

1.0 INTRODUCTION

Vinegar has long been appreciated as an important condiment and preservative for as long as man has been able to practice the arts of brewing and wine making (Vaughn, 1954). It is not surprising therefore, that it is mentioned in early classical literature, for example, the Bible (Matt. 27:48). In fact, it now seems as if vinegar was the fate of the wine that Noah took with him into the ark and failed to consume in due course (Mayer, 1963).

Vinegar may be produced from a variety of raw materials, the main requirement being a satisfactory economic source of ethanol. The usual raw materials used in its preparation are fruits, wine, molasses, malt and distilled alcohol. Vinegar made from these products are usually designated as wine, cider, malt, fruit vinegar and alcohol vinegar (white distilled vinegar) (Ebner, 1982). Other 'speciality' types such as seasoned vinegars are prepared by soaking vegetable seasoning agents, such as tarragon leaves, onion, garlic, peppers, or various spices in vinegar. These are formulated to lend an unusual flavour dimension to foods and are used primarily by consumers (Dziezak, 1990).

The making of vinegar from sugar or sugar containing raw materials entails two separate fermentation stages. In the first stage, sugars are converted into ethanol by the action of yeast. While, in the second stage bacteria oxidise the alcohol to acetic acid, the compound which gives vinegar its characteristically sharp taste (Adams, 1978).

The acetic acid content determines the strength of vinegar,

which is expressed as grain strength. Grain strength is equal to ten times the acetic acid content. For example, a 60-grain vinegar contains 6 percent (w/v) acetic acid, while a 40-grain vinegar has 4 per cent acetic acid. Concentrated vinegar can be distilled to the desired strength during processing (Cruess, 1966).

Where legal standards exist, the minimum acetic acid content of a vinegar is normally set at 4-grains per 100 cm³ (4% w/v). However, with the EEC (European Economic Community), it is mandatory that wine vinegar should contain 6 percent acetic acid (Adams, 1980). The acetic acid content of local vinegar is set at a minimum of 4 percent acetic acid (Food and Drugs Act & Regulations, 1960 Trinidad & Tobago).

Practically any tropical fruit that contains more than 9 percent sugar can be converted into a vinegar which will contain more than the legal minimum of 4-grains acetic acid per 100 cm³ (Cruess, 1966). Fruits of lower sugar content can still be used but the sugar content of the extract must be increased by the addition of sugar in some form e.g. molasses, raw sugar or syrup (Adams, 1980). Vinegar has been made from tropical fruits such as bananas (von Loesecke, 1929, Maldonado et al., 1975 and Adams, 1980); watermelon (Khattak, et al., 1965a); mangoes (Beerh et al., 1976); pineapple (Satyavati et al., 1972), orange, cashew fruit and tamarind (Maldonado et al; 1975). Yet, very little attention has been given to the local production of vinegar from these fruits. It is with this view in mind that bananas were considered worthy of study.

Compared to other fresh fruits, bananas contain the highest sugar concentration (approaching 20%) and would therefore be an ideal

substrate for vinegar production (Forysth, 1980). In addition, bananas are a major export crop in five Caribbean countries, namely Jamaica, Grenada, Dominica, St. Vincent and St. Lucia. As a result, large portions of reject bananas are readily available at centralised packing stations prior to shipment. For instance, in Jamaica in 1991, a total of 75,290 tons of bananas were produced for the export market and of this 15,200 tons were rejected (All Island Banana Growers Association Ltd., 1990-1991).

These fruits although of satisfactory eating quality are unsuitable for export because they are undersized, misshapen, or disfigured by skin blemishes. The manufacture of banana vinegar could be an important outlet for these reject bananas. Also, world production of bananas has expanded at a greater rate than consumption of the fresh fruit and import markets have become increasingly competitive. Therefore, producers are finding it more and more difficult to dispose of their whole output profitably on the fresh fruit market (Wilson, 1975). Again production of banana vinegar could be a possible diversion for such surplus. Statistical data in table 1 shows that Trinidad is capable of meeting its local requirement for vinegar as shown by the amount exported (Central Statistical Office, 1990-1991).

Jamaica on the other hand, had to meet its local requirements through importation for the period 1989 and 1990, but not in 1987-1988 (Statistical Institute of Jamaica, 1990-1991), which shows an increase in demand for the product. The production of vinegar from bananas could provide a means of substituting local product for expensive imports, thus conserving badly needed foreign exchange.