A NOTE ON THE PREPARATION OF RICINOLEIC ACID BY UREA COMPLEXING

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Some fatty acids were separated from hydrolysed castor oil by successive additions of urea. The method was utilised to prepare ricinoleic acid of B.P. 1948 standard from castor oil.

During recent work we required ricinoleic acid conforming to the B.P. 1948 standard. One of the simplest methods of obtaining the acid is by the hydrolysis of castor oil, but the product so obtained does not conform to the B.P. 1948 standard. The distillation of crude ricinoleic acid under reduced pressure involves the risk of polymerisation, the method being commercially uneconomical. Another method of purification utilises the process of solidification which is very slow because of the oily nature of the material, and a further disadvantage is that the temperature has to be maintained below 4° throughout the operation. Moreover, the congealing point of crude ricinoleic acid is close to that of the more pure form.

Mehta and Dabhade (1959) applied the urea complexing method to the separation of different constituents of chaulmoogra oil, which was otherwise difficult. The various fatty acids were regenerated from urea complexes by hydrolysis with hydrochloric acid. The method (Sinha, Chakrabarty and Chakrabarty, 1957) utilises the fact that in urea-adduct formation, the influence of melting-point and solubility are subordinate to the influence of unsaturation. With increasing saturation in the conjugated acids there is a marked tendency towards adduct formation with lesser concentrations of urea. Increase in the unsaturation and chain length interferes with the complex formation. Based on the above findings we have been able to obtain ricinoleic acid of B.P. 1948 quality from castor oil.

Experimental

Hydrolysis of castor oil. Castor oil (50 g.) was added to alcoholic caustic potash solution (25 g. in 225 ml. ethanol) and the solution was refluxed for 16 hr. or until a test portion of the reaction mixture was completely soluble in water. The ethanol was distilled from the reaction mixture and the residue dissolved in water (200 ml.), washed with ether, decolourised with charcoal and filtered. The filtrate was acidified with hydrochloric acid and the separated oil taken up in ether (200 ml.). The ethereal solution was washed with water and dried over anhydrous sodium sulphate. On removal of ether, a light-brown liquid (34 g.) was obtained.

Urea complexing. Hydrolysed castor oil (25 g.) thus obtained was dissolved in anhydrous ethanol (250 ml.). Urea (30 g.) was dissolved in the above solution by refluxing over a water-bath. The solution on cooling

yielded a colourless crystalline solid, which was filtered off. The solid was one fraction of the fatty acids. After diluting the filtrate to 250 ml. with anhydrous ethanol, more urea (25 g.) was added and dissolved by refluxing, and the solution cooled to yield a colourless crystalline solid, which was filtered off and dried. This solid was suspended in water (150 ml.) acidified with hydrochloric acid and heated on a water-bath for 15 min., the mixture was cooled, the separated oil taken up in ether, and the ether solution washed with water and dried over anhydrous sodium sulphate. On removal of ether, a yellowish-white liquid (5 g.), which is the ricinoleic acid, was obtained. The experiment was repeated with different samples of hydrolysed castor oil containing crude ricinoleic acid. The analytical data on three samples of ricinoleic acid obtained by this method are recorded in Table I.

TABLE I

	B.P. 1948 specification	Sample No. 1	Sample No. 2	Sample No. 3
Description ..	Yellow or yellowish-brown viscous liquid	Yellowish-white liquid	Yellowish-white liquid	Yellowish-white liquid
Solubility	Insoluble in water; soluble in ethanol	Conforms	Conforms	Conforms
Acid value	Not less than 175	184·9	184	182·6
Freezing point ..	Does not congeal to a solid mass until cooled below 4°	Congeals at about 2°	Congeals at about 2°	Congeals at about 2°
Iodine value ..	85 to 91	89·6	87·7	88·1
Refractive index at 40°	1·462 to 1·468	1·464	1·462	1·467

From these results, it is evident that the method can be applied to obtain ricinoleic acid of B.P. 1948 standard.

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