Quality and Composition of Potatoes as Influenced by Harvesting, Handling and Storage

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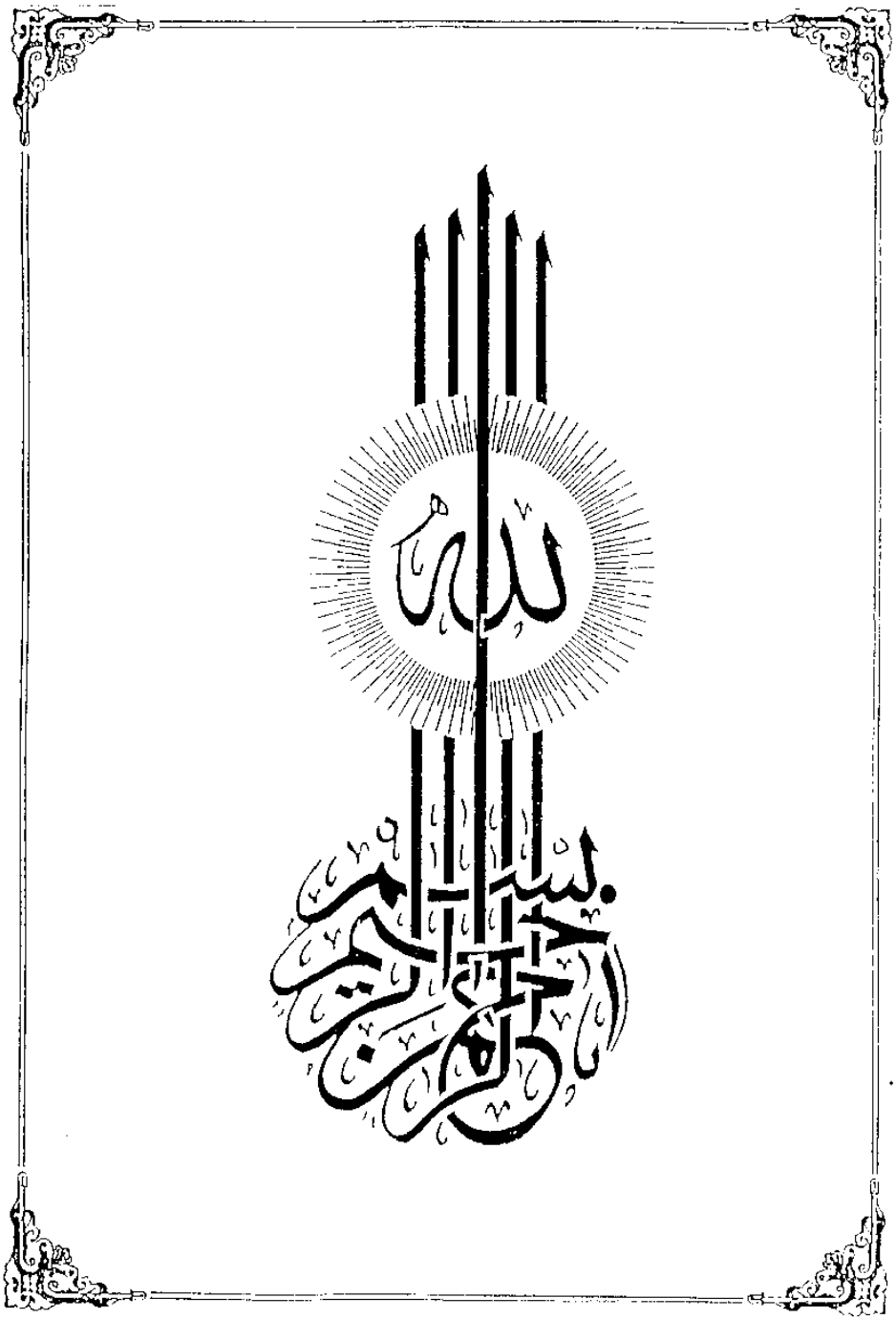

PRESENTATION

TO THE GREAT MASTER OF ALL HUMANITY OUR PROFIT MOHAMED

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ARABIC SUMMARY

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INTRODUCTION

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The potato holds an important place among the leading foods of the world, ranking, in total production, above any other vegetable crop. As a result of its wide distribution and use as a food by many people, it had demanded the attention of many research workers. The largest portion of researches dealt with the history, cultural practices, the control of diseases, and the development of varieties, little attention however has been given to chemical composition. It is a well known fact that number of physical and chemical factors are contributing to quality of potatoes, such as specific gravity, starch and sugars.

The production of small potato tubers "chats" for canning have become a new export commodity in the A.R.E. because of the demand from European Canning Industry during December, January, February, March and April.

The canning industry prefers small tubers "chats" which are 25 - 35 m.m. in diameter, with good tuber shape and shallow eyes. The specific gravity, total solids and starch content should be low, and the tuber texture should be cohesive in order to avoid disintegration, during the canning procedure;

(Talburt and Smith, 1959 and 1967, Smith 1968 and Bleasdale and Thompson 1971).

The A.R.E. should be in a very good position to supply the European Canning Industry with potato chats, since the climatic conditions are excellent for high yield during the period September through April as previously mentioned by Talneset et al. (1970). However, as a specialised production of potato chats is new in the A.R.E., it was decided to perform studies to find out suitable varieties, proper planting and harvesting dates, which will influence the physical and chemical properties of tubers, as well as the quality of chats suitable for canning.

The potato chats for export stay between 15 and 30 days storage in transit, so the changes in physical and chemical properties are of great importance during those periods.

The present investigation was undertaken to study the following aspects:-

I. Effect of planting dates, stage of maturity and planting spacings on physical and chemical properties of raw "chats" as well as quality of boiled "chats" at harvest time and during storage.

II. Effect of variety and stage of maturity on physical and chemical properties as well as quality and suitability for canning of small potato "chats" at harvest time and during storage.

III. Effect of planting methods and harvesting dates on physical and chemical properties as well as quality of potato "chats".

REVIEW OF LITERATURE

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Quality, i.e."the degree or grade of excellence possessed by a thing", cannot be adequately defined without reference to the use for which the thing in question is intended. Certain measures of quality in potatoes, such as the degree of sloughing, apply in opposite ways, the soup manufacturers definition of high quality corresponding to the canner's definition of low quality.

Quality might be defined, as far as this study is concerned, as "fitness for purpose". There are many factors which contribute to high quality for canned potatoes, such as low specific gravity, low dry matter and starch content.

What follows amounts to a survey of the effect which current commercial pratice in planting, harvesting and storage is likely to have on potatoes intended for canning process.

I. Effect of some cultural practices on physical and chemical properties of raw potatoes:-

Dry matter content:

It has been well demonstrated that the dry matter content of the tuber had much influence on the cooking quality, and best use for a particular potatoes. Smith (1931) showed

that the dry weight was almost equally presented as percentage in the very immature tubers regardless of their sizes. Bedford (1945) showed in potatoes grown for dehydration that the solids varied between tubers from the same hill and though the tuber size was of no effect in this regard. Akeley et al. (1955), recommended early planting dates for producing high cooking quality tubers with high total solid percentages so forth valuable for processing. Johnson and Rowberry (1962) prefered early harvest of potatoes devoted for storage without the fear of either yield or total solids reductions. To the contrary Schippers (1965) considered immaturity to result from late planting or early harvest as he found immature potatoes to be lower in the dry matter content as compared to mature ones.

Dunsworth (1963) showed no spacing effect on either the yield of No. 1 potatoes or the total solids content.

Yamaguchi et al. (1966) mantioned a dry matter content of 16 % determined in potatoes dug out 89 days after planting which increased up to 19 % in those dug out two weeks later, with no further increase with delayed harvest after 112 days from planting. Reeve et al. (1971) added that tubers harvested 80 days after planting were 1.0 to 2.5 % lower in total solids content than those harvested later.

Bleasdale and Thompson (1969) and (1971) pointed to relatively high dry matter content in big tubers than small ones. They added that mature tubers produced at a higher plant density to be much more prone to break down on canning than immature tubers produced at normal spacing. Specifying the character of recommended variety for canning they stressed on dry matter content to be less than 20 %.

Specific-gravity:

Vanasse et al. (1951) reported a significant effect of location of prodution and variety on specific gravity-dry matter relationship; while tuber size effect was not significant, but was relatively some what greater than the variety.

Terman et al. (1952) and Pifer (1956) found that specific gravity of tubers was relatively higher at cooler counties than low elevation in warmer counties. Murphy and Govern (1959) reported that high specific gravity coincided with long growing seasons. While Sawyer (1961) recommended earlier planting for the same purpose in addition to better yields. High specific gravity was obtained in potatoes growing at soil temperature between °60-°65 and 70-75°F as mentioned by Yamaguchi and Spurr (1964).

Mosher (1965) found that as seed pieces spacing decreased specific gravity increased. With respect to the performance of the specific gravity it was found by Kunkel and Holstad (1968) to be a minimum, early in the season but progressively increased as the season increased.

Ascorbic acid content, "vitamin C":

The potato is considered a good source of ascorbic acid. Consequently in growing potatoes devoted for canning, it is a necessity to apply the improved techniques which help the retention of the maximum amount of vitamin C in tubers, so forth its intial content in the tuber is of great importance (Noonan et al.1951). In this regard, Kelly and Somers (1949), and Namek and Moustafa (1953), reported a marked increase in ascorbic acid content in potatoes until maturity but it began to decline upon death of the top. Volkov (1959) c.f. Smith (1968) considered that vernalization of seed, close planting and large tubers were three factors leading to high ascorbic acid content. Ascorbic acid content of various potato varieties was 19 to 29 mg/100 gm. fresh weight. Mature tubers contained 20 - 50 % more ascorbic acid than immature ones as mentioned by Enachescu (1960). Buchkin and Zotova (1961), c.f.Smith (1968), obtained high vitamin C content in varieties of more intense yellow color. They added that the