A STUDY OF THE CHEMICAL COMPONENTS OF THE ROOTS OF *DECALEPIS HAMILTONII* (MAKALI VERU)

Part II. A Note on the Preparation of Inositol by Solvent Extraction

BY P. BHASKARA RAMA MURTI

(From the Department of Chemical Technology, Andhra University, Waltair)

Received February 4, 1941

(Communicated by Prof. T. R. Seshadri)

IN a previous communication was described the general chemical composition of the roots of *Decalepis Hamiltonii*. From the petroleum extract of the dry roots the isolation of resinols, sterols, fatty acids and an essential oil consisting mostly of *para* methoxysalicylicaldehyde was reported. The subsequent alcoholic extract yielded saponins, tannins and resin acids besides small quantities of inactive inositol. It was also observed that the roots tasted sweet and that this sweetness was very marked in the dry samples. Larger quantities of inositol were therefore expected to be present in this plant than what the early experiments indicated. Hence experiments have been carried out with a view to evolve a new and efficient method of extraction and the results are embodied in this paper.

Inositol seems to be widely distributed both in the vegetable and animal kingdoms and is stated to be the starting material for the synthesis of more complex compounds. However its rôle in the animal and plant metabolism is still obscure. The presence of isomeric forms of inositol was noted in the leaves and water of some species of Cocos[2] and also in fishes.[3] The muscles, flesh and blood of many animals are stated to contain it either in a free or combined state. However these are poor and inconvenient sources. For its isolation in quantity, wheat bran has been employed and found to be not quite suitable.[4] Herein inositol exists as phytin and can be precipitated as the calcium or the barium salt. The precipitate is then hydrolysed with mineral acids at elevated temperatures to produce inositol. The processes involved are complex and the equipment required is rather elaborate. The yield is only 0·52%. Though the preparation has to follow the same lines, the steep waters of the starch industry have been found to be quite suitable as the starting material for the production of inositol. The yield in this case is reported to be 12·52% on the dry phytin precipitate.[5]

Monomethyl ethers of both *d* and *l* inositol occur in certain varieties of rubber latex and can be obtained from the serum after coagulation. The

isolation of quebrachitol (*l*-monomethyl ether of inositol) on a large scale[6] from this source involved many chemical engineering problems, and the yield of it was found to be about 20 pounds for 1,000 gallons of the serum processed.

Attempts have all along been made to make inositol cheap with a view to stimulate research and to employ it in industrial processes. It has been tried as a base for the manufacture of synthetic resins[7] and its hexanitrate has been patented as a detonating agent.[8] If available at a low cost inositol could be used in the preparation of bacteriological media. Weiss and Rice[9] have suggested that by the use of inositol it is easy to differentiate between various strains of bacteria.

When inositol occurs free, in order to isolate it, the alcohol or the aqueous extract of the material is treated with basic lead acetate and the precipitated lead compound is further worked up. This method has been found to be unsuitable in the case of the *Decalepis* roots. It was not only time-consuming but the yield was also poor being only 0·01% on the weight of the air-dried roots. After a number of trials it has been discovered that it is possible to get high yields by suitable extraction with solvents alone. With a view to effect the removal of waxy and other matter that are likely to interfere with the final isolation of inositol various solvents have been examined for preliminary extraction and light petroleum has been found to be the best. The procedure is simple and very satisfactory. From the wax-free residue of the root methyl alcohol readily extracts inositol in a fairly pure condition. In order to improve the efficiency of the extraction it is desirable to employ methyl alcohol containing a little water. The details of the method are given below:

2 Kg. of the air-dried root powder were exhaustively extracted with petroleum ether for about 20 hours in a Soxhlet extractor. This treatment removed the oily and fatty matter completely from the material and the last traces of the solvent were removed by blowing air through it. Subsequently it was extracted with methyl alcohol. The first five syphonings were coloured brown and hence the extract up to this stage was collected separately (A). Then the extraction was continued with the same solvent for 15 hours and during this process the addition of 10% of water to the solvent improved the extraction of inositol to a considerable degree. The extract was concentrated by distilling off the major bulk of the solvent and set aside undisturbed for a day. Inositol separated out at the bottom of the container in a well-defined crystalline form and was recovered by filtration. The crude product was dissolved in 50 c.c. of boiling water and the insoluble

impurities were removed by filtration. The clear solution was concentrated on a water-bath to syrupy consistency and treated with an excess of ethyl alcohol with stirring. Colourless feathery crystals soon began to separate out and the magma was set aside for a day when pure glistening crystals of inositol were obtained. They appeared as broad plates and rods under the microscope, melted at 221–22° and tasted sweet. When mixed with an authentic sample of inactive inositol there was no depression in the melting point and thus its identity was established. Finally the exhausted root powder was further extracted with rectified spirit but no inositol could be obtained from it, its extraction being complete with methyl alcohol. The coloured preliminary extract with methyl alcohol (A) also did not contain any appreciable amount of inositol but they contained saponins and tannins. It was observed that if they were not collected separately at the first stages and removed, inositol could not be obtained in the simple manner described above since the saponins and tannins present kept it in solution and rendered crystallisation very difficult.

The method promises to be capable of wide application in the case of other plant materials. The process of extraction is simple and rapid, the losses in the solvents are negligible and the yield of inositol is quite satisfactory being about 0·4% on the weight of the air-dried roots.

The author's thanks are due to Prof. T. R. Seshadri for his interest in this work.

REFERENCES

1. Murti and Seshadri .. *Proc. Ind. Acad. Sci.* (A), 1941, **13**, No. 2, 221.
2. Muller .. *T.*, 1907, 1768.
3. ———— .. *J.C.S.*, 1912, 2383.
4. Hoglan and Bartow .. *Ind. Eng. Chem.*, 1939, 750.
5. Bartow and Walker .. *Ibid.*, 1938, 302.
6. Rhodes .. *C.A.*, 1932, **26**, 4502.
7. Burns, R. and Imp. Chem. Ind., Ltd. *B.P.*, 1934, 408, 597.
8. Crater, W. .. *U.S. Patent*, 1934, **1**, 951, 595.
9. Weiss and Rice .. *J. Med. Research*, 1917, **35**, 403.