135°, was identified as β-sitosterol. Apart from these, this contained many minor components none of which were phenolic in nature.

The presence of the C-glucoside, vitexin, in both *P. mungo* and *P. radiatus* may be of value with regard to the chemotaxonomy of pulses and the protection offered by the seed coat from the invading pathogens.

Experimental

Extraction and Separation.—120 g of air-dried seed coats of *P. mungo* and *P. radiatus* (from 1 Kg seeds of each) were extracted separately exhaustively with hot 95% ethanol (300 ml × 6) and concentrated under reduced pressure. The concentrate was dried over P_2O_5 in a vacuum desiccator. The dry concentrate was macerated well with ether (50 ml × 4) and separated into ether insoluble and ether soluble portions.

Ether insoluble portion of P. mungo.—The dried residue was subjected to column chromatography over silica gel (NCL) and methanol : chloroform (15 : 85) eluate gave compound A (30 mg), m.p. 265–66° (decomp.) after crystallization from methanol as yellow prisms.

Ether insoluble portion of P. radiatus.—The dried residue was subjected to column chromatography over silica gel (NCL) and methanol : chloroform (15 : 85) eluate gave compound A', 80 mg, m.p. 265–66° (decomp.), crystallized from methanol as yellow prisms.

Comparison of A and A'.—Both A and A' had the same R_f 0·5 in TLC (methanol : chloroform (1 : 4) and paper chromatography R_f 0·3 (15% aqueous acetic acid) and both melted at 265–66°, (decomp.). The m.m.p. of A and A' was undepressed.

Hydrolysis of A and A'.—A and A' were separately subjected to hydrolysis with Kiliani mixture (HCl : HOAc : H_2O 1 : 4 : 5) and 7% aqueous H_2SO_4. The ether extract in each case after 4 hr of the reaction over hot water-bath was tested for flavonoids and were not detected.

U.V. and visible spectra of A and A'.—Both A and A' had the same absorption values as vitexin in methanol and in the presence of added reagents[3].

Comparison with vitexin.—A and A' were compared with an authentic sample of vitexin by paper chromatography (15% aqueous acetic acid, R_f 0·3 for all). The m.m.p. of A and A' individually with the authentic sample of vitexin was undepressed.

I.R. spectra of A and A'.—IR spectra (in KBr) of A and A' were identical and compared well with the reported IR data of vitexin[4].

Ether soluble fraction of P. mungo.—Benzene : petroleum ether (2 : 5) eluate (NCL silica gel) gave a compound B, crystallizing as white flakes from methanol, 30 mg, m.p. 135°. It gave positive Libermann-Burchard reaction for steroids and compared with an authentic sample of β-sitosterol (TLC m.m.p.).

Ether soluble portion of P. radiatus.—Column chromatography and thin layer chromatography indicated the presence of the above compound, apart other compounds in very minor amounts.

Department of Chemistry,
University of Delhi,
Delhi-7, *April* 27, 1973.

R. Murari.
T. R. Seshadri.
S. Vydeeswaran.

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TRITERPENOID CONSTITUENTS OF *ALSTONIA VENENATA* FRUIT PODS

Alstonia venenata R. Br. (Fam. Apocynaceae) is a shrub which grows in the hilly regions of South India—in the hills of Ganjam up to a height of 2,000 ft and in the Western Ghats and Nilgiris up to a height of 6,000 ft. The plant is used as tonic, antiperiodic and anthelmintic. Ripe fruits of the plant find use in the treatment of syphilis, insanity and epilepsy in the Indian system of medicine[1].

Like other *Alstonia* species, *A. venenata* is quite rich in indole alkaloids[2–8] but it differs from other species in elaboration of alkaloids of vincadifformine and refractin skeletons[5–7]. In addition to indole bases, fruits of *A. venenata* have been found to contain monoterpene alkaloid[9–10]. No work on the non-nitrogenous principles of the fruits has yet been reported and the present communication describes the isolation and characterisation of β-amyrin and ursolic acid from the fruit pods of this plant.

The coarsely powdered and air-dried fruit pods of *A. venenata* were successively extracted with petroleum ether (60–80°) and rectified spirit. The petrol extract was freed from alkaloids by treatment with aqueous citric acid and the acid-insoluble yellowish gum was subjected to chromatographic resolution over Brockmann alumina. Elution of the column with petrol-benzene (95 : 5) mixture furnished a crystalline triterpene alcohol, m.p. 192–93° (M^+, 426). With acetic anhydride and triethylamine, it formed an acetate, m.p. 241–42°,

ν_{max} 1735 cm^{-1} and with benzoyl chloride and triethylamine, it gave a benzoate, m.p. 234–35°. The mass spectrum[11] of the parent alcohol, in addition to the molecular ion peak at m/e 426, showed significant fragment ions at m/e 218, 207, 203 and 189 suggesting its identity with β-amyrin which was confirmed by direct comparison (mixed m.p., co-TLC and superimposable IR spectra) with authentic sample.

The total non-basic material left after removal of alkaloids from the alcoholic extract was a greenish powder which was acetylated with acetic anhydride and pyridine and the crude acetylated product was chromatographed over neutral alumina. Chloroform-methanol eluate (95 : 5) from this column furnished an acetate of a triterpene acid, m.p. 291–92°, ν_{max} 3210–3275 cm^{-1}, 1722 and 1710 cm^{-1}. Methylation of this compound with diazomethane yielded a methyl ester, m.p. 249°, ν_{max} 1737 and 1729 cm^{-1}, the NMR spectrum of which, taken in $CDCl_3$, was found to be identical with that reported[12] for methyl ester of ursolic acid acetate. The identity of the two compounds was finally established by direct comparison (Co-TLC and superimposable IR spectra). Methyl ester of ursolic acid was also prepared by hydrolysis of the acetate with methanolic alkali and methylation of the generated ursolic acid with diazomethane to a crystalline compound, m.p. 172°.

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Dept. of Medicinal Chemistry, Banaras Hindu University, Varanasi-5, *May* 22, 1973.

V. B. Pandey.
A. B. Ray.

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RADIOCARBON DATES OF THE BURIED SOIL IN THE LOWER NARMADA VALLEY

The lower Narmada Valley in Gujarat State, in western India, stretches over 150 km from the escarpment of basalt hills in the east to the coast of the Gulf of Cambay. In this valley the river cuts vertically down into the alluvium. In some parts the sections measure more than 40 m in height, and in these sections the stratigraphy of the alluvium is clear. Near the bottom, up to a metre above the winter water level, the sections consist of hard clay. Within the proximity of the hills the clay is overlain by an indurated gravel layer. Above the gravels is a series of laminated silts weathered at the top to form a black cotton soil. About 30 km downstream from the hills, the gravel layer gradually disappears and the silts lie directly on the basal clay. Within the silts there is a predominant disconformity in the form of a buried land surface. It is seen in the sections continuously for over 100 km as a three to four metre deep reddish brown band, ten to twelve metres below the surface of the plain. It is the profile of a buried soil.

An equally prominent buried soil profile is seen in the sections of the Sabarmati and Mahi, the two other main rivers of the Gujarat plain and in the sections of the Men, Osrang and Karijan, the major tributaries of the lower Narmada. In all these river valleys the stratigraphy of the alluvium follows the same pattern and sequential order as in the lower Narmada.

Stone implements are found in all these river valleys. The gravels contain handaxes, cleavers, choppers and crude flakes, the tools of Early Stone Age man. On the black cotton soil numerous late Stone Age sites have been found. Therefore the alluvial formations in Gujarat have been studied by many archaeologists and earth-scientists. The works of Sankalia[1], Zeuner[2], Subbarao[3], Wainwright[4], Allchin, Hegde and Goudie[5] have contributed to the understanding of the typology of tool assemblages and their stratigraphy. But these alluvial sediments do not contain fossil pollen[6]. Neither have they so far yielded fossil bones. Therefore it has not been possible to provide a temporal framework for the stratigraphy of the alluvium or the stone tools found in it. A