which grows abundantly around Aligarh, Uttar Pradesh. In this communication we report the isolation and identification of β-sitosterol and two triterpenoids from the roots of this plant which has not been chemically investigated previously.

The plant material was collected locally during the monsoon. The dried roots, cut into small pieces, were extracted successively with petroleum ether and alcohol. The petroleum ether extract was adsorbed on a column of silica gel and the column eluted with petrol-benzene (3 : 1) and benzene. The compounds obtained from the eluate were purified by rechromatography and crystallisation to afford β-sitosterol (m.p. 131-32°) and betulin (m.p. 252-54°), respectively. The alcoholic extract on concentration deposited a solid, which was purified by chromatography on silica gel and identified as betulinic acid. The isolated compounds were identified on the basis of spectral data (nmr and ir) and comparison with authentic samples[3,4] (m.m.p.). Derivatives of the isolated compounds prepared for their identification included β-sitosterol acetate and benzoate, betulin acetate (m.p. 220°), betulinic acid acetate (m.p. 289°) and methyl ester of betulinic acid acetate (m.p. 198°).

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Chemical Investigation of *Mollugo pentaphylla*

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MOLLUGO pentaphylla, one of the three species of the genus *Mollugo* (fam. Molluginaceae) is an annual shrub and grows in paddy and maize fields during July-August. The other two species are *Mollugo spergula* (grows at the base of the eastern Himalayas[1]) and *Mollugo hirta* (distributed in West Bengal[2]).

Mollugo spergula[3-8] and *Mollugo hirta*[9-13] were studied in detail for their chemical constituents. Literature reveals that *Mollugo pentaphylla* has not been studied chemically so far. Jha *et al*[14] reported the crude methanolic extract of this plant to possess spermiostatic activity and Chopra[15] described other medicinal uses of this plant. Hence a chemical investigation of the aerial part of this plant was undertaken. All known compounds were characterised by comparison (m.m.p., co-tlc and co-ir) with authentic samples.

Finely powdered plant material (1 kg) was extracted with petroleum ether (60-80°) in soxhlet apparatus followed by extraction with methanol.

Petroleum ether extract :

The plant extract was concentrated under reduced pressure to a semisolid mass, which was chromatographed over neutral alumina.

Alkanes : Elution of the column with hexane yielded a white waxy solid, m.p. 68-70° (acetone). ν_{max}^{KBr} : 2950, 2870, 1470, 1399, 725 and 715 cm^{-1}. Gas chromatographic analysis of the above solid on Pye-Unicam gas chromatograph (model 124) (dual glass column 2.5 m × 3 mm, f.i.d., adsorbent 3% SE-30 on Chrom-2, programmed at 350° with 4°/min, carrier gas N_2 at 45 ml/min, chart speed 15″/hr) gave the following alkanes (percentage within parentheses) : C_{18}(36.03), C_{19}(1.71), C_{20}(15.44), C_{22} (1.38), C_{23}(0.85), C_{25}(3.44), C_{26}(0.36), C_{29}(1.71), C_{31}(5.15), *iso*-C_{18}(17.11), *iso*-C_{22}(1.71), *iso*-C_{23} (1.37), *iso*-C_{25}(5.15) and *iso*-C_{26}(8.58). Authentic samples (Analabs, USA) were co-chromatographed under identical conditions and identifications were made according to Hardman, Wood and Sofowora[16].

β-Sitosterol : Elution (petroleum ether-benzene ; 1 : 4) yielded β-sitosterol, m.p. 136-38°, acetate : m.p. 125-26°.

Methanolic extract :

The defatted plant material was next extracted with methanol in a soxhlet apparatus. The extract was concentrated to a sticky mass under reduced pressure which gave copious honey comb foam with water. It was dissolved in minimum volume of methanol and purified by repeated precipitation by pouring into large volume of acetone. The crude yellow saponin was resolved into five spots on silica gel G layers (solvent : I, di-isopropyl ether ; II, methylene chloride, hR_f 20, 41, 62, 85 and 93) and was also separated by preparative tlc (silica gel G, chloroform-methanol ; 95 : 5).

Oleanolic acid : (hR_f 41). Colourless needles, m.p. 303-304°, acetate, m.p. 262-63°.

Mollugogenol A : (hR_f 62). Colourless needles, m.p. 248-50°, acetate, m.p. 227-30°.

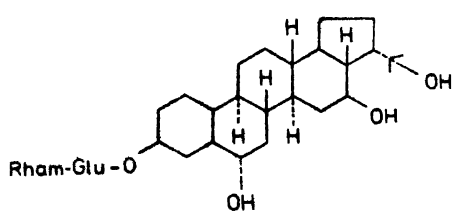
Mollugogenol B : (hR_f 85). Colourless needles, m.p. 220-23°, acetate, m.p. 192-94°.

Mollugogenol D : (hR_f 93). Colourless needles, m.p. 281-88° dec, acetate, m.p. 264-66°.

L-Rhamnopyranosyl-D-glucopyranosyl-mollugogenol A : (hR_f 20). It gave the usual tests for a

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saponin and was hydrolysed with 6% methanolic HCl. The aglycone was separated and identified as mollugogenol A (vide *supra*). The sugars in the hydrolysate were identified as rhamnose and glucose. TLC monitored hydrolysis of the saponin revealed the sugar sequence in it as rhamnose→glucose→ aglycone. 20.1 mg of the saponin was hydrolysed with 7% H_2SO_4 in 5 ml MeOH in a sealed tube and the sapogenin and the sugars were estimated[17]. Mollugogenol A was found to be 52.61% (required 52.89%) and the sugars 46.83% (required 47.10%). This showed that glucose and rhamnose were present in 1 : 1 ratio. It is well known that natural triterpenoid glycosides are usually C3-O-glycoside[18]. Hence the disaccharide chain was linked to mollugogenol A at position 3 through glucose. Further, furanose configuration for glucose is very uncommon among natural glycosides. It was therefore assumed that glucose unit was in pyranose form leaving 4-OH group free for glycosidic linkage with the terminal rhamnose unit, which also existed in pyranose form in natural glycosides. Furthermore, it is a general observation that D-sugars occur with β-glycosidic linkages and L-sugars with α-glycosidic linkages[19]. Based on above facts the structure of the above compound i.e. saponin of mollugogenol A may be represented as α-L-rhamnopyranosyl(1→4)-β-D-glycopyranosyl(1→3)-mollugogenol A (**1**).



(I)

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2'-Mercapto Maleianilic Acid as a New Gravimatric Reagent for the Determination and Separation of Zirconium(IV) and Thorium(IV)

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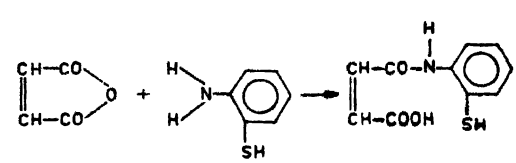
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ORGANIC acids and their derivatives have been investigated by several workers for the estimation of zirconium[1-6] and thorium[7-11]. In continuation of our previous work[12], we report the use of 2'-mercapto maleianilic acid as a new gravimatric reagent for the determination of Zr(IV) and Th(IV) and their separation from binary mixture by using a mixture of citrate and tartrate (1 : 1 molar ratio) as masking agent for zirconium(IV) ion. Ammonium nitrate has been used as a coagulating agent for better crystallization.

Experimental

2'-Mercapto maleianilic acid has been prepared by condensing purified maleic anhydride and *o*-amino thiophenol. The purity of the compound was confirmed by elemental analysis. (Found : C, 53.9 ; H, 4.75 ; N, 5.67. Calcd. : C, 53.94 ; H, 4.16 ; N, 5.2%). The condensation takes place according to the following way :



Sodium salt of the acid was prepared by dissolving the required amount of the reagent in a minimum

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