MICROBIOLOGICAL STUDIES ON SOME SOFT DRINKS IN EGYPT

By

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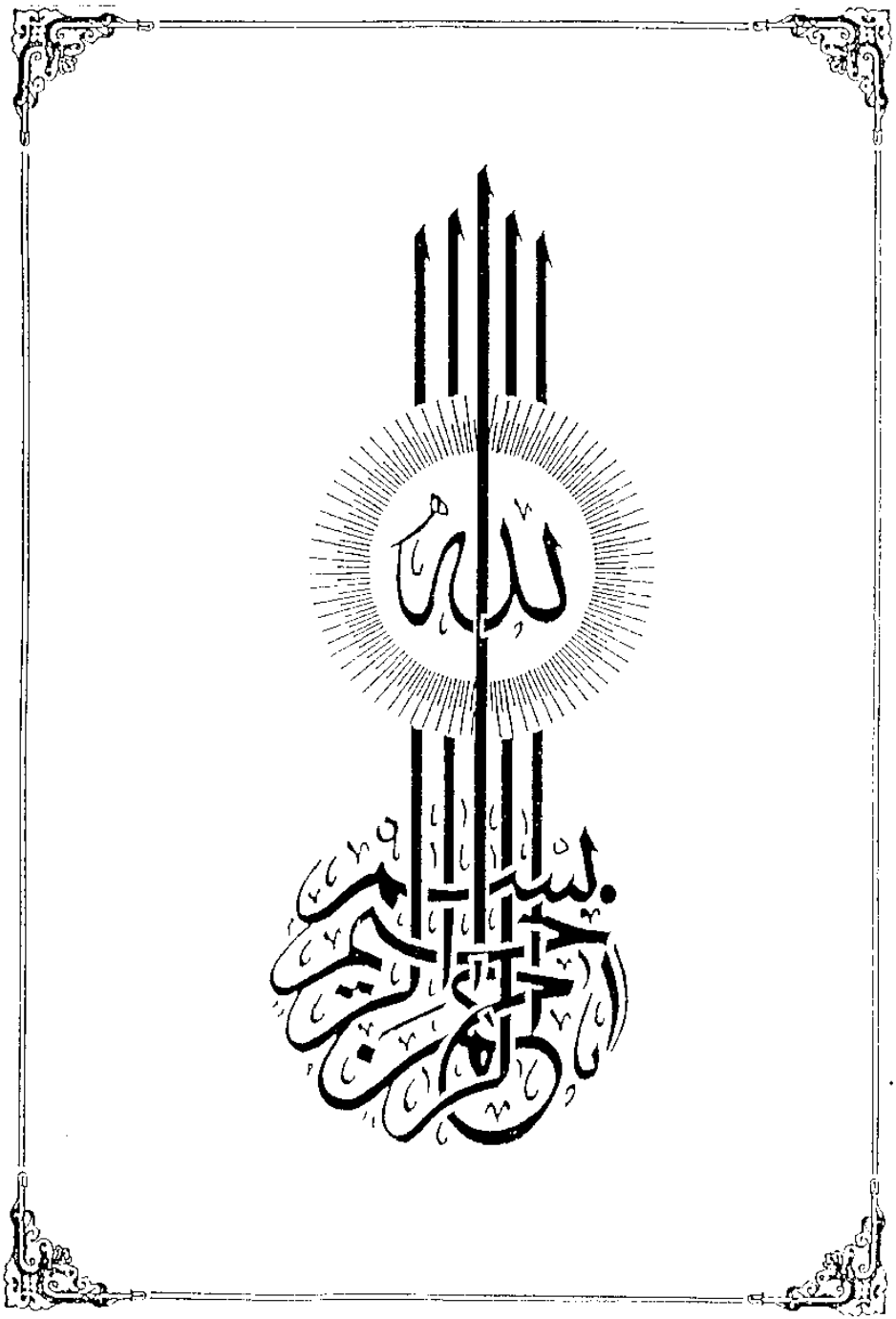

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INTRODUCTION

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It is recorded that the anual production of carbonated soft drinks in Egypt achieved 4.8 billion bottles (1986 - 1987). Since these products do not require thermal processing, microbial testing of raw materials and plant sanitation practice are extremely important. Because of the huge size of production, any microbial pollution of the product can cause serious economic or public health problems.

Therefore, the aim of the present study was to detect the sources of spoiling or pathogenic microorganisms during soft drink processing. In addition, the microbial quality and storage stability of different types of soft drinks were investigated. The longevity of some inoculated pathogenic and spoiling organisms in soft drink was also tested. Furthermore, the effect of frequent opening of screw capped large size bottles on their microbial content was studied.

The main part of this study was carried out on the production line of Pepsi-cola factory (Ghamrah, Cairo) during nine successive months. Other tested products were collected from the market. They included seven different types namely Coca-cola, Mirinda, Schweppes, Shani, Pepsi-cola, Spirospathis and Pepsi (Large size bottle).

It should be noticed that the total number of tested samples of the different types of soft drinks in the present study did not exceed 800 bottles. So, obtained results, particularly those concerning with the highly contaminated samples or the presence of fecal coliform in some samples should not be generalized to the overall production of certain type before further emphasis using much higher number of samples.

REVIEW OF LITERATURE

1. REVIEW OF LITERATURE

1.1. Carbonated soft drinks ingredients and characteristics:

Carbonated soft drinks are beverages made by absorbing carbon dioxide in potable water containing appropriate flavors and colors. The amount of carbon dioxide is not less than that which will be absorbed by the beverage at a pressure of 1 atm and a temperature of 15°C. In addition, the U.S Food and Drug Administration standard of identity for carbonated soft drinks specifies the ingredients that may be used, such as sweeteners, flavoring, coloring and acidification agents, foaming and emulsifying agents, stabilizing or viscosity- producing agents, caffeine and chemical preservatives.

The inter-related environmental factors that determine susceptibility of a soft drink product to microbial spoilage are intrinsic and extrinsic. Intrinsic factors are derived from the nature of the product and its formulation. These internal factors are not easy to change. On the other hand extrinsic factors are variables and introduced during processing, packaging, distribution and storage. They should be easier to change and control. The best known intrinsic factors are water activity, available nutrients and inhibitors, acidity, carbonation, redox potential and preservative content. Extrinsic factors include initial microbial load of

raw materials, filteration, chemical treatments heat processing, cleanliness of workers, pipes and equipments, plant hygiene, packaging materials and storage conditions.

1.1.1. Sweeteners :

Buchaman (1939) mentioned that the syrup for carbonated soft drinks could be prepared from sucrose or dextrose in water with a final pH not higher than 7. In addition, Anon (1970b) reported that sucrose, dextrose, liquid glucose, invert sugar and fructose are the main sugars used in the manufacture of carbonated soft drinks.

Przem (1974) recommended that sugar used in carbonated soft drinks should have a purity of 99.85-99.9% and ash content of 0.01-0.015%.

The sugar content is usually variable according to the type of soft drink, for example, Silliker et al (1980) gave two examples of the sugar content for cola drink and orange drink, which were 84.1 g sucrose (powder) and 141.0 g sucrose syrup (67^{o} Brix) per Kg drink, respectively.

Woodroof and Phillips (1981) noted that 7-14% sugar is used for soft drinks manufacture. They also reported that traces of neutral salts such as NaCl, Mg SO_4, $CaCl_2$ and KH_2PO_4 tended to increase inversion. In contrast, alkaline salts such as $NaHCO_3$, Na and K carbonate, minimize inversion,

while nitrogen compounds (ammonium salts, amino acids, and amides) increase the inversion.

Walker and Ayres (1970) reported that correctly stored, pure dry sugar was microbiologically stable but liquid sugar was more susceptible to spoilage during its distribution and storage. They added that osmotolerant yeasts and bacteria might be present were often inside sugar residues on the plant.

Tilbury (1976 & 1980) observed that when osmophilic yeasts grew in invert sugar they fermented fructose in preference to glucose and were thus preferential fructophiles.

1.1.2. Water :

Water makes up 88-90% of the total volume of carbonated soft drinks. Most bottles used further processes to purify the water using in the soft drinks manufacture. This is done to ensure that all bacteria are killed; to eliminate all substances in the water that may adversely effect the appearance, taste and stability of the finished product, to adjust the pH to the desired level and to assure consistency of water quality throughout the year, since municipal water quality may fluctuate.

Duncan and Colmer (1946) and Jacobs (1959) reported that using water containing organic and suspended matter is