

Vitamin C Content of Some Indian Plant Materials.

IN the course of a search for a suitable raw material for the preparation of ascorbic acid for the study of its action on catheptic proteases, we have examined a large number of indigenous fruits and vegetables for their content of this vitamin, using Tillmans' method of titration against 2:6 dichlorophenol-indophenol as modified by Harris¹ and by Emmerie and Eekelen.² Some of the results are given in the following table; parallel titrations against iodine are also included, the reducing power being expressed as ascorbic acid.

The experimental findings not only show the existence of strikingly rich sources of vitamin C among materials hitherto not examined, but also throw interesting light on the variations in the conditions in which it exists in plants. Thus the four materials, Nos. 2—5, in the table below give extracts which undergo oxidation very readily as do solutions of pure ascorbic acid. This tendency to rapid oxidation runs parallel with the absence of any considerable amount of other reducing material in the extracts, as shown both by the proximity of the values obtained by titration against the indicator and against iodine, as well as by the small fall in these titres after mercury

TABLE I.

Material	mg. of ascorbic acid per gm. of fresh material			
	Initial Value		Value after mercury treatment	
	Indicator	Iodine	Indicator	Iodine
1 The Indian gooseberry— <i>Phyllanthus emblica</i> Linn. ..	4.13	..	3.65	..
2 Drumstick— <i>Moringa oleifera</i> Lamk. Leaf ..	2.16	2.24	1.92	1.99
3 " " " Pod ..	1.91	2.10	1.91	2.10
4 <i>Sesbania grandiflora</i> , pers. Leaf ..	1.84	2.02	1.64	1.95
5 Chilli— <i>Capsicum frutescens</i> , Linn. Green ..	1.0	1.44	No precipitate with mercury	
" " " Ripe ..	1.67	2.17		
6 Cashew apple— <i>Anacardium occidentale</i> , Linn. Juice (mg. per ml.) ..	2.03	2.86	1.7	2.05
7 Custard apple— <i>Anona squamosa</i> , Linn. ..	1.03
8 Ber, <i>Zizyphus jujuba</i> Jus. ..	0.84
9 Orange (Sathukudi) ..	0.63	0.70

treatment of the extracts. Cashew apple and Indian gooseberry, on the other hand, give extracts of considerable stability, the latter in particular retaining its titre undiminished even after a week's standing. In these materials the difference between iodine and indicator titres are appreciable, and treatment with mercury causes the removal of a large amount of reducing material. After precipitation with mercury the extracts become readily auto-oxidisable, so that it would seem that originally they contained a substance or substances protecting ascorbic acid from oxidation and precipitable by mercury salts. It was further observed that lead acetate and trichloro-acetic acid were also capable of removing the natural anti-oxidant present in these juices. The nature of these protective (and perhaps interfering) substances is still under investigation but it was thought advisable to publish this short account of the findings already made,

especially in view of the announcement by Mawson³ of the protective action of animal-tissue extracts on ascorbic acid.

Another point to which attention may be drawn is that the ascorbic acid content of chilli, as well as of other fruits tried, attained a maximum at a certain stage of ripeness, the value being lower both in the unripe as well as in the over-ripe fruits.

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¹ Harris and Ray, *Biochem. J.*, 1933, 27, 303; Birch, Harris and Ray, *Ibid.*, 590.

² Emmerie and Eekelen, *Biochem. J.*, 1934, 28, 1158.

³ Mawson, *Biochem. J.*, 1935, 29, 569.