CHEMICAL CHANGES IN SOME SWEET POTATO VARIETIES AND ITS EFFECT ON THE QUALITY OF BREAD

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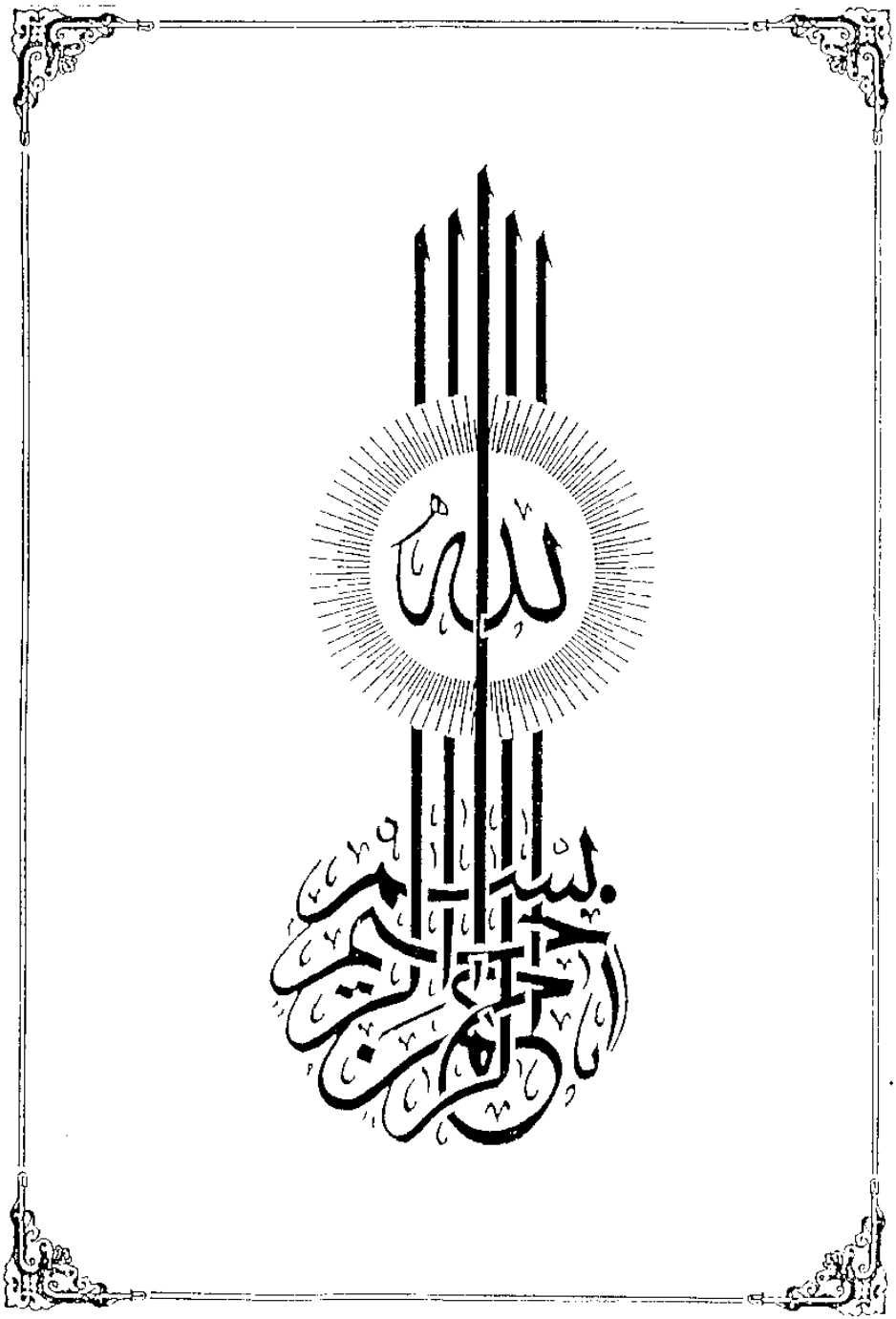

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C O N T E N T S

INTRODUCTION

In the convolvulaceae family, the sweet potato (Ipomoea Batatas Lam.) is a crop which has long been a very important food crop throughout the tropical, sub-tropical, and at least half of the temperate regions. It is regarded as a crop that can be produced without a great deal of effort.

Food value, easy cultivation and good keeping quality have made sweet potatoes an important food crop. Apart from its value as a food crop, it is receiving increasing attention as feed for livestock, and may also have possibilities as a source of alcohol, starch and flour. The sweet potato rates with the Irish potato in content of vitamins B and C (Gaafar, 1952) but is much richer in vitamin A (Sherman, 1945).

Though sweet potatoes are a popular article of food in Egypt, from a commercial standpoint, this crop has not been developed to its fullest extent. It occupied nearly 9095 faddan producing 84,364 tons with an average of 9.2 tons per faddan (1972).

Egypt [illegible] countries [illegible] consumes [illegible] quantities of cereals in the diet as shown in the following table which gives the total consumption of cereals per capita per year in some countries.

Country	Yearly consumption of cereals	Daily calories		
		from cereals	from food	cereal food
	kg.	cal.	cal.	%
Jugoslavia	186.6	1822	2525	72.1
U.A.R.	212.8	2075	2901	71.5
Italy	155.0	1490	2530	58.8
France	120.4	1154	2850	40.4
Germany	97.7	936	2840	33.0
Norway	103.8	996	3120	31.9
Canada	77.5	775	3115	24.9
U.S.A.	71.9	718	3090	23.3

(Per food supply per capita calories F.A.O., 1955)

As the total production of wheat in Egypt cannot fulfil the requirements, a great portion of wheat or flour has to be imported from foreign countries.

[illegible] flour is used [illegible] for the production of bread.

It has been found by several investigators, in India (Singh et al., 1953), in Peru (Faunce, 1960) and in the West Indies (Sammy, 1970) that sweet potato flour can be successfully added to wheat flour in making bread. In this way the importation of wheat from abroad can be restricted and consequently hard currency can be saved. Such a possibility is worthy of study, especially as sweet potato thrive best on sandy loam soils but can be grown on a wide range of soils. Furthermore sweet potato is adapted to regions having a growing period of at least four months with warm days and nights, plenty of sunshine and moderate rainfull. A large yield can be therefore secured when sweet potato is grown in Egypt. It was thought to be of interest to study the chemical changes that occurred in some sweet potato varieties during different methods of storage and the use of its extracted flour as a supplement for wheat flour in breadmaking.

REVIEW OF LITERATURE

The literature dealing specially with problems bearing a direct relation to the object of the present investigation is scarce. This review will therefore discuss in detail all available work related to:

a) Effect of different storage methods on the weight loss, dry matter content, sprouting and decay per cent of some sweet potato varieties.

b) Carbohydrate changes that occurred in some sweet potato varieties during storage.

c) Use of sweet potato flour as a partial substitute for wheat flour and its chemical and physical properties.

2.1. Effect of different storage methods on the weight loss, dry matter content, sprouting and decay per cent of some sweet potato varieties:

2.1.1. Storage temperature.

Thompson and Beattie (1922) found that 50-55° F was a better storage temperature for sweet potatoes than 55-60° F. or 50-55° F., though the differences were small,

[illegible] because of [illegible] to thrive at [illegible] temperatures. Internal physiological breakdown was likely to occur under prolonged exposure to temperatures under 40°F. Macgillivray (1953) indicated that after sweet potatoes have passed through a curing process they should be stored at 55°F. and 85 per cent relative humidity for a period of about 8 to 24 weeks. Cooley et al. (1954) reported that results of experiments conducted for 4 years with six varieties of sweet potatoes stored at 50, 55 and 60°F. for 3, 5 and 7 months indicated that storage at 55-60°F. was better than either a higher or a lower temperature. After 5 months of storage all varieties except Puerto Rico had smaller percentage of sound potatoes when stored at 50°F. than at 55° or 60°F. The difference between 55 and 60°F. was not significant.

Kushman and Leonier (1957) pointed out that sweet potato roots stored continuously at 70°F. did not keep quite as well as those stored at 60°F. Roots stored continuously at 50°F. did not have good keeping, culinary, or plant-producing qualities. Such roots developed high

[illegible]

comparable roots stored at [illegible] or [illegible]°C.

2.1.2. Weight loss.

Studies by Hasselbring and Hawkins (1915-a) were concerned with the changes that take place during the storage of sweet potatoes, these changes illustrate the complex nature of the processes and the balances among them. Naturally moisture was lost during storage but the percentage of moisture did not change greatly for water was a product of respiration, and losses were partly replenished. Also total weight declined, for carbohydrate was consumed in respiration with carbon dioxide diffusing away and water escaping by evaporation. Kimbrough (1928) reported that most of the loss in weight of sweet potatoes during storage was due to loss of water, but this was masked by loss in sugars in respiration and by the water formed in the same process. The percentage of water fluctuated very little during a storage period of as much as 6 months. Ezell and Wilcox and Ezell *et al.* (1952) conducted a storage experiment on four varieties of sweet potatoes. They found that the losses in weight, in general, were greatest at the two extremes of the storage

temperature [illegible] loss [illegible] [illegible] and the loss [illegible] rots was [illegible] immediate.

In the "Vegetable Production" MacGillivray (1953) reported that after harvest there is a continuation of life processes in the vegetable. In the case of fruits and a few other crops the harvested portion can no longer obtain water or organic foods from the plant, hence the vegetable can only maintains or suffer a decrease in food materials or undergo possible changes in texture and flavour. Much of the decrease in weight is due to loss of water. Humidity and temperature are important factors. Greatest weight loss occurs at low humidities and high temperatures. Minges and Morris (1953) pointed out that loss of weight in sweet potatoes during storage due largely to water loss, was most rapid immediately after harvest. During the first two or three weeks potatoes could be expected to lose from two to six per cent of their original weight. After this, the rate of weight loss under commercial storage conditions was about 2 per cent per month. Severe skinning during harvesting, low humidity during storage, or excessive sprouting may cause higher rates of water loss. Loss from rots was one of the chief