

Effect of some seedbed preparation practices and fertilization on growth and yield of maize

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Two field experiments were carried out at the Agricultural Research and Experiment center of the Faculty of Agriculture at Moshtohor, Kalubia Governorate, Zagazig University during 1995 and 1996 seasons to study the effect of seedbed preparation and biological fertilizer treatments on chemical and biological properties of soil, growth characters, yield and its components of maize cultivar single cross 128. The soil was clay loam with pH 7.7. Each experiment included the combination of five seedbed preparation treatments and four treatments of biological fertilizer. The design of the experiment was split plot design with four replications. The treatments were as follows: A - Seedbed preparation: 1- Zero tillage or no-tillage. 2- Chisel plow (once) alone. 3- Chisel plow (twice). 4- Moldboard plow (once) alone. 5- Moldboard plow (once) + chisel plow (once). B- Biological fertilizer treatments: 1- Control: without application of agrispon or cerialin. 2- Foliar application of agrispon. Spraying was carried out once, 45 days from planting. 3- Bacterial inoculation. N-fixing bacteria i.e. cerialin (*Azospirillum lipoferum* strain). 4- Spraying of agrispon + inoculation of cerialin. The important results of this study could be summarized as follows: I- Chemical and biological properties: A- Effect of seedbed preparation: 1- pH value was not affected by seedbed preparation treatments in both seasons. 2- The salinity values were markedly lower with moldboard plow (once) as well as moldboard plow (once) + chisel plow (once) compared with no-tillage. 3- The mean values of organic matter, total nitrogen, total phosphorus, available nitrogen and phosphorus were increased by plowing the soil either by chisel or moldboard plow in both seasons. Moldboard plow (once) + chisel plow (once) gave the highest values of the above characters. 4- Moldboard plow alone or with chisel plow gave the maximum number of azospirilla followed by chisel plow (twice) and chisel plow (once). B- Effect of biological fertilizer: 1- pH and E.C. values did not differ under different biological fertilizer treatments. 2- Organic matter and total nitrogen in the soil increased by bacterial inoculation or foliar application of agrispon. 3- Foliar application of agrispon gave the highest values of available nitrogen and phosphorus in the soil in the first season, whereas in the second season, foliar application of agrispon + bacterial inoculation gave the highest ones. 4- Biological fertilizers under study caused an increase in number of azospirilla in the two growing seasons. The highest azospirilla counts were obtained from biological inoculation with foliar application of agrispon. There was no difference in azospirilla counts between bacterial inoculation alone or with agrispon treatments in both seasons. II- Effect of seedbed preparation: A- Effect of seedbed preparation: 1- The Emergence percentage was significantly increased by using seedbed preparation treatments. The highest percentage of plants was obtained after moldboard plow (once) + chisel plow (once), while the lowest one was obtained after no-tillage. 2- All seedbed preparation treatments under study were significantly superior in depressing weed growth compared with no-tillage treatment. The best tillage system in reducing fresh and dry weight of weeds were moldboard plow (once) + chisel plow (once) and moldboard plow (once) alone. B- Effect of biological fertilizers: 1- Fresh and dry weight of weeds were not significantly influenced by foliar application of agrispon or bacterial inoculation at different growth periods in both seasons. C- Interaction effect: 1- The effect of the interaction between seedbed preparation and biological fertilizer was not significant for fresh and dry weight of weeds at different periods of plant growth in both seasons except fresh weight of weeds at 60 days from sowing in the first season. 2- Foliar application

of agrispon + bacterial inoculation after moldboard plow (once) + chisel plow (once) reduced fresh weight of weeds.

III-Growth characters

A-Effect of seedbed preparations:

- 1-Plant height and stem diameter at 60, 75 and 90 days from sowing were significantly increased by different seedbed preparation treatments as compared to no-tillage in both seasons. moldboard plow (once) + chisel plow once gave the tallest plants and maximum values of stem diameter at different growth periods of plant.
- 2-There were significant differences between the mean values of number of leaves per plant of the five seedbed preparation treatments at 60, 75 and 90 days from planting. Moldboard plow (once) + chisel plow (once) treatment gave the highest number of leaves per plant at 60, 75 and 90 days from planting, whereas, the lowest ones were produced after no-tillage treatment at the respective sampling dates.
- 3-Ear height was significantly increased by plowing and moldboard plow (once) + chisel plow (once) gave the highest value of ear height.
- 4-Fresh and dry weight of maize plant organs were significantly influenced by seedbed preparation at 60 and 90 days from sowing in the two growing seasons. The highest fresh and dry weight of leaves, stem + sheaths + tassel and ear were obtained by moldboard plow (once) + chisel plow (once).

S-Leaf area of the topmost ear

was significantly increased by using seedbed preparation in both seasons. Moldboard plow (once) + chisel plow (once) gave the highest leaf area of the topmost ear.

B-Effect of biological fertilizers:

- 1-Foliar application of agrispon and bacterial inoculation did not significantly affect plant height, number of leaves per plant and stem diameter at 60, 75 and 90 days from sowing, ear height at 75 and 90 days from sowing, fresh and dry weight of stem + sheaths + tassel at 60 and 90 days from sowing, fresh and dry weight of ear per plant at 90 days from sowing.
- 2-Fresh weight of leaves per plant at 60 and 90 days from sowing were significantly increased by agrispon, bacterial inoculation and the combination of them compared to the control treatment in both seasons also, biological fertilizer treatments significantly increased the dry weight of leaves per plant at 60 days from sowing in the first season only. Foliar application of agrispon + bacterial inoculation gave the maximum weight of leaves per plant at the different periods of plant growth.
- 3- Leaf area of the topmost ear. was not significantly affected by biological fertilizers in the two growing seasons.

C-Interaction effect:

- 1-The effect of interaction between seedbed preparation and biological fertilizer treatments was not significant for all studied characters of growth except ear height at 75 days from sowing and dry weight of stem + sheaths + tassel per plant at 60 days from sowing in the first season only.
- 2-Foliar application of agrispon after moldboard plow (once) + chisel plow (once) gave the highest values of ear height at 75 days from sowing and dry weight of stem + sheaths + tassel per plant at 60 days from sowing.

IV- Photosynthesis

A-Effect of seedbed preparation:

- 1- Seedbed preparation practices had no significant effect on all photosynthesis pigments in ear leaf in both seasons except chlorophyll "b" which was significantly increased by using moldboard plow or chisel plow alone or together as compared with no-tillage in the second season only.

B-Effect of biological fertilizer:

- 1-Chlorophyll "a", "b" and "a+b" were not significantly affected by biological fertilizers in both seasons.
- 2-The highest values of carotenoids content was produced from agrispon spraying with bacterial inoculation in the first season only.

V- Flowering

A-Effect of seedbed preparation:

- 1-Seedbed preparation caused a significant decrease in the time to 50% tasseling and silking in one season out of two.
- 2-Barren plants percentage and the percentage of plants carrying one ear were significantly decreased by seedbed preparation in 1995 and 1996 seasons. The lowest percentages were produced with moldboard plow (once) + chisel plow (once).
- 3-The percentage of plants carrying more than one ear was significantly increased by using seedbed preparation in both seasons.

B-Effect of biological fertilizers:

- 1-Biological fertilizer (foliar application of agrispon or bacterial inoculation) had no significant effect on tasseling and silking dates, percentage of barren plants, percentage of plants carrying one ear and more than one ear.

IV-Yield and its elements

A-Effect of seedbed preparation:

- 1-Ear length, ear diameter, number of rows per ear, number of grains per row and per ear, ear weight, grain weight per ear, 100 grain weight, shelling percentage, ear yield, grain yield and straw yield per feddan were significantly increased by using seedbed preparation in both seasons.
- 2-Moldboard plow (once) + chisel plow (once) was superior to the other treatments of seedbed preparation in increasing the yield and its components of maize.
- 3-The treatments of chisel plow (once), chisel plow (twice), moldboard plow (once) and moldboard plow (once) + chisel plow (once) increased the yield of ear per feddan by

3.50, 20.23, 16.43 and 35.39%, respectively, over the control treatment (no-tillage) in the first season. The corresponding increases in ear yield in the second season were 5.33, 16.66, 23.88 and 33.16%, respectively.

B-Effect of biological fertilizers:

- 1-Ear length, ear diameter, ear weight, grain weight, 100 - grain weight and shelling percentage were not significantly affected by biological fertilizers in the two growing seasons.
- 2-There was a significant effect of the applied agrispon spraying and bacterial inoculation on the mean values of number of rows / ear, number of grains per row and per ear, ear yield, grain yield and straw yield per feddan in one season only.
- 3-The greatest yields of ear, grain and straw per feddan were produced with bacterial inoculation + foliar application of agrispon.

C-Interaction .effect:

- 1-The effect of interaction between seedbed preparation and biological fertilizer treatments on all yield components, ear and grain yield per feddan were not significant in the two seasons. whereas, straw yield per feddan was significantly affected by the interaction between seedbed preparation and biological fertilizer in the first season only.
- 2-Bacterial inoculation alone or with foliar application of agrispon after moldboard plow (once)+ chisel plow (once) gave the maximum yield of maize.

11-Simple correlation:

- 1-The association between time of tasseling or time of silking and each of plant height, ear height, number of leaves / plant, stem diameter and leaf area was negative and highly significant in both seasons.
- 2-Positive and highly significant correlations were detected between grain weight/ear and each of plant height, ear height, number of leaves/plant, stem diameter, leaf area, total chlorophyll, ear length, ear diameter, number of grains per ear and ear weight. On the other hand negative and highly significant correlation was obtained between grain weight/ear and each of time of tasseling and time of silking.
- 3-100-grain weight was positively and significantly correlated with each of plant height, ear height, number of leaves/plant, stem diameter, leaf area, total chlorophyll, ear length, ear diameter, number of grains/ear, ear weight and grain weight/ear.
- 4-Significant positive correlations were found between grain yield/feddan and each of plant height, ear height, number of leaves/plant, leaf area, total chlorophyll, ear length, ear diameter, number of grains/ear, ear weight, grain weight / ear, 100- grain weight, shelling percentage, ear yield and straw yield/feddan. whereas, highly significant negative phenotypic correlation coefficient was found between grain yield/feddan and each of number of days to 500/0 tasseling and silking.
- 5-It could be concluded that the grain yield was positively associated with yield components of maize as affected by the interaction between seedbed preparation and biological fertilizers under study.