DECLARATION

THE WORK DESCRIBED IN THIS THESIS WAS CARRIED OUT, BY ME, AT THE LABORATORY SERVICES DIVISION, SRI LANKA STANDARDS INSTITUTION, UNDER THE SUPERVISION OF DR. A.H.de O.BAMUNUARACHCHI AND DR. I.K.PERERA AND A REPORT ON THIS HAS NOT BEEN SUBMITTED TO ANY UNIVERSITY FOR ANOTHER DEGREE.

S. Wijesekera

June 1989

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STUDY OF COMPOSITIONAL DATA AND THE DEVELOPMENT OF METHODS TO DETERMINE THE FRUIT CONTENT OF PROCESSED FRUIT PRODUCTS

BY

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ABSTRACT

This dissertation discusses methods developed, for the determination of fruit content in processed fruit products, such as jams and cordials. The work done here is characterized, by the application of a large number of chemical analytical techniques.

The introduction explains, the importance of this type of study. In chapter 2, where the main emphasis is on the review of previous investigations carried out on processed fruit products, details of the different fruits used and the methods employed to manufacture jams and cordials, on an industrial scale, are also presented. In addition, it includes a brief description, of most of the fruit products available in the market, and the different theories put forward to explain the setting of jam. Lastly, methods tried out in the past by other investigators, who worked on developing methods, to determine the fruit content in processed fruit products are reviewed.

The experimental chapter describes, how the samples of fruits were collected and pulped, and the methods used in the laboratory, to prepare the fruit products. This section also describes, the different parameters, that the pulp and the product were analysed for, and how they were determined.

The results obtained, on analysing the pulp samples and their corresponding processed products, are

described in the next chapter.

Some selected methods, which may be of possible value for the determination of fruit content, based on,

(a) The content of total fatty acids,

(b) The content of total polyphenolics,

(c) The determination of Lead number, are considered first.

In the above methods, the basic definition of the fruit content which is :

$$\frac{\text{Percentage of constituent A in sample}}{\text{Percentage of constituent A in pulp}} \times 100$$

was used.

Methods using fatty acid content and polyphenolic content, were tried out, only with the laboratory made samples, and were found to give reasonably good results. However, to apply these methods to determine the fruit content of commercial samples, it would be necessary to analyse the corresponding pulp from which they were made, for the particular parameter in question.

The "Lead number" method was observed to give good agreement for the laboratory made samples, but not for the commercial samples. One reason may be due to citric acid added during jam manufacture in industry, which interferes with the results obtained. It was

found that the formula used by Bonney,[1]

$$x = \frac{5790\ B}{AD - BC}$$

agreed well, for the laboratory made jam samples.

The AOAC method[2,47] where,

$$\text{the fruit content} = \frac{100 - M}{100 - F}$$

agreed only for simple fruit-sugar[47] mixtures and not for jams and cordials to which are added other ingredients.

Next samples collected from different geographic areas were considered. It was noted that wide variations were observed in the concentrations of most of the constituents of the pulp while in the laboratory made jam samples the concentrations of almost all parameters reduced as expected in proportion to the amount of pulp used in making them.

Depending on the coefficient of variability (α), some parameters were selected as index constituents. They are, total nitrogen, total phosphorous, total ash, and total water insoluble solids. It was observed, that when pineapple, passion fruit, woodapple and mango jams were analysed along with the pulp samples, the figures obtained for the index constituents, based on pulp results, deviated marginally from the experimental values obtained.

The changes that occur in the magnitude of the index constituents in the processed fruit products, when the ingredient contributions were considered are also discussed. In the case of jams the calculated results based on the Nehring and Klinger model, deviated from the experimental results obtained. In fact, there was no agreement between the experimental and the calculated values obtained, when ingredient contributions were considered.

Pineapple jam was selected as the first product, followed by passion fruit, woodapple, mango and lemon. The reasons, for selecting only some parameters as index constituents, are discussed here in detail.

Commercial samples were collected for each product made, and they were also analysed for these index constituents. It was found, that they too gave, a high α, illustrating the difficulties in selecting parameters, to determine the fruit content.

The inference drawn on the results of pulp and cordial samples are next presented. Even here a similar observation as for jams were noted.

Finally, a simple multivariate statistical analysis based on four index constituents were tried out, on the experimental results obtained, for pineapple jam made in the laboratory. The results obtained was found to be in good agreement for the

laboratory made jam samples, (48% being the true fruit content and the average obtained for the laboratory made samples is 40%) confirming its reliability. This method was then extended to the commercial samples to determine their fruit content, and their results indicated that they fall within the acceptable range, which is about 40% or more in the case of jams.

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