EFFECT OF SOME FERTILIZERS LEVELS ON THE PRODUCTIVITY OF SWEET PEPPERS

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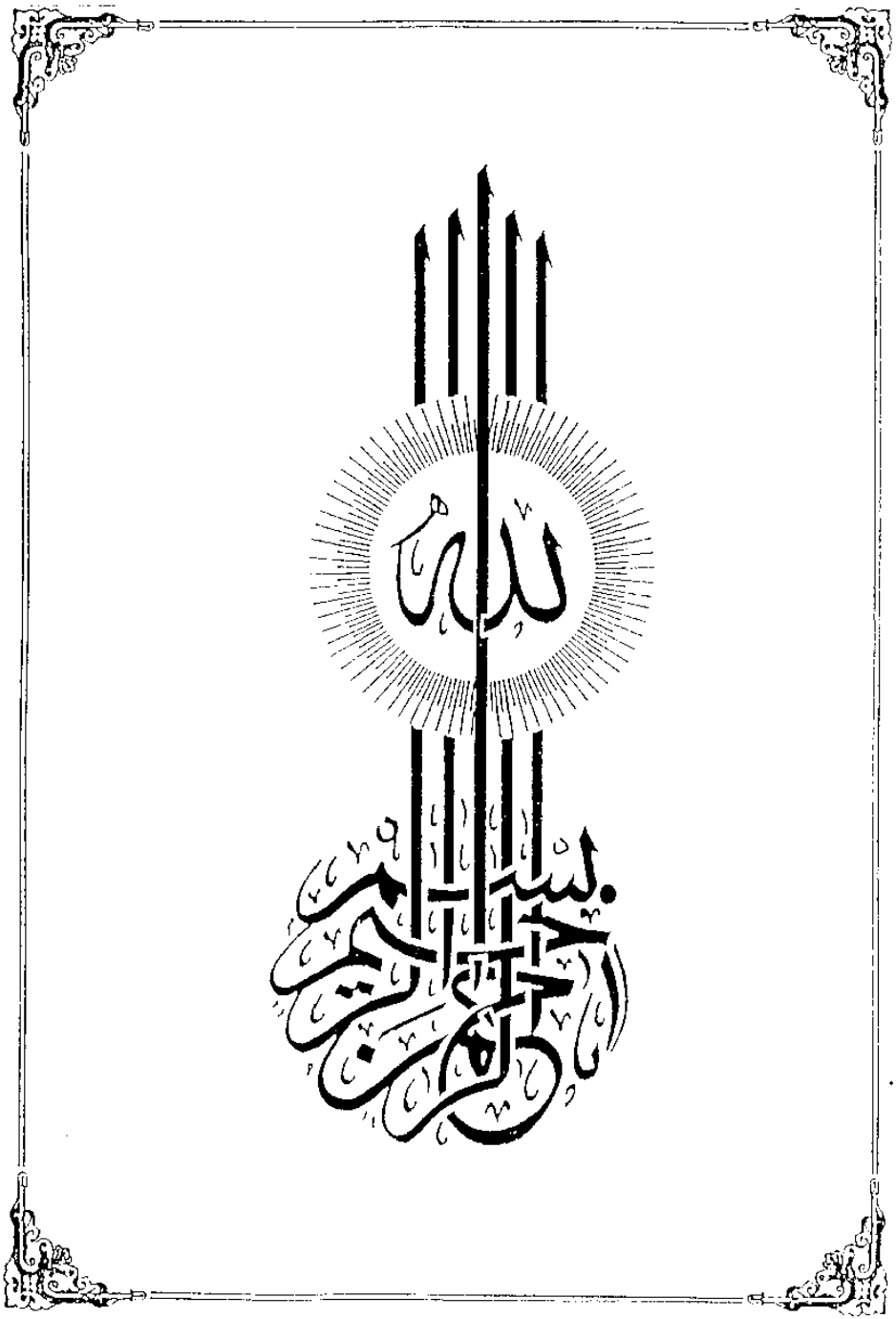

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CONTENTS

	Page
Chapter 1; INTRODUCTION	1
Chapter 2. REVIEW OF LITERATURE.	3
2.1. Plant growth.	3
2.1.1. Morphological characters.	3
2.1.2. Dry matter.	6
2.2. Frost tolerance.	6
2.3. Chemical contents.	7
2.3.1. Soluble sugars.	7
2.3.2. Nutritional elements.	8
2.4. Yield.	10
2.4.1. Early yield.	11
2.4.2. Marketable yield.	13
2.4.3. Total yield.	14
2.5. Fruit quality.	16
2.5.1. Plysical characters.	16
2.5.2. Chemical composition.	17
Chapter 3. MATERIALS AND METHODS.	21
Chapter 4. RESULTS AND DISCUSSION.	
4.1. First experiment: EFFECT OF NITROGEN, STABLE MANURE AND SUCROSE ON GROWTH AND YIELD.	
4.1.1. Plant growth.	33
4.1.2. Frost tolerance.	38
4.1.3. Chemical contents.	41
4.1.4. Yield.	49
4.1.5. Fruit quality.	53

Page

4.2. Second experiment: EFFECT OF PHOSPHOROUS, STABLE MANURE AND ZINK ON GROWTH AND YIELD.

4.2.1. Plant growth. 61

4.2.2. Frost tolerance. 65

4.2.3. Chemical contents. 67

4.2.4. Yield. 74

4.2.5. Fruit quality. 77

4.3. Third experiment: EFFECT OF POTASSIUM AND STABLE MANURE ON GROWTH AND YIELD.

4.3.1. Plant growth. 86

4.3.2. Frost tolerance. 90

4.3.3. Chemical composition. 92

4.3.4. Yield. 97

4.3.5. Fruit quality. 100

Chapter 5. SUMMARY AND CONCLUSIONS. LITERATURE CITED. 108

LITERATURE CITED. 117

ARABIC SUMMARY.

Chapter (1)

INTRODUCTION

Winter sweet pepper is one of the most important vegetable crops for export as well as for local consumption. European contries demond the fresh pepper fruits during winter monthes up to April with very high prices, so pepper production throughout this period is more benifi-cial and economical. Since climatic conditions prevailing, in Egypt, during the winter plantation are not more favourable for the growing of pepper plants, the early production is restricted and fruit quality is affected. These problems night be overcomed by development of new cultivars favourable for winter production, spraying with certain growth regulators to induce some tolerance to cold weather, improvement of cultural practices, or application with mineral and organic fertilizers to find out an effective fertilization regime for early pepper production with best quality.

The present investigation was carried out to overcome the winter pepper production by means of mineral or stable manure fertilization. Different levels of each of nitroge, phosphorous or potassium were separately studied in the presence of the other two elements. Application of stable manure with or without mineral fertilizers was used for comparison in each experiment.

quite satisfactory in this regard, the following experiments were undertaken:-

1- Effect of nitrogen, stable manure, and sucrose on growth, cold tolerance, chemical composition, yield and quality of winter sweet pepper.

2- Effects of phosphorous, stable manure, and zinc on growth, cold tolerance, chemical composition, yield, and quality of winter sweet pepper.

3- Effects of potassium and stable manure on growth, cold tolerance, chemical composition, yield and quality of winter sweet pepper.

Chapter 2

REVIEW OF LITERATURE

Effects of stable manure, mineral fertilizers, and sucrose on growth, frost tolerance, chemical composition, yield, and quality of sweet peppers will be reviewed under the following headings:

a) Plant growth.

b) Frost tolerance

c) Plant chemical composition.

d) Fruit quality

2.1. Plant growth

2.1.1. Morphological characters:

Relatively high nutritional requirements for pepper crop has been, sometimes, established in the literature.

Nitrogen deficiency was repeatedly reported to be determinative to plant high which was found to be favoured by application of nitrogenus fertilizers to pepper plants, Miller (1961), Snigh and Nettles (1962) and Lal and Pundrik (1971).

Increasing the applied phosphorus above 100 lb/acre did not much increase pepper plant height, Ozaki et al. (1955), although it responded favourably, under local conditions, to the application of calcium superphosphate

up to 100 kg/fed., El-Mansi (1968).

In sandy soil, a very marked increase in pepper plant height was obs rved b/ increasing the potassium level from 100 to 200 lb/acre, Ozaki et al. (1955).
El-Mansi (1968), howev r, reported that in soil containg 0.29 mg K_2O/100 gm soil, no effect was observed for application of potassium sulphate up to 100 kg./fed.

Root length as well as dev lopment of tomats plant w s suppressed by addition of nitrogen and not with potassium application which has been favourable, Steineck (1964). Potassium eff ct was found to be dependent on nitrogen supply; the more available nitroge, the greater was the effect of potas ium within a certain concentration range.

Number of branches of pepper plants increased consistently with applic tion of calcium nitrate up to 300 kg. or by calcium superphosphate up to 200 kg per feddan, El-Mansi (1968).

Respecting the leaf charact ristics, nitrogen deficiency was charact rized b/ stunted weak growth with pepper chlorotic leaves, Miller (1961). Howeve , Hernando et al. (1964) indicated that the very young capsium plants sustained some leaf injury even from a 0.5% urea spray.

Mehrotra et al. (1968) found that a paling of chillies plants, bleaching of leaves and premature leaf abscisson wer due to lack of nitrogen. The perple coloration of stem and leaves or the grey-green coloration and stunting of pepper plants were, however, explained to be, due to the lack of phosphorus, Miller (1961) and Mehrotra et al. (1968).

Pepper plants receiving low potassium levels showed deficiency symptoms on the leaves before the flowering stage was reached, Campbell and Swingle (1965). Chillies leaf crinkling with necrotic spotting and marginal scorching was also obtained from the lack of potassium, Mehrotra et al. (1968). In fact, nitrogen and potassium fertilization had signficant influence on the colour of pepper foliage. The bronzing colour of the leaves, however, appeared to be induced from the high nitrogen rates, Ozaki et al. (1955) and Iley and Ozaki (1967).

Regarding growth, in general, increasing the level of phosphorus fertilization resulted in increasing pepper plant growth, Ivanic (1961) and Ozaki and Iley (1966). Thomas and Heilman (1967) showed that phosphorus increased shoot to root growth. Somos and Tarjanyi (1964) added that the vegetative growth of pepper plant was slower with low potassium levels than with high ones.

2.1.2. Dry matter:

Dry matter yields of different parts of pepper plant, i.e. roots , branches, and leaves were increased by the application of nitrogen, Iley and Ozaki (1967), Thomas and Heilman (1967) and El-Mansi (1968). Similar trend was obtained with application of phosphorus, Thomas (1967), in spite of the very little effect obtained by Thomas and Heilman (1967). This was also true with potassium which was found by El-Mansi(1968) to be not effective up to 100 kg./feddan, although Richter et al. (1968) reported that ascending rates of potassium were depressive.

The application of phosphorus with high levels of nitrogen significantly increased the dry matter yields of pepper plant, Thomas and Heilman (1967).

Concerning the NPK fertilizers, Petkov (1964) showed that their application gave the greatest dry matter content of pepper plants. Patron (1966) added that the moderate rate of fertilizer application (10 tons compost/ ha. + 180 kg N, 45 kg. P and 30 kg. K/ha.) produced the highest dry matter of pepper plant.

2.2. Frost tolerance:

One of the most interesting problems in vegetable crops is the study of frost tolerance of plants.

Ozaki (1960) found that the frost in December and Febraury injured the fruits, and killed the exposed foliage and tips of the young stems of pepper plants. Fortnightly applications of ammonium nitrate at the rate of 30 lb N/acre resulted in a higher second crop yield than rates of either 20 or 40 lb/acre.

Concerning potassium effect, Ozaki (1960) showed that after frost injury, the fertnigthly applications of potassium sulphate, at the rate 40 lb K_2O /acr , to pepper plants were required to produce the highest yield.

Symygin and Matveeva (1963) reported that sugar solution protected cell plant tissues of cabbage and onion from damage during both slow and rapid freezing. The degree of protection increased with increasing concentration of sugar solution. Tyankova (1969) also mentioned that the highest number of freezed undamaged pepper seedlings was found in plants receving 50 ml of 2 M sucrose before being kept overnight in a refrigerator at -2 to - 3C°.

2.3. Chemical contents:

2.3.1. Soluble sugars

Several investigations have bean carried out for evoluation of the chemical compositions of plants as affected with fertilizer application.

Goma (1958) found that nitrogen had no considerable

effect on the total and reducing sugar concentrations in blades and stems of squash, reducing sugars being, however, supressed in petioles. In spite of that, Lashim (1961) reported that nitrogen supply caused a depression in the percentages of both reducing and total sugars in leaves and stems of the sweet potatoes plants whose non-reducing sugars were not influenced. These results were confirmed by Singh and Nettles(1962) who reported that at higher nitrogen levels (150lb.N/acre), sugar content of pepper leaves was reduced.

With respect to phosphorous fertilizers, Goma (1958), pointed out that percentages of total sugars in blades and petioles of squash plants, receiving medium phosphorus level, were higher than those fertilized with low or high phosphorous levels. He added that reducing sugars in petioles and stems, but not in blades, were increased considerably with application of phosphorous.

2.3.2. Nutritional elements:

Fertilizer application has been repeatedly reported to affect the chemical composition of plants.

On both phosphated and non-phosphated soil, the application of nitrogen, at a suitable rate, to pepper plants increased the total phosphorus aptake and the

absorbed phosphorus percentage, Thomas and Heilman (1967). These results were relatively similar to those of El-Mansi (1968) who reported that nitrogenous fertilizers increased the concentration and absolute amount of both nitrogen and potassium, but reduced the phosphorus concentration and not its absolute amount in the tissues of different parts of pepper plant.

With regard to phsophorus application and its effect on the mineral content of plants, Miller (1961) showed that pepper plants receiving low rates of phosphorous fertilizers contained the highest potassium content. This was confirmed by Hortenstine (1962) who concluded that application of phosphrous fertilizers depressed the uptake of potassium by pepper plants. However, Thomas and Heilman (1964) revealed that phosphorous fertilizers gave no significant effect on both nitrogen and potassium contents of pepper foliage.

Respecting potassium fertilization, pepper plants produced with low potassium levels contained the highest amount of phosphorous and those produced with high potassium levels contained the lowest amount of nitrogen, Campbell and Swingle (1965). In spite of that, Richter et al.(1968) reported that potassium content of the shoots and roots of pepper was increased, but its nitrogen and phosphorous contents were not