

THE MUCILAGE OF FENUGREEK (*TRIGONELLA FŒNUM GRÆCUM*).

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In a recent communication on the subject (*Biochem. J.*, 1932, **26**, 255) Daoud has described the mucilage of fenugreek as the silico-phosphoric ester of manno-galactan. His method of preparation consists in the addition of alcohol to an aqueous extract of fenugreek bran till the final concentration of alcohol reaches 30 per cent. The precipitate thus obtained is redissolved in water and reprecipitated by addition of alcohol.

The product so obtained does not however appear to have been subjected to any further purification. The quantitative relationships between phosphorus and silicon or between either of those elements and total carbohydrates have not been examined. The present authors and their associates have been engaged on the chemical examination of fenugreek for the past few years and the object of this communication is to place on record a few important observations on the purification and chemical composition of the mucilage.

Preparation :—The mucilage was first precipitated from the aqueous extract of bran in a manner similar to that described by Daoud (*loc. cit.*). The preparation thus obtained was dissolved in water and reprecipitated by alcohol, the process being repeated several times to obtain a pure product. It was observed that the ash content of the preparation decreased steadily on purification as may be seen from the analyses of successive precipitates (Table I).

TABLE I

Precipitate as obtained in order	Percentages		
	Ash	Phosphorus *	Nitrogen
1	1.57	0.24	...
2	0.68	0.07	0.53
3	trace	0.02	0.11

* According to the micro-method of Pregl.

The results indicate that one or more compounds containing nitrogen and phosphorus occur as impurities in association with the mucilage.

Electro-dialysis.—In order to eliminate crystalloidal impurities mechanically carried down by the mucilage, an aqueous extract of the mucilage (2nd precipitation) was subjected to electro-dialysis using the main laboratory supply (110 D.C.) as the source of current. Three thick arc carbons served as anode and a platinum strip ($1\frac{1}{2}$ sq. in.) was used as cathode. The liquid in the middle cell was periodically stirred, and the dialysis continued for a period of 4 days, when the conductivity reached almost that of distilled water. The product obtained on precipitating the dialysed extract contained the same percentages of phosphorus and nitrogen as the undialysed one, thereby showing that the impurities were not crystalloids.

Saturation with Magnesium sulphate.—In view of the previous observations of Sreenivasa Rao and Sreenivasaya that phosphorus is associated with the water-soluble protein of fenugreek (*J. Indian Inst. Sci.*, 1932, **15A**, 122), further purification of the mucilage was directed towards obtaining a protein-free product. An aqueous solution of the mucilage was saturated with magnesium sulphate and the precipitate thus obtained separated by centrifuging. The mucilage was precipitated from the centrifugate by addition of alcohol. The precipitate was washed successively with 50 per cent. alcohol, absolute alcohol and finally, ether. The white product thus obtained possessed all the properties of the original mucilage but was entirely free from both phosphorus and nitrogen.

The above observations show clearly that the mucilage itself does not contain any phosphorus or nitrogen but occurs associated with one or more impurities which are either proteins or some other types of compounds that can be removed by protein precipitants.

Removal of impurity by treatment with boiling alcohol.—An aqueous solution of the crude mucilage was treated with alcohol to a concentration of 30 per cent. The suspension thus obtained was refluxed over a boiling water-bath for 8 hours and allowed to stand at the room temperature for 48 hours. The precipitate was then separated, extracted with water and the mucilage precipitated from the aqueous extract with alcohol. Analysis of the precipitate showed that its phosphorus content was almost negligible (0.001 per cent.) thus lending further support to the suggestion that the impurity resembled proteins in behaviour and was denatured and coagulated by boiling alcohol.

Hydrolysis of the mucilage.—On hydrolysis with acids, the mucilage yielded mannose and galactose in equal proportions as has been reported by previous workers. Elementary analysis of the purified product gave the following percentages.—C, 44.3; H, 6.2; and O, 49.5. The results would thus show that the mucilage is a mannogalactan with the empirical formula, $C_6H_{10}O_5$.

SUMMARY.

The mucilage from fenugreek is usually associated with a nitrogenous impurity which can be removed either by repeated dissolution in water and reprecipitation with alcohol or by saturation with magnesium sulphate. The purified mucilage is a mannogalactan.

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