

## Introduction

" These observations are, I trust, true on the whole; although I do not pretend they are perfectly void of mistake, or that a more nice observer might not make additions, since subjects of this kind are inexhaustible."

Gilbert White.

The purpose of this investigation was to study the effect produced on the amino acid, ash and sugar levels in sugar cane juice by the application of different amounts of nitrogen, phosphorus and potassium to the growing plant. A further point of interest was to discover whether there was an interrelationship between the amount of amino acid and the reducing sugar, sucrose and total ash contents of sugar cane juice.

Although the sugar and ash content of cane juice has been studied extensively, the amino acids have been rather neglected. This is probably due to the fact that they are very minor constituents of sugar cane juice and they were therefore difficult to analyse accurately. Nevertheless, the amino acids must play an important part in the biology of sugar cane because proteins, which are built up from amino acids, are the substances which promote and control many of the manifold activities of the plant. It has been discovered that viruses, which can seriously affect sugar cane, are essentially composed of protein materials. Hence it is possible that the amino acid status of the plant is related to its resistance or susceptibility to attack by virus diseases.

Amino acids might also be important on the technological side in affecting the colour and degree of crystallization of the syrups obtained in the factory (Pratt & Wiggins 1949). Thus it is possible that the amino acid content of the juice may affect the yield of the sugar ultimately obtained. It is known that very high concentrations of nitrogen affect cane quality (Borden 1945) and this effect could be due to a rise in the amount of certain nitrogenous compounds, such as amino acids, in the cane. Amino acids may also be of use biologically as indicators of maturity, nutrient deficiency or, as has been mentioned above, susceptibility or resistance of the plant to virus and other diseases.

It is possible that amino acids could be extracted for use in food manufacture. Glutamic acid, which has a strong meaty flavour, has been extracted from sugar beet molasses and has been used on a large scale in the flavouring of tinned foods in the U. S. A. (Van Hook 1949). If they could be extracted in economic quantities the amino acids might be of use for balancing animal diets. Lysine, for example, is of great importance as a growth stimulant and might be used to supplement chicken rations (Gerricke 1945).

Some preliminary work of interest has shown that there might be a relationship between the amino acid and sucrose level in sugar cane juice. It has been found that during the drought period the amino acid content of the sugar cane juice rises precipitantly and this rise is followed some weeks later by a rise of the sucrose level in the plant (Williams 1952). If these two phenomena are connected it may be possible to use amino acids as a means of strengthening the sugar content of the cane at harvest time.

The experimental work described in this dissertation has been divided into six sections. The first section describes the field layout and the methods of sampling which have been employed. The second section deals with the analysis of the samples of sugar cane for amino acids and it has been subdivided into two sections; one deals with the quantitative aspect of the amino acid content and the other with the qualitative aspect. The next three sections discuss the results of the analyses of sucrose, reducing sugars and sulphated ash respectively. The sixth section describes a further trial which the author has laid down apart from the main experiment in order to discover the effects of irrigation during the dry season on the amino acid level in sugar cane. In the seventh section a comparison is drawn between the analytical results from the main experiment and the plot yields.

A short review of the relevant literature on the subject is given at the beginning of each section. The methods of chemical analysis used and the details of the statistical analysis have been included as appendices in order that the main argument outlined in the dissertation is maintained without interruption.