A NOTE ON THE CHEMICAL COMPOSITION OF CASTOR LEAVES

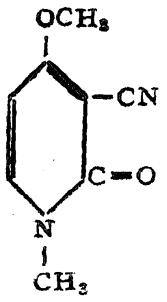
By N. V. Subba Rao

(From the Department of Chemical Technology, Andhra University)

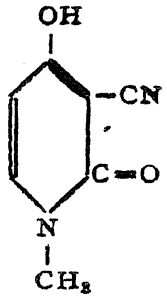
Received February 12, 1945

(Communicated by Prof. T. R. Seshadri)

In 1864 Tuson[1] isolated ricinine from castor seeds and this compound was believed to be the poisonous principle of the seeds, till ricin, the albuminoid toxin was isolated and proved to be the main toxic component.[2] Wayne[3] in 1874 examined castor leaves and after elaborate treatment for the removal of chlorophyll, resin and tannins, he was able to isolate ricinine in a crystalline form. He further reported the presence of large quantities of potassium nitrate in these leaves. The constitution of ricinine (I) was established through the efforts of Böttcher[4] and Späth and co-workers[5].



(I)



(II)

Castor leaves are usually fed to cattle and are believed to increase the yield of milk. They are further utilized as food material for the Eri-silk worms. The statement[6] has also been made that the leaves in the powder form could be made use of as an insecticide for repelling aphids, mosquitoes, white flies and rust mites. This led to the present investigation and the chemical examination has now been conducted systematically on lines similar to those used by us for the other plant insecticides and poisons.

The dried leaf powder was extracted with a series of solvents, light petroleum, ether, chloroform, acetone and alcohol in succession and each extract examined in detail for crystalline substances. Only ricinine could be isolated and no other substance. In the course of this study it has been found that ricinine is best isolated from the chloroform extract of the leaves.

It has now been obtained in a yield of 0·85% from this extract and identified by a study of its properties and preparation of ricininic acid (II). The extract did not yield any other crystalline substance either by treatment with alkali or solvents. The new method of isolation is easier and far better than that employed by Wayne[3] and it shows that the leaves form the most suitable material for isolating this compound.

Search for ricin in castor leaves, adopting the method employed in the case of castor seeds, showed that it is not present in them. Since no other crystalline substance or definite amorphous substance could be isolated, the insecticidal properties of the castor leaves are attributable only to ricinine. Ricinine is mildly bitter to the taste and irritant to the throat. It is toxic to mosquito larvæ when used in conjunction with soap and repellant to cockroaches.

Experimental

Isolation of ricinine from the leaves.—200 g. of the sun-dried leaves were powdered and extracted thrice with chloroform in the cold (500 c.c. portions each time) and the combined extracts distilled to recover the solvent. The residue (13·5 g.) was taken in ether (200 c.c.) when a crystalline solid began to separate out. After allowing it to stand overnight, it was filtered (R) and the filtrate was repeatedly extracted with 5% alkali. No crystalline substance could be isolated from the alkali extracts. The ether solution was washed free of alkali and evaporated down. This residue was worked up by treatment with various solvents but no definite substance could be separated.

Identification of ricinine.—The crystalline substance (R) obtained above was once again treated with a small quantity of ether, filtered, washed with ether and dried in air. Yield: 1·7 g. or 0·85%. It was pale greenish yellow in colour and melted at 196°. On recrystallisation from alcohol (colourless tablets) the melting point rose to 201°. It was soluble in common organic solvents and also in hot water and had all the properties of ricinine.

1·0 g. of the substance was saponified by heating with 100 c.c. of N/2 alcoholic potash for 3 hours, the solvent distilled off and the alkali solution filtered. It was then acidified and the solid that separated, was filtered and recrystallised from hot water (colourless needles and rods). It melted at 315°. Its properties agreed with those of ricininic acid. (Found: C, 56·3; H, 4·3. $C_7H_6O_2N_2$ requires C, 56·0; H, 4·0.)

The author thanks Prof. T. R. Seshadri for suggesting the work and for continued interest.

SUMMARY

Ricinine has been shown to be the only definite crystalline component of castor leaves. An easy method of isolating it from this convenient source is described. It is only feebly bitter and mildly toxic.

REFERENCES

1. Tuson .. *Trans. Chem. Soc.*, 1864, **17**, 195.
2. Stillmark .. *J. C. S. Abst.*, 1890, **A**, **1**, 535.
3. Wayne .. *Pharm. J. Trans.*, (3), **4**, 749.
4. Böttcher .. *Ber.*, 1918, **51**, 673.
5. Spath and co-workers .. *Monatsh.*, 1921, **42**, 251 ; *Ber.*, 1923, **56**, 880 and 2454.
6. .. Editorial, *Ind. and Eng. Chem.*, 1940, **32**, 35.