THE RELATIONSHIP BETWEEN ZEA MAYS AND PRECEDING AND AFTER CROPPING

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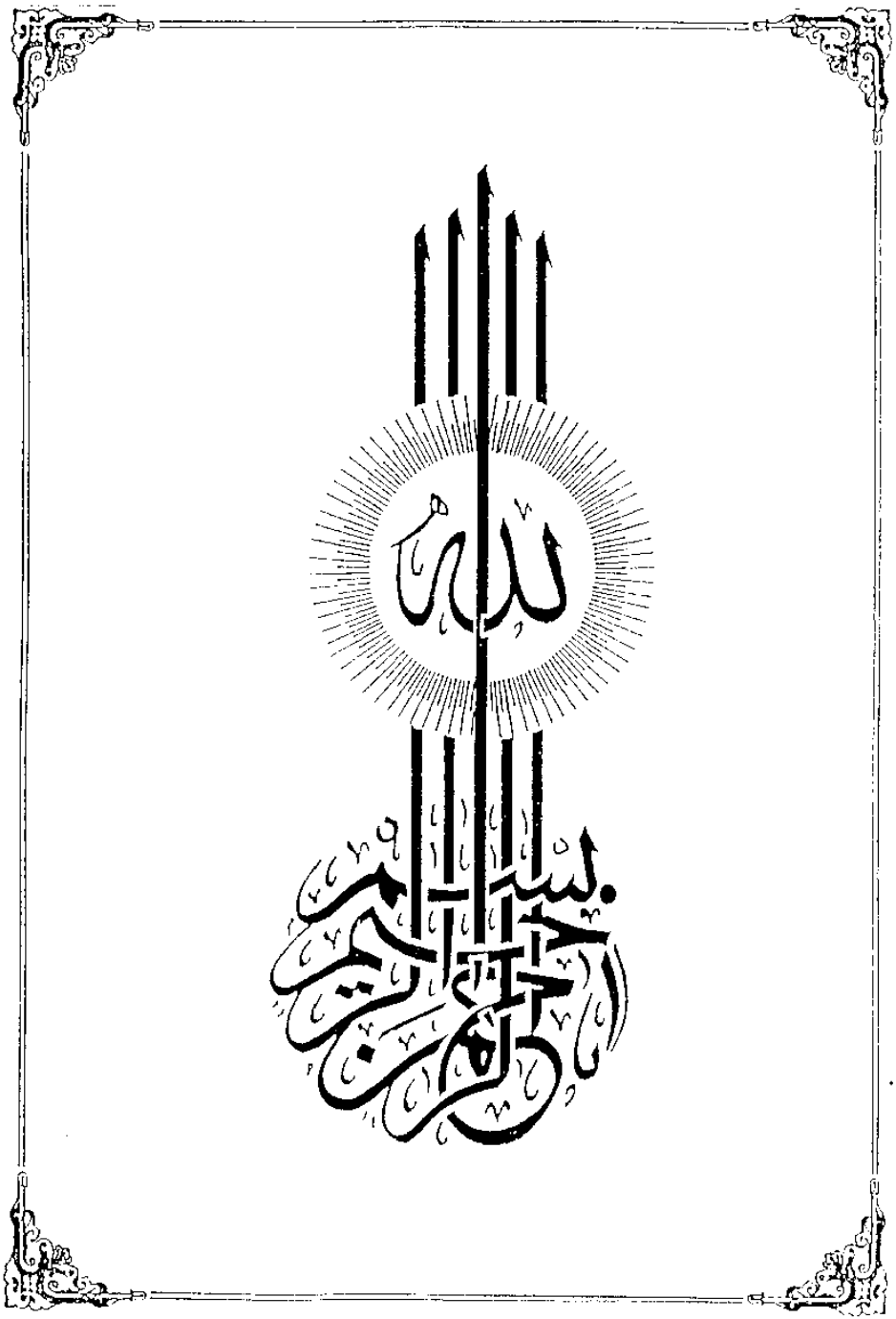

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CONTENTS

INTRODUCTION

The position of maize crop in Egyptian rotation is considered as one of the important factors governing the soil productivity . Maize thrives well during the summer season in Egypt. It is preceded by winter crops of which berseem, horse bean, flax and wheat are the most important. Similarly, winter crops, i.e. berseem, horse bean, flax and wheat follow maize crop in the rotation .

This work was designed to investigate the effect of some preceding winter crops on the growth, root distribution and yield of maize crop .

In addition, the effect of maize crop and some cultural treatments of maize on the yield of the following winter crops was given considerable consideration .

Review of Literature

Effect of preceding crops on the yield of following crops .

The influence of crops upon those which follow has been thoroughly investigated by many investigators in different parts of the world . Nevertheless, the causes of the effect still requires further research work.

The effect of crops on those which follow are complex and interdependant . The physical, chemical and microbial conditions of the soil play a part in the effect of crops on the succeeding ones (58) . The effect of crops on that which follow may be beneficial or deleterious. The deleterious effect may be due to microbiological population of soil associated with that crops (57) . Crops after legumes produce greater yield than after non-legume crops (29,39, 40,68,74). Some legume crops have a more beneficial influence on those which follow than other legume ones . The yield of corn following soybean was much lower than those following other legumes (15) . Alfalfa and sweet clover had beneficial effect on the following crops, namely maize , oats or wheat, although red clover and soybean had no beneficial influence (59).

In Egypt, the yield of maize could be arranged with regard to the preceding crops in descending order of horse bean, berseem, wheat, barley and flax (73). Legume crops enriched the soil with nitrogen and this increased the yield of the following maize crops (59, 86). Fallowing has a marked effect on the following crop . Godulyan (26) presented preliminary data on the study of various crops preceding maize . He obtained highest yields after winter crops grown on fallow soil, the lowest yields after summer grain.

Nitrogen was the most important single factor influencing yields of corn and wheat following meadow, grain and soybeans (71) . However , the effect of the preceding crop on the next crop was greater than the effect of fertilizers (6) . Maize crop exerts a marked effect on the following winter crops . Both silage maize and sugar beet were the best preceding crops for high yield of barley (36) . Hedlin and Ridley (30) obtained higher yields of wheat following flax and corn than following oats, barly or spring rye. Yield of winter wheat tended to be low when cereal crops were the preceding crop as compared with legumes particularly pea (89), and maize or vetch-oats mixture (76), silage maize compared with potatoes (88), maize compared with peas(54), maize and cowpeas compared with berseem fallow or fallow with continuous

cropping and current manuring practices (55) .

In Egypt, the yield of both grain and straw of wheat was inferior after maize as compared with sorghum, peanut and sesame (7).

Effect of nitrogen fertilizer on the growth and yield of maize :

In Egypt, El-Khishen and Kassen (18) at Alexandria, Omar (61) at Giza, Kassen (33) at Alexandria, Moursi et al (49) at Sakha found a favourable response of maize yield to nitrogen fertilizer . Adding nitrogen fertilizer for maize crop caused an increase in the yield of ears (1,2,3,4,5,6, 24,37, 46, 51, 61, 67, 80, 83, 84, 87; 92) . Many investigators studied the importance of nitrogen fertilizers as a factor influencing the grain yield of maize crop. There was an increase in the grain yield of maize crop by adding nitrogen fertilizer (1, 2, 3, 4, 5, 12, 27, 35, 37, 46, 48; 51, 60, 61, 67 , 80 , 83, 84, 85 , 92) .

Effect of distance between hills on the growth and yield of maize :

Increasing the number of plants per feddan by reducing distance between hills caused a depression in plant height (52, 93), and depressed the dry weight of different parts of maize plant namely blades, stem + sheaths, tassels and ears (52).

Many investigators found an increase in the percentage of barren stalks with increase in plant population of maize (8, 52, 53, 61, 81, 93). Narrowing distance between hills depressed the dry matter of the different parts of maize plant namely blades, stem + sheaths, tassels and ears but resulted in an increase of weight of those parts per sq. m (52). Bushnell (13) showed that the closer spacing resulted in a large production of total dry matter . Several investigators studied the relationship between plant population and yield of maize grains. Burkon and Moher (11), Siller (75), Saunders, (70), Kohnke and Miles (34), Fisher and Smith (21), Haynes and Sayre (27) and Thomas (84) Showed that there is a close relationship between distance between hills and yield of maize plants. The increase in yield of maize crop by narrowing distance between hills were found

by early increasing them (11, 14, 16, 22, 25, 28, 31, 32, 34, 69, 72, 78, 81, 94).

In Egypt, Omar (61) working on Amerkani Badri found that the best distance between plants was 50 cm, whereas El-Ibrashi (17) demonstrated that the best distance was 35 cm. between hills and he showed that there was no statistical significant difference between treatments of 35 and 50 cm between hills. Yousff (93) in U.A.R. found that the average yield of grain per feddan was significantly affected by varying plant population and maximum yield was obtained from 24.000 plants per feddan.

Increasing distance between hills from 30 to 60 cm. resulted in a depression in yield of ears and grains (50).

Narrowing distance between hills increased straw yield (13, 16, 25, 27, 47, 50), decreased the number of ears per plant (10, 50, 61, 70) and increased the number of ears per feddan (50).

Effect of nitrogen fertilizer and distance between hills on the depth and distribution of roots of maize plant :

During the early growth period , nitrogen fertilizer produced deeper and more extensive root systems of corn (38), whereas at the end of the growth period, the root penetation, distribution and dry weight of roots were the same in both nitrogenfertilized and unfertilized soil (38). The dry weight of roots within a unit of soil volume became great with adding calcium nitrate (51).

In uniform soil, the roots of corn were symmetrically developed around the corn hill, where the root penetration was about 48 inches on the silt loam soil (20) . At the end of the growing season, about 60 to 70 percentage of roots by weight were found in the top foot of soil, while 5 to 8% of the roots were found below 3 feet . Lateral root extension was generally limited to 20 inches between rows and 8 to 18 inches within the rows (38).

In irrigated soil, a large percentage of the plant roots were growing in the first foot of soil, and the greatest concentration of roots were usually found in the top six inches of soil (9).

In Egypt, Moursi et al (50) found that widening distance between hills increased the number of lateral prop roots, their weight and diameter and the weight of roots per soil volume.

Effect of preceding crops on soil nitrogen and organic matter content :

The preceding crops have marked influence on the both nitrogen and organic matter content of the soil . The amount of nitrogen in the soil increased in the soil planted with legume crops (41, 44, 45, 61, 88) as compared with non legume crops (41, 86) .

The effect of crops on the nitrate accumulation varies considerably among crops . There was greater accumulation of nitrate in the soil after alfalfa than after the grasses (56) . The nitrate in the soil were relatively high after alfalfa, red clover, rye, summer fallow and timothy and low after corn, oats and potatoes (68). Fribourg et al (23) found that nitrogen availability from residues during the second growing season was not more than 7.5%, 3.5% and 2.0% of that originally contained in alfalfa, red clover, soybean straw, respectively, and non of nitrogen from oat

hull application .

The amount of nitrogen absorbed by preceding summer crop per feddan was very high for peanut, medium for maize and sesame and low for sorghum (7).

Organic matter content of soil decreased much faster when the land cropped to wide-spaced crops (maize) than to close-spaced crops (wheat) (55) .

Mannan (41) reported that, soil organic matter content and C/N ratio were higher in rotation which included sorghum than any other system .

Badr (7) in Egypt found that no statistical significant difference in the organic matter content of the soil after harvesting different winter crops. However, it was less after Egyptian lupin and chick pea than that after wheat, barley, horse bean and berseem the organic matter content could be arranged in descending order with regard to the preceding summer crop as follows maize, sorghum, peanut and sesame (7) .

Sutherland (82) showed that high rates of N applied to continuous corn had increased organic matter levels over the amount contained in soil taken from the continuous