SOME STUDIES ON VITAMINS

Thesis
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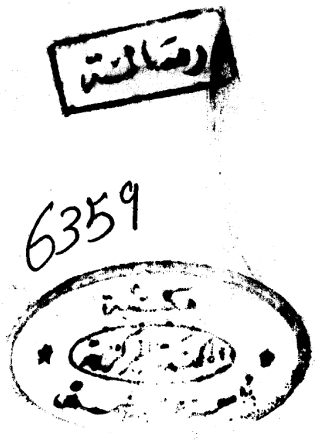

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PUBLISHED WORK

1- Evaluation of Ascorbic Acid of Certain Foodstuffs, Bulletin De L'Academie Polonaise Des Sciences, serie des sciences biologiques, CL II, Vol. XVIII, No. 6, 301, 1970.

2- A study on the Vitamin "C" Content of Solanaceae Edible Vegetables, Ein-Shams Medical J.; Accepted for Publication.

3- A study on the Vitamin "C" Content of Rosaceae Edible Fruits, Ein-Shams Medical J.; Accepted for Publication

4- Evaluation of Local Citrus Fruits as a Source of Vitamin "C"., Ein-Shams Medical J.; In Press.

5- A study on the Vitamin "C" Content of Vegetable Salad Constituents, Ein-Shams Medical J.; Accepted for Publication.

6- The Vitamin "C" Content of Some Egyptian Popular Foodstuffs, Ein-Shams Medical J.; Accepted for Publication.

7- Comparative Study on the Determination of Vitamin "C" by Oxidimetric Methods, Al-Azhar Medical Journal; In Press.

8- Ascorbimetry: The Microdetermination of Potassium Permanganate, Al-Azhar Medical Journal; Accepted for Publication.

9- Ascorbimetry: The Microdetermination of Ferricyanide in Presence of Ferrocyanide., Al-Azhar Medical Journal; Accepted for Publication.

10- Ascorbimetry: The Determination of Iodine Value of Certain Edible Oils and Fats, Al-Azhar Medical Journal; In Press.

11- A New Titrimetric Method for the Determination of Vitamin "C", Analytical Biochemistry (U.S.A.), 52, 245, 1973.

SUMMARY

PART I

1) A total of 50 samples of each of 20 types of foodstuffs was collected at random from the market and analysed for the ascorbic acid content. Certain Egyptian foodstuffs consumable in the raw state was studied. Moreover the ascorbic acid content of consumable pickles and some edible fruits was determined. The vitamin "C" content of certain raw and canned foodstuffs was evaluated as well. Various vegetables commonly consumed after being cooked were investigated when crude and after cooking.

The ascorbic acid content of various foodstuffs under investigation was determined by the N-bromosuccinimide method.

2) A study on the ascorbic acid content of certain Solanaceae edible vegetables is reported. The evaluation of Hungarian sweet paprika "yellow" experimentally cultivated under native environment and winter cherry with regard to the ascorbic acid content seems to be unknown previously. Statistical analysis of the data gained shows the maximum, minimum, mean, standard deviation, coefficient of variation,

mean, standard error and confidence intervals for vitamin "C" at both 95% and 99% levels, respectively. Frequency distribution of ascorbic acid content of each vegetable and Tukey's table are also listed. There is a marked variability in the ascorbic acid content of Solanaceae members and even within varieties of the same members including green pepper and sweet yellow paprika.

3) Evaluation of the ascorbic acid content of Rosaceae edible fruits is reported. Statistical analysis of the data gained is shown. It is obvious that Rosaceae edible fruits may be classified into four groups according to their ascorbic acid content. There is notable variability in the ascorbic acid content between individuals of the same type of fruit. On the whole, edible fruits of Rosaceae family cannot be considered as rich sources of vitamin "C".

4) A study on the evaluation of the ascorbic acid content of various local citrus fruits is reported. Citrus fruits could be classified into three groups with regard to vitamin "C" content.

Statistical analysis of the data gained shows the maximum, minimum, mean, standard deviation (S.D.),

coefficient of variation (C.V.), mean standard error and confidence intervals of vitamin "C" content at 95% and 99.9% levels. Frequency distribution of vitamin "C" content and Tukey's table of mean comparisons in pairs of citrus fruits are also shown.

5) A study on the evaluation of the vitamin "C" content of vegetable salad constituents is reported. Statistical analysis of the data gained shows the maximum, minimum, mean, standard deviation, coefficient of variation, mean standard error and confidence interval of vitamin "C" content at both 95 and 99.9% levels. Frequency tables for the vitamin "C" content of each member and Tukey's table for comparisons of mean content of each member in pairs are also recorded.

The present study shows that there is a notable variation between individual units of the vegetable salad members which are poor in vitamin "C" than members of high vitamin "C" content, showing much less variability from one observation to another of individual units.

6) [illegible] samples of each of [illegible] Egyptian foodstuffs analysed for the vitamin "C" content is reported. Statistical analysis of the data shows the maximum, minimum, mean, standard deviation, coefficient of variation and the confidence intervals at both 95 and 99.9% levels. Frequency distribution tables are also shown.

It is notable that sycamore fig is a richer source of vitamin "C" than common fig, although both fruits belong to the same family Moraceae. The ascorbic acid content of sycamore fig and common cultivated radish root is reported for the first time. The present findings show that common radish leaves contain more vitamin "C" than common radish roots, as evidenced by the previously reported value of 80 mg %.

7) A comparative study on the simultaneous oxidation of L-ascorbic acid by such oxidimetric methods as permanganate, N-bromosuccinimide and ferricyanide methods is done. The difference of the results of vit. C content obtained by these oxidimetric methods on the same sample of each foodstuff does not exceed ± 2%. It seems that the permanganate method is not suitable to determine the vitamin "C" content of urine since the error is notably high.

8) An ascorbimetric method is described for the micro-determination of potassium permanganate. The mechanism of the reaction is discussed. The proposed method surpasses the previously accepted oxalic acid method in accuracy and does not necessitate heating. The experimental error does not exceed ± 2%. Comparative analysis of potassium permanganate by the proposed method and the previously accepted oxalic acid method is reported.

9) A titrimetric method for the microdetermination of potassium ferricyanide is described. The mechanism of the reaction is discussed. The proposed method is easy, rapid and so sensitive as to determine quantities as low as 50 ug of potassium ferricyanide. The experimental error does not exceed ± 2%. The method is suitable to determine ferricyanide even in the presence of ferrocyanide .

10) The iodine value of certain edible oils and fats can be determined by Wij's method using standard L-ascorbic acid solution instead of standard

[illegible] solution.
[illegible]
of [illegible] remarkable reducing property and [illegible] lower
molecular weight.

PART III

11) A new titrimetric method for the determination of L-ascorbic acid with standard cupric salt solution, e.g., copper sulphate or copper acetate is described. The mechanism of the reaction is discussed. The method is simple, rapid and sensitive to determine amounts as low as 25 ug of L-ascorbic acid. The experimental error does not exceed ± 2%. Comparative analysis of L-ascorbic acid by the proposed method and the N-bromosuccinimide method is reported. The determination of L-ascorbic acid content of certain pharmaceuticals and foodstuffs is shown.

REVIEW OF LITERATURE

The quantitative determination of L-ascorbic acid still represents a major problem especially when present with other components. Furthermore some degradation products of L-ascorbic acid cannot be differentiated from the parent compound by specific methods of assay. This may explain the falacies and contradictory results of investigations on the stability of this vitamin. Hence, it seems necessary to ascertain at first a specific method of assay for this vitamin before approaching the stability problem properly. Previous methods for the determination of L-ascorbic acid are numerous and include various methods as is listed below:

I. Oxidimetric Methods.
II. Spectroscopical and Spectrophotometric Methods.
III. Polarographic Methods.
IV. Chromatographic Methods. V. Colorimetric Methods.

I. Oxidimetric Methods

These oxidimetric methods are based on the oxidation-reduction behaviour of L-ascorbic acid. Such methods may be summarised as follows :

.. Methylene Blue Method

This method of determination was proposed by Martin and Bunsignore (1934). L-ascorbic acid is extracted with trichloroacetic acid solution, then titrated with a standard solution of methylene blue. ~~in the presence of sodium citrate, bicarbonate and thiosulphate~~. Later on Sabalitschka and Priem reported on the inadequancy of this method for the determination of L-ascorbic acid in hydrated vegetables (1941).

2. 2,6 Dichlorophenol-indophenol Method

Tillmans et al (1928;1932) were the first to use the indophenol method for the determination of L-ascorbic acid in plant food stuffs. Strohecker and Vauble (1936) developed a modified technique for extraction of L-ascorbic acid prior to its determination. The indophenol method was adopted as a recognised method for the determination of L-ascorbic acid in fruits and vegetable juices (Official Methods of Analysis, 9th Edn., Association of Agricultural Chemists, Washington, D.C., 1965) biological materials (Harris and Ray 1935; Harris and Olliver,1942) and in pharmaceutical