9]

Plant. During the course of screening programme at C.D.R.I., Lucknow ethanol extract showed hypotensive activity.[10] Benzene fraction of this EtOH extractive (chromatographed over alumina) yielded hypotensive isoflavonoid *mundulone*[5] $C_{26}H_{26}O_6$ m.p. 180–181°; acetate $C_{28}H_{28}O_7$ m.p. 189–191°; benzoate $C_{33}H_{30}O_7$ m.p. 166° (m.m.p., IR, UV, TLC and NMR). This compound was found to be highly toxic even at the dose level of 1 mg/kg.

[1] Y. N. SHUKLA, J. S. TANDON, D. S. BHAKUNI and M. M. DHAR, *Experientia* **25,** 357 (1969).
[2] Y. N. SHUKLA, J. S. TANDON, D. S. BHAKUNI and M. M. DHAR, *Phytochem.* **10,** 1909 (1971).
[3] D. S. BHAKUNI, N. C. GUPTA, S. SATISH, S. C. SHARMA, Y. N. SHUKLA and J. S. TANDON, *Phytochem.* **10,** 2247 (1971).
[4] P. R. JEFFERIES, *J. Chem. Soc.* 473 (1954).
[5] B. F. BURROWS, N. FINCH, W. D. OLLIS and I. O. SUTHERLAND, *Proc. Chem. Soc.* 150 (1959).
[6] N. FINCH and W. D. OLLIS, *Proc. Chem. Soc.* 176 (1960).
[7] B. F. BURROWS, W. D. OLLIS and L. M. JACKMAN, *Proc. Chem. Soc.* 177 (1960).
[8] K. B. RAO and N. V. SUBBA RAO, *J. Sci. Ind. Res.* **17B,** 384 (1958), *Curr. Sci.* **35,** 410 (1966).
[9] C. S. BARNES, J. L. OCCOLOWITZ, N. L. DUTTA, P. MADHAVAN NAIR, P. S. PHADKE and K. VENKATRAMAN, *Tetrahedron Letters* 281 (1963).
[10] Dr. B. N. DHAWAN, Pharmacology Division, C.D.R.I., Lucknow, personal communication.

Other compounds isolated are *munetone* $C_{21}H_{18}O_4$ m.p. 195–197° (IR, NMR and MS), Sericetin $C_{20}H_{17}O_4$ m.p. 144° (IR, NMR and MS); acetate $C_{22}H_{19}O_5$ m.p. 172–173° and a *phytosterol* m.p. 144–150° $[\alpha]_D$ − 60°; acetate m.p. 134°.

Plant. Duabanga Sonneratiodes Ham. (Lythraceae). *Occurrence.* Eastern Himalaya, Assam and Andaman Islands. *Previous work.* Stem bark.[3]

Stem bark. During the course of screening programme of biologically active plants at C.D.R.I., Lucknow this plant showed a good order of anti-cancer activity against Walker Carcinosarcoma 256 in rats.[11] This activity was found to be located in benzene fraction of EtOH extractive which (chromatographed over silica gel) gave *hentriacontanone* (m.p., m.m.p., TLC and oxime), *lignoceryl ferulate*[12] $C_{34}H_{58}O_4$ m.p. 80–81° (IR, NMR and m.m.p.). On alkaline hydrolysis it furnished lignoceryl alcohol $C_{24}H_{50}O$ m.p. 76° (m.m.p., IR, NMR and acetate) and ferulic acid $C_{10}H_{10}O_4$ m.p. 170° (m.m.p., IR and NMR), *acacetin*[13] $C_{16}H_{12}O_5$ m.p. 258° λ_{max} 270 and 328 nm; acetate $C_{20}H_{16}O_7$ m.p. 204° (MS and NMR). *Betulinic acid* $C_{30}H_{48}O_3$ m.p. 316°; acetate $C_{32}H_{50}O_4$ m.p. 296°; methylester $C_{31}H_{50}O_3$ m.p. 200° (m.m.p., $[\alpha]_D$, MS and NMR) and *sitosterol-β-D-glucoside* (m.p., m.m.p., $[\alpha]_D$, acetate and NMR). Acid hydrolysis afforded sitosterol (m.p., m.m.p., $[\alpha]_D$ and acetate) and glucose (PC).

Plant. Paspalum scrobiculatum L. (Gramineae), *Occurrence.* Hotter parts of India, wild or cultivated.

Seeds. Light petroleum extract (chromatographed over alumina) gave *hentriacontanol, hentriacontanone, sitosterol* and *campesterol* $C_{28}H_{48}O$ m.p. 156–157° $[\alpha]_D$ − 48°; benzoate $C_{35}H_{52}O_2$ m.p. 155° $[\alpha]_D$ − 26° (m.m.p., TLC and NMR).

[11] D. S. BHAKUNI, M. L. DHAR, M. M. DHAR, B. N. DHAWAN, B. GUPTA and R. C. SRIMAL, *Ind. J. Exptl Biol.* **9**, 91 (1971).
[12] D. K. KULSHRESHTHA and R. P. RASTOGI, *Phytochem.* **10**, 2831 (1971).
[13] A. G. PERKIN, *J. Chem. Soc.* **77**, 423 (1900).

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CACTACEAE

FATTY ACIDS OF *OPUNTIA ENGELMANNII*

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Key Word Index—*Opuntia engelmannii*: Cactaceae: fatty acids.

Plant. Opuntia engelmanii. Uses. Food,[1–3] medicinal.[4] *Previous work.* On sister species *O. ficus-indica*[5] and *O. fragilis*.[6]

[1] P. SCHARP, *Tex. Acad. Sci.* **21**, 9 (1966).
[2] E. SHULTZ, *Texas Cacti*, pp. 52–54, Texas Academy of Science, San Antonio, Texas (1930).
[3] D. WENIGER, *Cacti of the Southwest; Texas, New Mexico, Oklahoma, Arkansas, and Louisana*, pp. 168–173, University of Texas Press, Austin, Texas (1969).
[4] R. A. VINES, *Trees, Shrubs and Woody Vines of the Southwest*, pp. 775–778, University of Texas Press, Austin, Texas (1960).
[5] A. ARCOLEO, M. RUCCIA and M. C. NATOLI, *Atti Accad Sci. Lettere Arti Palermo*, Part 1, 25, 323 (1964).
[6] R. A. ABRAMOVITCH, R. T. COUTTS and E. E. KNAUS, *Planta Med.* **16**, 147 (1968).