RELATIONSHIP BETWEEN FERTILIZATION AND PLANT DISTRIBUTION WITH YIELD AND ENVIRONMENTAL FACTORS IN MAIZE FIELDS

By

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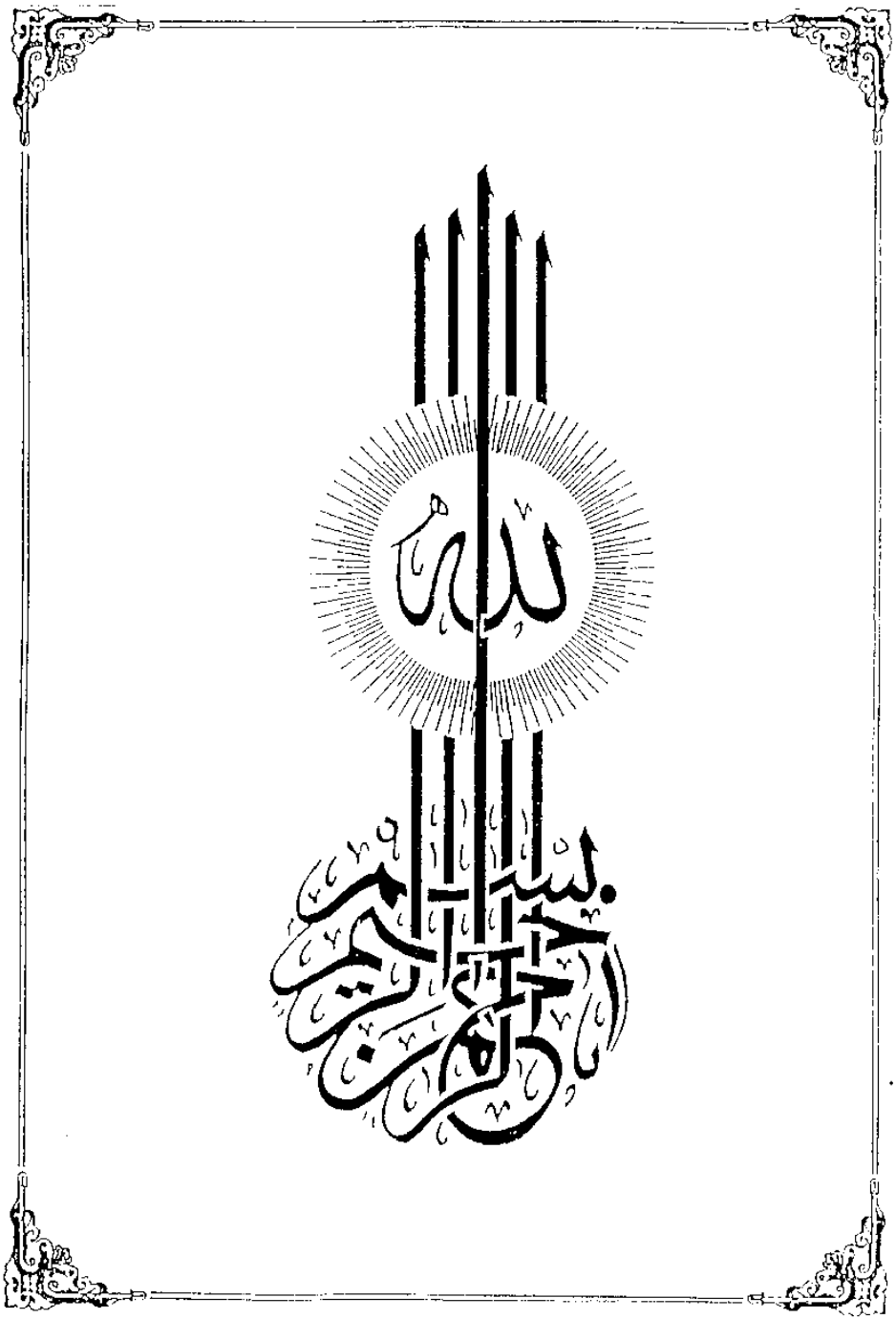

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ABSTRACT

Two field experiments were conducted in the Agriculture Experimental Station of National Research Center at Shalakan (Kalubia Governorate) during 1989 and 1990 seasons to study the relationship between nitrogen, zinc sulphate, fertilization rates and plant distribution and density on growth, yield and its components of maize plants (*Zea mays* L.) as well as light penetration percentage, soil temperature and moisture. The results indicated that.

1. Increasing nitrogen rates from 70 to 140 kg N/fed. and zinc sulphate rates added foliarly from 0.0 to 2000 ppm caused a significant increase in maize plant height; number of leaves/plant; leaf area (LA); leaf area index (LAI); crop growth rate (CGR); dry weight of plant, leaves, stems, tassel and ears. Ear height; diameter, number of rows/ear, number of kernels/row, seed index; grain yield/plant; grain and stover yield/fed.; biological yield; shelling percentage; harvest index; number of two ears/plant; grain

content of total carbohydrate, crude protein and zinc, and soil temperature, while number of barren plants, lodged plants, soil moisture and rate of light penetration were decreased.

2. Increasing plant density from 20 to 30 thousand plant/fed. and decreasing distance between hills from 60 to 30 cm induced significant increase in plant height, LAI, SLW, grain, stover yield and biological yield/fed., barren and lodged plants and soil temperature, while significant decrease were obtained in LA, RGR, CGR, NAR, dry weight of the whole plant, leaves, stems, tassel and ears; ear height, length, diameter, number of rows/ear, number of kernels/row, seed index, grain yield/plant, shelling %, harvest index, number of two ears/plant, grain content of carbohydrate, protein and zinc, light penetration and soil moisture content.

3. Highly significant and positive simple correlation was obtained between grain and stover yield and soil temperature and nitrogen, zinc rates, while it was negative with light penetration and soil moisture.

4. Multiple correlation between grain and stover yield and both of N, Zn rates, plant density and light penetration, soil moisture and moisture were highly significant.

Key Words: Plant density and distribution, Nitrogen fertilizer, Zinc sulphate,Light penetration, Soil moisture, Soil temperature, Growth, Yield, Total carbohydrate, crude protein, zinc content, ear characters, RGR, CGR, NAR, LA, LAI, SLW, Lodged plants, Barren plants, Grain yield, Stover yield, Maize, Corn, *Zea mays*.

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INTRODUCTION

Maize plant is considered as one of the most important cereal crops used in human consumption, animal feeding, starch industry and oil production, in the world as well as under Egyptian conditions. It represent the third cereal crops in importance and productivity and comes after wheat and rice, respectively.

Continuous attempts were occurred for increasing its productivity to face urgent demands of Egyptian people through the last period. This can obtained through both of breeding programs to produce highly productive and qualitative gene forms as well as adjusting the environmental conditions in respect to arrive to that strategy.

Nitrogen fertilizer application was shown as one of the reliable factors which this plant can respond to it under different circumstances and needs to get more attention in order to get more increase in both production and quality. Most of the previous studies indicates more response to this factor. Under Egyptian conditions, most of soils appears alkalinity reactions which affect greatly the availability of most of the micronutrient elements. Zinc is considered as one of these micronutrients since it start to decrease in the Nile water suspension after the construction of High Dam, and its deficiency effects start to appear on some of the cultivated crops under these conditions. Maize is

considered as one of the more susceptible species for zinc deficiency. It can respond much to the addition of that element but to what extent, it's needed to study.

Maize yield is considered as the resultant of all factors affect its growth and production. One of these is the optimum plant population which can occupied a unit area as well as the way of plant distribution in order to get more and highly photosynthestic system to change the received light energy to chemical one. This also needs more investigation to get more development in the maize productivity.

It well known that the plant growth is affected greatly with the surrounded environment which in turn, can affect in other way these environment. To what extent these responses, and how is the interactions between its affect the productivity of the plants, its needs more investigation.

The aim of this study is to investigate how is maize plant (*Zea mays* L.) yield and quality respond to the increasing or decreasing of plant population and distribution (20 and 30 thousand plant/fed.) under the addition of different rates of nitrogen fertilizer (i.e. 70, 105 and 140 kg N/fed.) and zinc sulphate added as foliar application (0, 0.1%, 0.2% $ZnSO_4$). Also, the effect of these factors on the surrounded main environmental factors, mainly light intensity penetration, soil temperature and moisture and its reflection on yield was studied.

II. REVIEW OF LITERATURE

II.1. Effect of Nitrogen Application:

Nitrogen is one of the major elements essential to plants especially for cereal crops such as maize. It exerts a marked effect on growth, yield and its components of most of field crops.

II.1.A. Growth Characters:

Plant height of maize was shown to be increased with increasing nitrogen fertilizer rates as reported by El-Hattab *et al.* (1980); Adris (1981); Shafshak *et al.* (1981); Gouda (1982); Walburg *et al.* (1982); Moursi *et al.* (1983); Salem *et al.* (1983); Abdel-Lateef (1984); Gomaa (1985); Gheith *et al.* (1986); Matta (1986); Soliman (1986); Abdel-Aziz *et al.* (1987); Badr (1987); Ahmed (1989); El-Deeb (1990); Abdul-Galil *et al.* (1990) and El-Kholy (1993). On the other hand, nitrogen fertilization did not exert any significant effect on maize plant height as obtained by Abd El-Gawad *et al.* (1974); when applied as 25, 50 and 75 kg N/fed.; Nour El-Din *et al.* (1974) when applied 20, 40 and 60 kg N/fed.; Younis *et al.* (1990) when applied 90 and 120 kg N/fed. and Salwau *et al.* (1992) when applied 60, 120 and 150 kg N/fed.

The number of active leaves per plant was increased by increasing nitrogen fertilizer rates as reported by Mahgoub (1979); El-Hattab *et al.* (1980); Khalifa *et al.* (1983);