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# RESPONSE OF MAIZE GROWTH AND YIELD TO SOWING METHODS, MECHANICAL WEED CONTROL AND NITROGEN FERTILIZER LEVELS

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## ABSTRACT

Two field experiments were carried out at the private field in El-Orman village, El-Sinbelaween Center, Dakahlia Governorate, during 2005 and 2006 seasons to find out the effect of three sowing methods (Afeer, Hyrathy and Improved Hyrathy), three mechanical weed control (without, one and two hoeing) and three nitrogen fertilizer levels (75, 100, and 125 kg N/fed) on growth, yield and its components of maize (*Zea mays* L.) Single Cross 10 (S.C. 10). Each sowing methods was done in separate experiment. Every experiment of sowing method was carried out in split plot design with four replications. The obvious results of this investigation can be summarized as follows:

- Sowing maize plants via Improved Hyrathy method significantly increased all studied characters as compared with other sowing methods (Afeer and Hyrathy) in both seasons.
- Mechanical weed control in maize fields through two hoeing caused remarkable increases in growth characters, yield and its components comparison with without hoeing or controlling weed by one hoeing in the two growing seasons.
- Application nitrogen fertilization at the level of 125 kg N/fed significantly exceeded other levels (75 and 100 kg N/fed) of studied growth parameters and yield components as well as grain yield in both seasons.

Finally, the preferable growth and yield of maize S.C. 10 can be achieved through planting by Improved Hyrathy method, controlling weeds by hoeing at two times and mineral fertilizing with 125 kg N/fad under the environmental conditions of El-Sinbelaween Center, Dakahlia Governorate.

## INTRODUCTION

Maize or corn (*Zea mays* L.) is considered as one of the main cereal crops in Egypt, comes the third after wheat and rice. Maize is very essential either for the human food or animal feeding and a common ingredient for industrial products. It plays a vital source of daily human food because their flour mixed with wheat flour by 20 % for bread making. Also, maize is used as a feed for livestock wether forage, silage or grains. The grains also has many industrial uses, including transformation into plastics and fabrics. Therefore, a great attention should be paid to raise maize productivity by maximizing yield per unit area in order to reduce the gab between its production and consumption. There are many factors that enhance maize productivity among them sowing methods, mechanical weed control (hand hoeing) and nitrogen fertilizer levels.

In Egpt, maize always sowing through many methods include dry sowing (Afeer) and wet sowing method (Hyrathy). Each has advantages and disadvantages. Choose any sowing method based on type of soil and its capacity to retain water, presence of weeds, efficiency to control weeds and

stand establishment risks associated with each method. There are few investigations with respect to the effect of sowing methods on maize productivity. In this concern; Shafshak et al. (1984) showed that dry method (Afeer) of planting maize significantly increased the grain yield by 10 % as compared with wet method (Heraty) of planting. Roshdy (1988) reported that wet method of planting maize significantly increased the number of grains/ear as compared with the dry method. Oraby and Sarhan (2002) revealed that new wet seeding method of maize crop was superior in grain yield per feddan compared with other studied seeding methods (conventional dry – Afeer and no – tillage).

Weeds are considered as a major problem in maize fields. In Egypt, mechanical weed control through hand hoeing is still a traditional method for weed control. Many researchers studied the effect of mechanical weed control on maize growth and yield for example; El-Bially (1995) found that all chemical and mechanical weed control treatments had greater 100-grain weight and yields than the control, with maximum yields being recorded with hoeing twice and Cyanazine/atrazine treatment. Donald (2000) reported that hoeing was the traditional method for controlling weeds between crop rows. Hoeing and hand-pulling as a mechanical weed control methods were used to control weeds growing in rows. Manceau and Blondel (2000) showed that mechanical and chemical weed control operations may be carried out successively to control the weeds in maize fields. These techniques are quite satisfactory but require a high level of expertise. Sharma et al. (2000) noticed that hoeing at 15 days after sowing (DAS) controlled the growth of all weed species and their population. Whereas, hoeing at 30 DAS was less than half compared with no inter-culture treatment. Saad El-Din, Samia et al. (2004) declared that hand hoeing treatment twice (21 and 35 days from sowing) as well as Fluroxypyr, Triclopyr and Bentazone herbicides at the high rates were the best treatments in controlling total annual weeds and improved all growth of maize plants and resulting in longest ears, the highest number of grains/row, the heaviest weight of 100 grains, the highest grain yield per feddan as compared with unweeded control treatment. Abd El-Lattief and Fakkar (2006) cleared that the most effective weed control treatment against maize weeds and enhancement growth characters, yield components and grain yield of maize was hand hoeing thrice at 15, 30 and 45 DAS as compared with other mechanical weed control treatments. Abouziena et al. (2007) observed that grain yields were improved with fluroxypyr applied 2 week after sowing (WAS) followed by one hand hoeing 6 WAS or hoeing at 3 WAS followed by bispyribac-Na applied 6 WAS. However, highest yields were obtained by hoeing early during the growing season.

Nitrogen plays a key role in plant nutrition. It is the mineral element that required in the greatest quantity by cereal crop plants especially maize and it is the nutrient most often deficit in the Egyptian soils. Thus, increasing application of nitrogen fertilizer levels led to significant increases in growth, yield and its components and quality characters of maize crop (El-Ganayni, 2000 ; El-Banna, 2001 ; El – Metwally et al., 2001 ; El-Murshedy, 2002 ; El-Shenawy, 2003 ; Ghazy, 2004 ; Abd-Alla, 2005 ; Soliman, Salwa, 2006 ; Wopereis et al., 2006 and Seadh and El-Zehery, 2007). In spit of mineral

fertilizers have a good effect on plant productivity, Schroder et al. (2000) stated that high nitrogen application rates are used by maize growers as an insurance, but may have an adverse effect on the environment. Therefore, it must be adjusted application of nitrogen rates to the amounts of soil mineral nitrogen present shortly before planting.

Consequently, this investigation was undertaken to appoint the effect of sowing methods, mechanical weed control and nitrogen fertilizer levels on growth, yield and its components of maize (*Zea mays* L.) Single Cross 10 (S.C. 10) under the environmental conditions of El-Sinbelaween Center, Dakahlia Governorate.

## MATERIALS AND METHODS

Two field experiments were carried out at the private field in El-Orman village, El-Sinbelaween Center, Dakahlia Governorate, during the seasons of 2005 and 2006 to determine the effect of sowing methods, mechanical weed control (number of hoeings) and nitrogen fertilizer levels on growth, yield and its components of maize (*Zea mays* L.) Single Cross 10 (S.C. 10).

Each sowing methods (Afeer, Hyrathy and Improved Hyrathy) was done in separate experiment. Maize grains were hand sown using aforementioned methods in hills 30 cm apart at the rate of 2 – 3 grains/hill on one side of the ridge. Dry sowing method (Afeer) was done using dry grains in dry land then irrigation. Wet sowing method (Hyrathy) was carried out using wet grains (soaked in water for 6 hours) in wet land (irrigated before 5 days). Improved Hyrathy method was implemented as the same of Hyrathy method, but grains were sown in the middle of the ridge at the depth of 12 cm.

Every experiment of sowing method was carried out in split plot design with four replications. The main plots were occupied with three mechanical weed control treatments (number of hoeings) *i.e.* without, one hoeing and two hoeing. The first hoeing was done before the first irrigation (21 days from sowing) and the second hoeing was performed before the second irrigation.

The sub plots were assigned to three nitrogen fertilizer levels (75, 100 and 125 kg N/fed). Nitrogen fertilizer in the form of ammonium nitrate (33.5 % N) was added at the formerly mentioned levels in two equal parts, one half after thinning (before the first irrigation) and the other half before the second irrigation.

Each experimental basic unit (sub – plot) included five ridges, each of 70 cm width and 3.0 m length, resulted an area of 10.5 $m^2$ (1/400 fed).

The soil of experimental site was characterized as a clay loam as shown in Table 1, which cleared some physical and chemical properties.

Calcium superphosphate (15.5 % $P_2O_5$) was applied during soil preparation at the rate of 150 kg/fed. Potassium sulphate (48 % $K_2O$) at the rate of 50 kg/fed was applied at the first dose of nitrogen fertilizer.

**Table 1: Physical and chemical soil characteristics at the experimental sites during 2005 and 2006 seasons.**

| Soil analysis | 2005 | 2006 |
|---|---|---|
| ***A: Mechanical analysis*** | | |
| Sand % | 21.79 | 21.63 |
| Silt % | 29.88 | 30.74 |
| Clay % | 48.33 | 47.63 |
| Texture | Clay loam | Clay loam |
| ***B: Chemical analysis*** | | |
| Organic matter | 1.92 | 1.88 |
| Available N (ppm) | 31.52 | 29.31 |
| Available P (ppm) | 10.23 | 9.81 |
| Available K (ppm) | 221 | 215 |
| pH | 7.71 | 7.69 |
| EC m. mohs/cm at 25$^0$C | 2.68 | 2.71 |

Maize grains were sown on 15$^{th}$ and 20$^{th}$ May in the first and second seasons, respectively using previously mentioned methods. The other agricultural practices were kept the same as normally practiced in maize fields according to the recommendations of Ministry of Agriculture and Land Reclamation, except for the factors under study.

**STUDIED CHARACTERS:**

**A- Growth characters:**

1- Number of days from sowing to 50 % tasseling:

After 75 days from planting, random samples of ten guarded plants were taken at random from each sub – plot to determine the following growth characters:

2- Plant height (cm).
3- Ear height (cm).
4- Height of air root (cm).
5- Ear leaf area (cm$^2$); it was calculated by the following formula according to Gardner *et al,* (1985):

- Ear leaf area = length X maximum width of ear leaf X 0.75

**B- Yield and its components:**

At harvest (after 120 days from planting) random samples of ten guarded plants were taken at random from each sub – plot to determine the following growth characters:

1- Number of ears/plant.
2- Ear length (cm).
3- Ear diameter (cm).
4- Number of rows/ear.
5- Number of grains/row.
6- Ear weight (g).
7- Ear grains weight (g).
8- Shelling percentage (%).
9- 100-grain weight (g).
10- Grain yield (ardab/fed); it was determined by the weight of grains per kilograms adjusted to 15.5 % moisture content of each plot, then converted to ardab per feddan (ardab = 140 kg).

**Statistical analysis**

All obtained data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the split – plot design to each experiment (sowing methods), then combined analysis was done between

sowing methods as published by Gomez and Gomez (1984) by using means of "MSTAT-C" computer software package. Least Significant of Difference (LSD) method was used to test the differences between treatment means at 5 % level of probability as described by Waller and Duncan (1969).

## RESULTS AND DISCUSSION

**I- Effect of sowing methods:**

Data presented in Tables 2, 3 and 4 illustrate that, the effect of sowing methods on number of days from sowing to 50 % tasseling, plant height, ear height, height of air root, ear leaf area, number of ears/plant, ear length, ear diameter, number of rows/ear, number of grains/row, ear weight, ear grains weight, shelling percentage, 100-grain weight and grain yield/fed was significant in both seasons of this investigation with exception shelling percentage in the second season only. There were substantial differences in all studied characters among various studied sowing methods (Afeer, Hyrathy and Improved Hyrathy) in both seasons. Since, sowing maize by Improved Hyrathy method produced the highest values of the previously mentioned characters, excluding height of air roots and shelling percentage in both seasons. On the other wise, traditional sowing method (Afeer method) gave the lowest values of these characters, except height of air roots in the two growing seasons. However, sowing with the Hyrathy method came in the second rank after sowing with the Improved Hyrathy method in both seasons. Such effects of Improved Hyrathy method might have been due to the improvement in germination percentage, reduced height of air root (Table 2) and then efficiency of root system in penetration soil, stable of plant and uptake water and nutrients. Similar results were reported by several researchers such as Shafshak et al. (1984), Roshdy (1988) and Oraby and Sarhan (2002).

**II- Effect of mechanical weed control:**

The effect of mechanical weed control via hoeing (number of hoeings) on maize growth, grain yield and its components was significant in both seasons, except shelling percentage in the second season only as shown in Tables 2, 3 and 4. From obtained results, it could be recommend that controlling weeds in maize fields by two hoeing before first and second irrigation markedly produced the highest values of all studied characters, except height of air root and shelling percentage in both seasons under the environmental conditions of this study. Whereas, controlling weeds in maize fields by one hoeing gave the best values of all studied characters after aforementioned treatment in the two growing seasons. On the other wise, control treatment (without hoeing) resulted in the lowest values of these characters, exclusion height of air root in both seasons.

This effect of increasing number of hoeings may be ascribed to high efficiency in safety weed control, disassembly surface layer of soil and then increasing root system. Confirming this conclusion by Donald (2000), Manceau and Blondel (2000), Sharma et al. (2000), Saad El-Din, Samia et al. (2004) and Abouziena et al. (2007).

**Table 2: Number of days from sowing to 50 % tasseling, plant height (cm), ear height (cm), height of air root (cm) and ear leaf area ($cm^2$) as affected by sowing methods, mechanical weed control and nitrogen fertilizer levels of maize during 2005 and 2006 seasons.**

| Characters / Treatments | No. of days from sowing to 50 % tasseling | | Plant height (cm) | | Ear height (cm) | | Height of air root (cm) | | Ear leaf area ($cm^2$) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2005 | 2006 | 2005 | 2006 | 2005 | 2006 | 2005 | 2006 |
| ***A- Sowing methods:*** | | | | | | | | | | |
| Afeer | 54.7 | 54.0 | 291.1 | 275.5 | 162.3 | 152.0 | 8.43 | 9.67 | 620.8 | 607.0 |
| Hyrathy | 55.7 | 55.5 | 303.7 | 293.3 | 168.8 | 155.4 | 6.02 | 5.70 | 635.6 | 640.9 |
| Improved Hyrathy | 61.0 | 57.0 | 310.8 | 302.1 | 173.4 | 164.6 | 0.55 | 1.83 | 655.7 | 645.2 |
| F. test | ** | ** | ** | ** | ** | ** | ** | ** | ** | ** |
| LSD 5 % | 2.2 | 0.8 | 4.5 | 5.6 | 2.2 | 3.1 | 0.30 | 0.36 | 10.9 | 13.9 |
| ***B- Weed control:*** | | | | | | | | | | |
| Without | 54.6 | 54.0 | 293 | 278.6 | 162.7 | 153.6 | 5.76 | 6.51 | 616.4 | 604.7 |
| One hoeing | 57.3 | 55.5 | 301 | 290.8 | 168.3 | 156.6 | 4.78 | 5.76 | 638.7 | 639.9 |
| Two hoeing | 59.6 | 57.0 | 310 | 301.4 | 173.5 | 161.7 | 4.46 | 4.93 | 657.0 | 648.5 |
| F. test | ** | ** | ** | ** | ** | ** | ** | ** | ** | ** |
| LSD 5 % | 1.8 | 0.7 | 2.4 | 2.3 | 1.8 | 1.9 | 0.23 | 0.27 | 8.3 | 13.0 |
| ***C- Nitrogen fertilizer levels:*** | | | | | | | | | | |
| 75 kg N/fed | 55.8 | 54.1 | 288.0 | 278.3 | 161.7 | 151.0 | 4.96 | 5.66 | 568.5 | 567.6 |
| 100 kg N/fed | 57.2 | 55.7 | 303.5 | 290.1 | 168.7 | 157.8 | 5.00 | 5.68 | 653.8 | 645.2 |
| 125 kg N/fed | 58.5 | 56.7 | 314.1 | 302.3 | 174.1 | 163.2 | 5.03 | 5.86 | 689.8 | 680.2 |
| F. test | ** | ** | ** | ** | ** | ** | NS | ** | ** | ** |
| LSD 5 % | 0.6 | 0.5 | 1.7 | 2.1 | 1.1 | 1.4 | - | 0.12 | 9.8 | 9.5 |

**Table 3: Number of ears/plant, ear length and diameter (cm), number of rows/ear and number of grains/row as affected by sowing methods, mechanical weed control and nitrogen fertilizer levels of maize during 2005 and 2006 seasons.**

| Characters / Treatments | Number of ears/plant | | Ear length (cm) | | Ear diameter (cm) | | Number of rows/ear | | Number of grains/row | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2005 | 2006 | 2005 | 2006 | 2005 | 2006 | 2005 | 2006 |
| ***A- Sowing methods:*** | | | | | | | | | | |
| Afeer | 1.04 | 1.05 | 18.92 | 18.14 | 4.38 | 3.50 | 12.04 | 11.72 | 42.6 | 39.2 |
| Hyrathy | 1.07 | 1.07 | 19.72 | 19.10 | 4.51 | 3.79 | 12.57 | 12.28 | 44.9 | 42.7 |
| Improved Hyrathy | 1.09 | 1.10 | 20.34 | 19.86 | 4.66 | 4.19 | 13.03 | 12.75 | 46.5 | 45.7 |
| F. test | ** | * | ** | ** | ** | ** | ** | ** | ** | ** |
| LSD 5 % | 0.02 | 0.03 | 0.11 | 0.07 | 0.04 | 0.07 | 0.20 | 0.19 | 0.2 | 1.3 |
| ***B- Weed control:*** | | | | | | | | | | |
| Without | 1.01 | 1.03 | 18.91 | 18.19 | 4.36 | 3.69 | 12.18 | 11.90 | 43.1 | 41.4 |
| One hoeing | 1.08 | 1.07 | 19.75 | 19.06 | 4.52 | 3.84 | 12.59 | 12.31 | 45.0 | 42.5 |
| Two hoeing | 1.11 | 1.11 | 20.32 | 19.85 | 4.67 | 3.95 | 12.88 | 12.53 | 45.9 | 43.6 |
| F. test | ** | ** | ** | ** | ** | ** | ** | ** | ** | ** |
| LSD 5 % | 0.04 | 0.03 | 0.13 | 0.07 | 0.03 | 0.06 | 0.10 | 0.11 | 0.3 | 0.6 |
| ***C- Nitrogen fertilizer levels:*** | | | | | | | | | | |
| 75 kg N/fed | 1.00 | 1.00 | 19.13 | 18.32 | 4.36 | 3.71 | 12.19 | 11.90 | 42.8 | 41.3 |
| 100 kg N/fed | 1.07 | 1.08 | 19.72 | 19.01 | 4.54 | 3.83 | 12.55 | 12.26 | 45.1 | 42.7 |
| 125 kg N/fed | 1.13 | 1.13 | 20.13 | 19.76 | 4.66 | 3.93 | 12.91 | 12.59 | 46.1 | 43.5 |
| F. test | ** | ** | ** | ** | ** | ** | ** | ** | ** | ** |
| LSD 5 % | 0.03 | 0.02 | 0.09 | 0.13 | 0.02 | 0.05 | 0.12 | 0.07 | 0.2 | 0.5 |

**Table 4: Ear weight (g), ear grains weight (g), shelling percentage, 100-grain weight (g) and grain yield (ardab/fed) as affected by sowing methods, mechanical weed control and nitrogen fertilizer levels of maize during 2005 and 2006 seasons.**

| Characters / Treatments | Ear weight (g) | | Ear grains weight (g) | | Shelling (%) | | 100-grain weight (g) | | Grain yield (ardab/fed) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2005 | 2006 | 2005 | 2006 | 2005 | 2006 | 2005 | 2006 |
| ***A- Sowing methods:*** | | | | | | | | | | |
| Afeer | 241.6 | 223.4 | 203.5 | 187.6 | 84.4 | 84.1 | 37.56 | 34.94 | 25.06 | 22.50 |
| Hyrathy | 255.0 | 232.5 | 219.8 | 202.1 | 86.3 | 85.0 | 39.99 | 37.23 | 27.12 | 24.66 |
| Improved Hyrathy | 280.5 | 262.6 | 231.9 | 219.3 | 82.7 | 83.5 | 40.75 | 39.01 | 28.33 | 27.44 |
| F. test | ** | * | ** | ** | ** | NS | ** | ** | ** | ** |
| LSD 5 % | 3.4 | 13.1 | 2.0 | 2.6 | 1.3 | - | 2.00 | 0.57 | 0.19 | 0.36 |
| ***B- Weed control:*** | | | | | | | | | | |
| Without | 246.6 | 231.2 | 208.8 | 196.0 | 84.8 | 84.9 | 37.83 | 36.19 | 25.39 | 23.92 |
| One hoeing | 258.0 | 235.9 | 219.6 | 203.2 | 85.2 | 84.3 | 39.72 | 37.03 | 26.77 | 24.76 |
| Two hoeing | 272.5 | 251.5 | 226.8 | 209.9 | 83.4 | 83.4 | 40.75 | 37.96 | 28.35 | 25.93 |
| F. test | ** | ** | ** | ** | ** | NS | ** | ** | ** | ** |
| LSD 5 % | 2.5 | 8.2 | 1.5 | 1.7 | 1.1 | - | 1.46 | 0.24 | 0.19 | 0.27 |
| ***C- Nitrogen fertilizer levels:*** | | | | | | | | | | |
| 75 kg N/fed | 237.1 | 218.5 | 204.0 | 190.83 | 86.2 | 85.3 | 38.12 | 36.28 | 25.00 | 23.41 |
| 100 kg N/fed | 263.6 | 244.1 | 221.4 | 204.94 | 84.1 | 84.0 | 39.84 | 37.09 | 27.16 | 25.01 |
| 125 kg N/fed | 276.5 | 256.0 | 229.8 | 213.36 | 83.1 | 83.3 | 40.34 | 37.80 | 28.35 | 26.18 |
| F. test | ** | ** | ** | ** | ** | ** | ** | ** | ** | ** |
| LSD 5 % | 1.7 | 9.7 | 1.5 | 1.2 | 0.9 | 0.9 | 1.42 | 0.17 | 0.17 | 0.20 |

**III- Effect of nitrogen fertilizer levels:**

The data revealed in Tables 2, 3 and 4 show that the effect of nitrogen fertilizer levels on all studied characters was significant in the two seasons, except height of air root in the first season only. It can be stated that all studied characters significantly increased as a result of increasing nitrogen fertilizer levels from 75 up to 125 kg N/fed and the differences between them were obvious in both seasons. Application the highest level of nitrogen fertilizer (125 kg N/fed) produced the highest values of growth parameter, grain yield and its components in both seasons. Fertilizing maize plants with 100 kg N/fed came in the second rank after fertilizing with 125 kg N/fed with respect to these characters with lowest difference compared with increasing nitrogen fertilizer levels from 75 to 100 kg N/fed in both seasons. It means that the response of maize to increasing nitrogen fertilizer levels was up to 125 kg N/fed.

The increases in growth, yield and its components of maize crop as a result of increasing nitrogen fertilizer level up to 125 kg N/fed can be easily ascribed to the low soil content of available nitrogen, phosphorus and potassium (Table 1), hence nitrogen considers one of the major elements for plant nutrition and it increases the vegetative growth through enhancing leaf initiation, increment chlorophyll concentration in leaves and photosynthesis process. Moreover, nitrogen encourages plant to uptake other elements and activating accumulation of carbohydrates, which translated from leaves to developing roots which in turn enhanced ear length and diameter, ear weight, ear grains weight and 100-grain weight and finally grain yield per unit area. Similar results were in coincidence with those stated by Ghazy (2004), Abd-Alla (2005), Soliman, Salwa (2006), Wopereis et al. (2006) and Seadh and El-Zehery (2007).

**IV- Effect of interaction:**

The effect of interaction between sowing methods and weed control treatments on grain yield (ardab/fed) was significant in the first seasons, but was insignificant in the second season (Table 5). The optimum treatment that produced the highest values of grain yield was utilization Improved Hyrathy method + two hoeing, where its results were 30.11 ardab/fed as illustrated in Table 26. It was followed by the treatment of using Hyrathy method + two hoeing in both seasons.

Data presented in Table 6 indicate that the interaction between sowing methods and nitrogen fertilizer levels had a significant effect on grain yield/fad during the first and second seasons. Grain yield was significantly increased with every increase in nitrogen fertilizer under studied sowing methods. Moreover, the highest means of grain yield were produced with the application Improved Hyrathy + 125 kg N/fed, which resulted were 29.62 and 28.80 ardab/fad in the first and second seasons, respectively.

The effect of interaction among sowing methods, weed control and nitrogen fertilizer levels on grain yield (ardab/fad) was significant in the first and second seasons as presented in Table 7. It can be observed that, the highest values of grain yield (31.75 and 30.05 ardab/fed/fed) were resulted from sowing maize by Improved Hyrathy method and controlling weeds by hoeing at two times in addition of 125 kg N/fed in the first and second

seasons, respectively. Application Improved Hyrathy method and controlling weeds by twice hoeing beside adding 100 kg N/fed came to in the second rank after previously mentioned treatment in both seasons.

It can be concluded that planting maize through Improved Hyrathy method, controlling weeds by hoeing at two times and mineral fertilizing with 125 kg N/fad in order to maximizing its productivity under the environmental conditions of El-Sinbelaween Center, Dakahlia Governorate.

**Table 5: Grain yield (ardab/fed) of maize as affected by the interaction between sowing methods and weed control during 2005 season.**

| Weed control / Sowing methods | Without | One hoeing | Two hoeing |
|---|---|---|---|
| Afeer | 23.93 | 25.05 | 26.20 |
| Hyrathy | 25.49 | 27.14 | 28.74 |
| Improved Hyrathy | 26.75 | 28.14 | 30.11 |
| F. test | | * | |
| LSD 5 % | | 0.34 | |

**Table 6: Grain yield (ardab/fed) of maize as affected by the interaction between sowing methods and nitrogen fertilizer levels during 2005 and 2006 seasons.**

| Seasons / Treatments | 2005 season | | | 2006 season | | |
|---|---|---|---|---|---|---|
| | 75 kg N/fed | 100 kg N/fed | 125 kg N/fed | 75 kg N/fed | 100 kg N/fed | 125 kg N/fed |
| Afeer | 22.94 | 25.40 | 26.84 | 20.85 | 22.60 | 24.05 |
| Hyrathy | 25.28 | 27.50 | 28.59 | 23.61 | 24.67 | 25.70 |
| Improved Hyrathy | 26.80 | 28.58 | 29.62 | 25.78 | 27.75 | 28.80 |
| F. test | | * | | | * | |
| LSD 1 % | | 0.39 | | | 0.46 | |

**Table 7: Grain yield (ardab/fed) of maize as affected by the interaction among sowing methods, weed control and nitrogen fertilizer levels during 2005 and 2006 seasons.**

| Seasons / Treatments | | 2005 season | | | 2006 season | | |
|---|---|---|---|---|---|---|---|
| | | 75 kg N/fed | 100 kg N/fed | 125 kg N/fed | 75 kg N/fed | 100 kg N/fed | 125 kg N/fed |
| Afeer | Without | 21.87 | 24.47 | 25.45 | 19.6 | 22.0 | 23.1 |
| | One hoeing | 22.85 | 25.32 | 26.97 | 21.0 | 22.3 | 23.9 |
| | Two hoeing | 24.10 | 26.42 | 28.10 | 21.8 | 23.4 | 25.1 |
| Hyrathy | Without | 23.70 | 25.87 | 26.90 | 22.4 | 23.4 | 24.7 |
| | One hoeing | 25.10 | 27.60 | 28.72 | 23.5 | 24.8 | 25.5 |
| | Two hoeing | 27.05 | 29.02 | 30.15 | 24.8 | 25.7 | 26.8 |
| Improved Hyrathy | Without | 25.52 | 26.87 | 27.85 | 25.1 | 27.1 | 27.6 |
| | One hoeing | 26.80 | 28.35 | 29.27 | 25.6 | 27.2 | 28.7 |
| | Two hoeing | 28.07 | 30.52 | 31.75 | 26.6 | 28.8 | 30.0 |
| F. test | | | * | | | * | |
| LSD 5 % | | | 0.51 | | | 0.60 | |

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## إستجابة نمو ومحصول الذرة الشامية لطرق الزراعة ، المقاومة الميكانيكية للحشائش ومستويات السماد النيتروجينى

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**قسم المحاصيل – كلية الزراعة – جامعة المنصورة.**

أقيمت التجارب الحقلية بمزرعة خاصة بقرية الأورمان – مركز السنبلاوين – محافظة الدقهلية خلال موسمى ٢٠٠٥ و ٢٠٠٦ لدراسة تأثير طرق الزراعة (عفير ، حيراثى وحيراثى معدلة)، المقاومة الميكانيكية للحشائش (بدون عزيق ، عزقة واحدة وعزقتان) ومستويات السماد النيتروجينى (٧٥ ، ١٠٠ و١٢٥ كجم نيتروجين/فدان) على صفات النمو والمحصول ومكوناته لمحصول الذرة الشامية هجين فردى ١٠. ونفذت التجارب فى تصميم القطع المنشقة مرة واحدة ذو أربع مكررات لكل طريقة زراعة ثم أجرى التحليل التجميعى لطرق الزراعة. ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى:

أدى زراعة محصول الذرة الشامية بطريقة الزراعة الحيراثى المعدلة إلى زيادة معنوية والحصول على أعلى القيم لجميع الصفات تحت الدراسة مقارنة بالزراعة بالطرق الأخرى (العفير والحيراثى) فى موسمى الدراسة.

مقاومة الحشائش المنشرة فى حقول الذرة الشامية ميكانيكياً من خلال عزقتين أدت إلى زيادة ملحوظة فى جميع صفات النمو والمحصول ومكوناته تحت الدراسة مقارنة ببدون عزيق أو إجراء عزقة واحدة فقط فى كلا موسمى الدراسة.

أدى تسميد محصول الذرة الشامية بـ ١٢٥ كجم نيتروجين/فدان إلى تفوق معنوى على مستويات التسميد النيتروجينى الأخرى (٧٥ و ١٠٠ كجم نيتروجين/فدان) كما نتج عنها أعلى القيم لكل من صفات النمو ، مكونات المحصول ومحصول الحبوب خلال موسمى الدراسة.

*توصى الدراسة بزراعة الذرة الشامية صنف هجين فردى ١٠ بطريقة الزراعة الحيراثى المعدلة وإجراء عملية العزيق مرتان والتسميد النيتروجينى بمعدل ١٢٥ كجم نيتروجين/فدان للحصول على أعلى نمو ومحصول تحت ظروف مركز السنبلاوين – محافظة الدقهلية.*