

EFFECT OF SOME AGRICULTURAL AND INDUSTRIAL TREATMENTS
ON THE PROPERTIES OF STARCH AND ITS DERIVATIVES PRODUCED
FROM EGYPTIAN VARIETIES OF SWEET POTATOES

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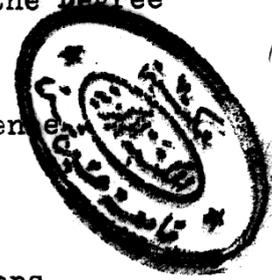
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I N T R O D U C T I O N

Sweet potato (*Ipomea batatas*) is well spread all over the tropical & subtropical areas of the world. It originated in equatorial America and spread by means of Spanish and Portuguese transplanations. Although it has been planted in North America in 1650, sweet potato was introduced in Egypt only recently. (Stino et al. 1963).

A great deal of investigation has been carried out on sweet potato in different countries. In America, Kimbrough (1942) stressed its vitality as a feed for livestock, Gould (1946) paid particular attention to its economic aspects and Taggart (1950) defined its importance for human nutrition. Blizzard et al. (1946) and Bahatti (1957) carried out experiments in which sweet potato proved to compete with maize and wheat crops per unit area. Stino and Lashin (1953) reported that sweet potato produced 3 times the amount of carbohydrates produced by wheat, besides it does not require a great effort and expense for its production and can be grown in a wide range of soils.

In industry, sweet potato starch is superior to that of maize (Kihara 1953) particularly for textile industry (Paine et al. 1938) and adhesive production (Barham 1946). Moreover, the production of alcohol from sweet potatoes is technically possible (Miyaji 1948). Data reveal that sweet potato crop can be produced on an industrial scale (Kimbrough 1948).

The total acreage of sweet potatoes in the United Arab Republic increased from 2,500 feddans in 1940 to 5,915 feddans in 1955 and to 11,538 feddans in 1962. The relatively faster rate of land reform in the United Arab Republic, due to the establishment of the High Dam, will provide new areas to be utilized in Agriculture. A part of this land may fit for the sweet potato crop which can be cultivated in newly-reclaimed areas where it is not yet fit for maize and wheat production. The average production per acre of sweet potato in the United Arab Republic is about 10 - 15 tons (Lashin 1949) which is considered a high yield relative to that in the United States of America and Japan. The yield of starch from sweet potato per unit area in the United Arab Republic

is about twice as much as that produced from maize grains (Gaafar and Abou-Raya 1961). Thus attention and studies are focused on sweet potato crop as a source of carbohydrates which might replace the shortage of imported maize grains.

AIM AND SCOPE

Yield of sweet potatoes is greatly affected by nitrogen and potash; moreover, these two elements play a great role in the Synthesis and metabolism of both carbohydrates and protein compounds. Therefore, experiments were carried out to study the effect of both mentioned elements, separately or combined together, on the tuber yield and consequently the yield of starch in the sweet potato crop. Quality and properties of certain carbohydrates in the tubers were also studied.

Two varieties of sweet potatoes were used in the present investigation : var. 435/1 seemed to be suitable for starch production and var. 17/8 as a table variety.

REVIEW OF LITERATURE

The literature concerning the effect of fertilizers on growth and yield of sweet potatoes greatly differ according to numerous factors, such as :

- 1 - Crop Variety
- 2 - Type of Soil
- 3 - Time of Planting
- 4 - Stage of Plant Growth
- 5 - Form and Amount of Fertilizer Dressings
- 6 - The Proportions of Various Elements in the Fertilizer Mixture.

As the main purpose of the present investigation is the study of both nitrogen and potassium in relation to plant growth and quality of tubers, the review of literature will be limited to those two elements, each one by itself.

I - NITROGEN

Effect of Nitrogenous Fertilizers on the Growth and Yield of Sweet Potatoes :

In a study on sweet potatoes, Edmond and Sefisik (1930) showed that nitrogen was essential for the proper development of both vines and roots; they also indicated that nitrogen should be available to the plant during most of the growth period.

Amounts needed from the mentioned nutritonal element appeared to be variable in different soils.

Geise (1929) achieved some increase in the yield of sweet potatoes from the use of nitrogen fertilizers on three different soils, the most marked response was obtained on the very acid type.

In a more recent study, Skinner et al. (1932), working on four sandy soil types, reported that nitrogen was essential

for the yield of the tubers of sweet potatoes. Approximately 35 to 40 pounds of nitrogen per acre were advantageous.

Those results have been confirmed by Cooper and Watts (1936) in Arkansas who found that approximately 15 pounds of nitrogen per acre were sufficient on the silt loam soils, whereas quantities up to 40 pounds per acre were necessary on the poor soils.

Currey (1939) also demonstrated that nitrogen proved to be the most beneficial nutrient for increasing the yield of sweet potatoes. Amounts ranging from 20 to 40 pounds of nitrogen per acre appeared to be satisfactory.

Anderson (1942), in a study for the fertilizer effect in different types of soils, reported that the total yield of tubers in relatively poor areas increased as applied nitrogen increased. With more fertile fields, particularly those previously cultivated by legumes before sweet-potato, the difference in yield between various nitrogen treatments were insignificant.

Nitrogen appeared to be more favourable for sweet potatoes when combined with some other nutritional elements such as phosphorus and potassium.

Scott (1920) studied the influence of fertilizers on Triumph sweet potatoes grown in Florida Sandy soils and found that nitrogen fertilizers when combined with phosphorous and potassium gave a marked response in yield.

Hotehkiss (1921) demonstrated that nitrogen in combination with phosphorous improved the yield of sweet potatoes under Texas conditions.

In a trial to correlate the nitrogen content of the growth medium and that of plant, Leonard et al. (1949) concluded, from a study on sweet potatoes grown in Sandy loam soil, that the supplied nitrogen was found to be related to the nitrogen content of the leaf blades and yield of fleshy roots. Plants with leaf blades varying from 4.7 to 5.0 per cent nitrogen in early summer and from 3.0 to 3.8 per cent at harvest gave higher yields than those supplied with smaller amounts of nitrogen.

Under local conditions, Stino et al. (1956) concluded that application of large amounts of nitrogen was not essential in fertile soils which have been previously grown with clover. However, a small amount, i.e. 8 kilograms of actual nitrogen per feddan, was found to be needed to be applied for obtaining the best results.

In a relatively recent study, Lantican and Soriano (1961) indicated that significant increase in the yield of sweet potato were obtained only when application of nitrogen was increased from zero to 100 kg/ha. Those results were recently confirmed by Lukovnikova (1965) who pointed out that application of mineral fertilizers, particularly nitrogen, along with organic fertilizers had increased the total yield of potato tubers.

Effect of Nitrogen Fertilizers on the Nitrogenous Compounds in Plant.

Nitrogen content of plant has been reported by several investigators to be related to amounts of nitrogenous fertilizers supplied to the growth medium.