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EFFECT OF SOME WEED CONTROL TREATMENTS AND FOLIAR FERTILIZATION ON GROWTH, YIELD AND ITS COMPONENTS, CHEMICAL COMPOSITION AND ASSOCIATED WEEDS OF MAIZE PLANTS AT NOBARYA

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ABSTRACT

Two field experiments were conducted at experimental Farm of National Research Centre at Nobarya during 1998 and 1999 seasons to study the effect of some weed control treatments [unweeded – Hand hoeing – Fluroxypyr herbicide] and foliar micro elements fertilization (Greensit and Stemifule) on growth, yield and its components, chemical composition and associated weeds of maize plants.

The main results could be summarized as follows :

All weed control treatments alone or in combination with foliar fertilization had significant effect on fresh and dry weight of maize weeds after 45 and 75 days from sowing. The highest efficiency in decreasing fresh and dry weight of total weeds was obtained by hand hoeing with Greensit or with Stemifule followed by Fluroxypyr with Greensit or with Stemifule.

All weed control treatments as well as both microelements fertilizer treatments markedly increased growth characters of maize [plant height, No. of leaves per plant, Fresh weight of plant and leaf area] yield and its components [number of ears, ear length and diameter, No. of grains/row, weight of ear grains per plant, weight of 100 grains and grains yield/fed. as well as chemical composition [oil %, protein % and total carbohydrates %], Maximum values were obtained by hand hoeing with Greensit or with Stemifule followed by Fluroxypyr with Greensit or with Stemifule. On other hand, the lowest values were obtained by unweeded plants.

INTRODUCTION

Maize (*Zea mays*, L.) is one of the most important cereal crops in the world. In Egypt, maize is considered one of the main cereal crops, it ranks the third after wheat and rice in Egypt. The cultivated area with maize is limited to meet the increasing demand of human consumption and animal feedings. Maximizing crop yields of high yielding varieties depends today on fertilizers and herbicides. The infestation of maize fields with weed is known to be a major constrain for obtaining high yield (Nieto, 1970).

Under the current crop production practices simultaneous or sequential application of herbicides as other agricultural chemicals like foliar fertilizers are made in single cropping season. Whether applied in a mixture or sequentially, these chemicals may undergo a change in physical and chemical characters which could eventually tend to enhancement or reduction in the efficacy of one or more compounds. A normally safer herbicide might prove to be toxic to crop or an effective compound may show reduced activity on a weed species.

Weed control treatments play an active role for raising grain yield in maize since weeds cause great losses in yield. As hand labor become scarce and costly, herbicides replaced it as a cheep and easy method for weed control in maize fields. In general application of herbicides depend not only on its efficiency in controlling weeds, but also on its effect on maize plants. In this respect Metwally *et al.* (1994) found that hand hoeing treatment significantly decrease the growth of broad leaf weeds and most annual weeds as well as improved the growth of maize plants and

produced the longest ears the highest number of grains/row and the highest grain. Hussein (1996) found that controlling weeds by hand hoeing decrease in nutrient uptake by weeds and increase in maize grain yield/fed. Mosalem and Shady (1996) reported that the herbicidal treatments significantly increased plant height, ear length and diameter, number of kernels/row, ear weight, shelling %, 100 kernel weight and grain yield/fed of maize. El-Moursy and Badawi (1998), stated that hand hoeing treatment resulted in significant increase in all studied growth characters and grain yield/fed. while decrease dry weight of broad leaved and grassy weeds as compared with unweeded. El-Mersawy and El-Mashed (2000) indicated that post-emergence herbicide and hand hoeing gave the highest percent reduction in fresh weight of broad leaved weeds. Finally, El-Metwally *et al.* (2001) recorded that maximum values of growth characters as well as grain yield/fed. were recorded from hand hoeing, followed by that of Fluroxypyr. Also the highest efficiency in decreasing fresh and dry weight of total weeds was obtained by hand hoeing twice followed by Fluroxypyr treatments. On the other hand, El-Metwally (2002) reported that Fluroxypur treatment gave the best control of broad leaved weeds followed by that of two hand hoeing.

With respect to the effect of foliar fertilizer on plants Rodrigues and Querires (1995) reported that foliar fertilizer application significantly increased total chlorophyll content of leaves and dry weight, total protein and ash content of leaves, El-Quesni, *et al.* (2002) mentioned that foliar application of Stemifule decreased significantly the total weeds grown in soybean field and increased significantly photosynthetic pigments in leaves, total carbohydrate and protein content. Latha (2003) reported that foliar application of zinc gave positive on N, P, K, Cu, Fe, Mn and Zn at different growth stages of maize.

The objective of the present investigation was to study the efficiency of some chemical and mechanical weed control treatments and foliar fertilization on the growth and yield of maize plants, as well as its components and chemical composition of grains during its growth and harvest stage at Nobarya.

MATERIALS AND METHODS

Two field experiments were carried out during the two summer season 1998 and 1999 at the Agricultural Experimental Farm of National Research Centre at Nobarya. Beheria Governorate, Egypt. The purpose was to study the influence of some weed control treatments and spraying with micronutrients elements on growth, yield and its components of maize cv. Single 10 (SC10) as well as the associated weeds.

The experiment included nine treatments:

1. Untreated plants (control).
2. Hand hoeing treatments were carried out twice, (3 and 5 weeks after sowing).
3. Fluroxypyr (Starane 20 %) : (4-Amino-3,5-Dichloro-6-Floro-z-pyridloxy acetic acid) was applied at rate of 0.2 L/fed. as post-emergence after 23 days from sowing.
4. Greensit (1 cm/liter) [70 g/L (N), 20 g/L (P), 29 g/L (K), 10 g/L (Mg), 1000 mg/L (Fe), 100 mg/L (Mn), 50 mg/L (Zn), 10 mg/L (Cu)].
5. Stemifule (1 gm/liter) [20 % (N), 10 % (P), 10 % (K), 1000 ppm (Mg), 1500 ppm (Zn), 1400 ppm (Fe), 1700 ppm (Mn), 500 ppm (Cu)].
6. Hand hoeing + Greensit.
7. Hand hoeing + Stemifule.
8. Fluroxypyr + Greensit
9. Fluroxypyr + Stemifule

The micronutrients were sprayed as foliar spray (200 L/fed.), twice, the first dose was applied 30 days after sowing and the second equal dose was 15 days later.

The experimental design was randomized complete block arrangement replicated four times.

The soil of the experiment was sandy. The mechanical analysis (Piper, 1950) and chemical analysis (Jackson, 1958) of soil were carried out before sowing presented in Table (1).

Grains were sown in 20 and 23 May in the first and second seasons, respectively in hills spaced 30 cm apart. Thinning to one plant per hill was done after 20 days from sowing. After the first sowing farmyard manure at a rate of 40 m3 per feddan and calcium super-phosphate (15.5 % P2O5) at a rate of 150 kg per fed. and potassium sulphate (48% K2O) at a rate of 100 kg per fed. were added. Nitrogen fertilizer was applied as ammonium sulphate (20 % N) in two equal doses at 20 and 35 days after sowing, respectively.

The total fresh and dry weight of weeds per square meter in each plot was determined 45 and 75 days after sowing. The different weeds were separated into the following two groups, i.e. 1- Broad leaved, 2- Grasses. At 90 days after sowing random sample of plant from each replicate was taken and plant height, No. of leaves per plant, area of leaf, fresh weight and dry weight of plant were determined.

Table (1) : Mechanical and chemical analyses of Nobarya soil before executing the experiment.

Components	Value
Mechanical analyses :	
Soil fraction :	
Sand %	75.6
Sit %	17.4
Clay %	5.5
Texture class	Sandy
Chemical analyses :	
pH	7.9
E.C.	0.11 mmhos/cm.
CO_3	-
HCO_3	2.5 meq/100 g. soil
Cl^-	1.0 meq/100 g. soil
Ca^{+2}	2.5 meq/100 g. soil
Mg^{+2}	1.0 meq/100 g. soil
Na	1.3 meq/100 g. soil
K^+	0.05 meq/100 g. soil
Total nitrogen	350 ppm

m.equivalent/100 g. soil.

Each group was weighted separately. The plant were harvested at maturity after 120 days from sowing, in the two successive seasons. At harvest time, random samples of four plant from each plot were taken for determining, number of ears, weight of ears, ear length and diameter, weight of ear, No. of rows/ear, No. of grains/row, ear grain weight, weight of 100 grains and grains yield (ardab/fed.).

Chemical analysis :

The chemical constituents of the grains were determined in samples previously even dried (at 75°C) and finally grounded into powder materials:

1. Oil content: for determining oil %, duplicate samples were analyzed according to the method described and used by Bedov (1971), using soxhlet equipment.
2. Total nitrogen content was estimated by the kjeldahl method (Ranganna, 1979). N values were multiplied by 6.25 to calculate protein content.
3. Total carbohydrates was carried out according to modified Shaffer and Hartman method (1921).

The obtained results were statistically analysed as randomized complete block experiment. All data obtained were statistically analyzed according to the method adopted by Snedecor and Cochran (1967), L.S.D. at 5 % level of significance was used to compare between means.

RESULTS AND DISCUSSION

A. Effect on fresh and dry weight of weeds :

During the two growing seasons of maize crop, the weeds observed after 45 and 75 days from sowing were as follows:

1. **Annual broad leaved** : *Hibisucs trionum*, L.; *Portulace oleracae*, L. *Xanthium spinosum*, L. *Corchorus olitorius*, L. and *Solanum nigrum* L.
2. **Annual grasses** : *Echinochloa colonum*, L. and *Echinochloa crus-gali*, L.

In both seasons data presented in Table (2) show significant effects on fresh and dry weight of broad-leaved, grasses and total weeds after 45 and 75 days from sowing.

The highest efficiency in decreasing fresh and dry weights of broad leaved weeds was obtained by Fluroxypyr followed by hand hoeing treatments. Hand hoeing exerted the highest reduction in fresh and dry weights of grass weeds followed by that Fluroxypyr treatment. The lowest values of fresh and dry weights of total weeds after 45 and 75 from sowing were recorded when maize field was hoed two times followed by Fluroxypyr. On the other hand the highest fresh and dry weights of broad-leaved, grasses and total weeds were recorded when maize plants were unweeded.

Generally, the results in Table (2) indicated that all weed control treatments alone or combined with spraying by micro-elements fertilizer used in this study decreased significantly fresh and dry weights of broad leaved, grasses and total weeds as compared to unweeded treatment. These results may be due to the inhibition effect of weed control treatments on growth of weeds. Hand hoeing was the most effective for controlling maize weeds. This may be due to attributable efficiency of hoeing in stunting of weeds.

Similar observations were reported by El-Gazzar *et al.* (1996), Mosalem and Shady (1996), Rout and Satapathy (1996), El-Moursy and Badawi (1998), Ahmed (1999), El-Metwally, *et al.* (2001) and El-Metwally (2002).

The results clear that foliar micronutrients spraying combined with hand hoeing or Fluroxypyr gave the highest efficiency in decreasing fresh and dry weights of total weeds, whereas foliar fertilizer alone caused no significant effect on fresh or dry weights of weeds.

B. Effect on growth of maize plants :

Data recorded in Table (3) indicate that plant height, number of leaves/plant, area of leaf as well as fresh and dry weights of maize plants

after 90 days from sowing were significantly increased as compared with unweeded treatment as a result of controlling weeds by different weed control treatment alone or in combination with microelements spraying. Maximum values were obtained by hand hoeing + Greensit or with Stemifule followed by that of Fluroxypyr + Greensit or with Stemifule. On the other side, the lowest value was recorded by unweeded treatment.

Generally, it could be stated that hand hoeing and Fluroxypyr increased the reduction in fresh and dry weight of weeds grown with maize plants in Table (2) and minimized the weed competition for maize plants and consequently increased the capacity of maize plants in utilizing the environmental factors, i.e. light, mineral nutrient, water and carbon dioxide in building great amount of metabolites available for building new tissues and this might account for the previous finding. These results are in harmony with those reported by El-Moursy and Badawi (1998), Ahmed (1999), El-Metwally *et al.* (2001), and El-Metwally (2002).

It can be seen also from data mentioned in Table (3) that all growth characters of maize plants, i.e. plant height, area of leaf fresh and dry weight as well as number of leaves/plant after 90 days from sowing were significantly increased by application of micro elements (Greensit or Stemifule) alone or in combination with weed control treatments as compared to control. The highest values were recorded when maize plants were sprayed with Greensit + hand hoeing.

The increase in growth characters as a result of spraying micro-elements fertilizer may be attributed to enhance the activity of photosynthesis and protein synthesis in leaves, which in turn encourage photosynthetic apparatus, also the increase in growth characters when micro-elements were applied (Joshi *et al.* 1974). Similar results were mentioned by Nassar *et al.* (2000), El-Quesni *et al.* (2002) and Latha, (2003).

C. Effect on yield and its components :

Data recorded in Table (4) demonstrate clearly that elimination of weeds by hand hoeing and herbicides alone or in combination with microelements markedly increased ear length, ear diameter, ear weight, number of grains/row, ear grains weight, weight of 100 grain and grain yield as compared to unweeded treatment. In both seasons, hand hoeing + Greensit or Stemifule recorded the highest values of the previously mentioned characters followed by that of Fluroxypyr + Greensit or with Stemifule. On the other hand, the lowest values of the previously mentioned characters were recorded with unweeded treatment.

The superiority of hand hoeing and Fluroxypyr treatments in producing high grain yield might be due to their high efficiency in controlling weeds without damage to maize plants. This reduced the competitive effect of weeds and leading to the grain in grain yield. The improving impact of effective hand hoeing and herbicides on maize grain yield was also reported by El-Gazzar *et al.* (1996), Rout and Satapathy (1996), El-Moursy and Badawi (1998), Sharma *et al.* (1998), Ahmed (1999), El-Metwally, *et al.* (2001) and El-Metwally, (2002).

Table (2) : Effect of some weed control treatments and foliar fertilization on fresh and dry weights of weeds (Averages of two seasons 1998 and 1999).

Treatments	After 45 days from sowing						After 75 days from sowing					
	Broad leaved (g)		Grasses (g)		Total weeds (g)		Broad leaved (g)		Grasses (g)		Total weeds (g)	
	Fresh wt.	Dry wt.	Fresh wt.	Dry wt.	Fresh wt.	Dry wt.	Fresh wt.	Dry wt.	Fresh wt.	Dry wt.	Fresh wt.	Dry wt.
Unweeded	795.0	198.3	454.6	98.0	1230.4	98.3	938.0	232.0	525.3	110.0	1463.3	342.0
Hand hoeing	118.0	27.6	54.3	12.5	172.5	40.1	155.0	41.3	67.2	15.8	222.2	37.1
Fluroxypyr	42.3	11.2	183.7	37.8	226.0	49.0	57.3	15.6	212.5	58.6	265.8	74.2
Greensit	760.0	187.6	433.5	03.9	1193.5	283.2	393.0	224.3	518.3	102.3	1411.6	326.6
Stemifule	765.0	189.0	438.2	99.0	1201.2	288.0	902.3	225.2	522.0	107.5	1424.5	332.2
Hand hoeing + Greensit	86.8	26.0	33.6	8.3	119.9	34.2	95.8	25.2	45.6	10.3	140.8	36.1
Hand hoeing + Stemifule	88.3	26.3	37.0	8.9	125.3	35.2	99.3	26.2	49.5	11.6	149.1	36.8
Fluroxypyr + Greensit	31.5	9.3	150.3	30.3	181.8	39.6	37.6	10.2	178.0	46.3	226.6	56.5
Fluroxypyr + Stemifule	33.0	9.6	160.2	31.9	193.2	41.4	39.5	10.5	186.3	48.6	228.8	59.1
L.S.D. at 5 %	30.3	8.46	26.9	5.8	42.6	15.2	43.9	8.5	16.7	8.2	55.3	16.8

Table (3) : Effect of weed control treatments and foliar fertilization on growth characters after 90 days from sowing. (Average two seasons 1998 and 1999).

Treatments	Plant height (cm)	No. of leaves/plant	Area of leaf (cm)	Fresh weight of plant (g)	Dry weight of plant (g)
Unweeded	269	17.0	600	470.0	129.5
Hand hoeing	307	20.5	650	620.3	158.6
Fluroxypyr	295	19.3	630	575.2	146.8
Greensit	288	18.2	623	560.0	140.3
Stemifule	285	18.0	613	557.2	138.5
Hand hoeing + Greensit	329	22.6	650	685.3	172.2
Hand hoeing + Stemifule	325	22.5	656	678.6	171.5
Fluroxypyr + Greensit	316	20.30	647	638.8	153.3
Fluroxypyr + Stemifule	311	20.10	644	627.6	150.8
L.S.D. at 5 %	16.2	1.25	22.11	26.5	7.2

Table (4) : Effect of weed control treatments and foliar fertilization on yield and its components of maize. (Average of two seasons 1998 and 1999).

Treatments	Ear length (cm)	Ear diameter (cm)	Ear weight (g)	No. of row/ear	No. of grains row (g)	Ear grains weight (g)	100 grain weight (g)	Grain yield/ fed. ardab
Unweeded	16.20	3.89	268.3	11.82	32.3	125.3	31.5	23.61
Hand hoeing	20.84	4.75	340.5	12.93	40.5	191.5	39.3	32.38
Fluroxypyr	19.88	4.55	319.3	12.63	39.9	175.2	36.8	29.22
Greensit	18.50	4.31	295.6	11.96	36.5	146.6	33.3	25.60
Stemifule	18.12	4.23	288.0	31.90	36.0	143.8	33.0	25.20
Hand hoeing + Greensit	22.64	5.21	368.3	13.25	49.2	208.3	44.0	34.20
Hand hoeing + Stemifule	22.93	5.45	859.0	13.78	48.9	206.0	43.6	33.90
Fluroxypyr + Greensit	21.52	4.89	333.0	12.90	43.8	195.5	40.5	31.70
Fluroxypyr + Stemifule	21.45	4.80	328.3	12.90	43.0	192.0	39.9	31.30
L.S.D. at 5 %	2.1	0.65	12.11	0.60	2.4	5.31	1.3	1.2

Results also indicated that there was a significant interaction effect between weed control treatments and micronutrient elements on ear grains weight and grain yield/fed. Greensit or with Stemifule + hand hoeing gave highest values of grain yield/fed. when compared with other treatments. On the other hand the lowest values of ear grain weight and grain yield/fed. were noticed by unweeded treatments. Similar results were reported by El-Quesni, *et al.* (2002).

D. Effect on chemical composition :

Data presented in Table (5) show the effect of different weed control treatments and microelement fertilizer on chemical composition of maize grains. Data in Table (5) indicated that all weed control treatments alone or in combination with micro elements fertilizer caused increases in percentages of oil, protein and total carbohydrates. The highest values of oil, protein and carbohydrates were observed from hand hoeing + Greensit or with Stemifule followed by Fluroxypyr with Greensit or with Stemifule. Whereas the lowest value was recorded from unweeded plants.

Table (5) : Effect of some weed control treatments and foliar fertilization on chemical composition of maize grains. (Average of two seasons 1998 and 1999).

Treatments	Protein %	Oil %	Total carbohydrates of grains
Unweeded	9.40	4.30	58.06
Hand hoeing	9.87	4.90	65.90
Fluroxypyr	9.65	4.80	61.20
Greensit	9.88	4.85	63.92
Stemifule	9.89	4.83	61.22
Hand hoeing + Greensit	10.30	5.20	68.00
Hand hoeing + Stemifule	10.18	5.01	67.20
Fluroxypyr + Greensit	10.11	4.96	65.21
Fluroxypyr + Stemifule	10.03	4.90	64.93

Superiority of chemical contents in maize grains as a result from the application of some weed control treatments might be due to higher suppression in weeds which minimizing their ability to complete. These results are in agreement with those obtained by Ahmed (1999), El-Metwally, *et al.* (2001) and El-Metwally (2002).

Also results indicate that micro elements alone or in combination with weed control application had significant effect on the percentages of oil and protein as well as carbohydrate of maize grains as compared to control. The results are also in good agreement with those obtained by Ahmed *et al.* (2001) and El-Quesni *et al.* (2002).

It can be concluded that in general hand hoeing twice and application of Fluroxypyr herbicide treatments decreased significantly the fresh and dry weights of maize weeds. Such results cleared that hand hoeing and Fluroxypyr herbicide treatments as well as foliar fertilization treatments were efficient in increasing productivity of maize and highest grain yield of maize can be obtained by hand hoeing twice with Greensit or Stemifule followed by Fluroxypyr with Greensit or Stemifule.

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تأثير الرش ببعض معاملات مكافحة الحشائش والتسميد الورقى على النمو والمحصول والتركيب الكيميائى والحشائش المصاحبة لنبات الذرة فى النوبارية

صنعة حسين الجيار

قسم النبات – المركز القومى للبحوث – الدقى – القاهرة – مصر

اجريت تجربتان حقليتان بمزرعة المركز القومى للبحوث بالنوبارية خلال موسمى ١٩٩٨ ، ١٩٩٩ لدراسة تأثير بعض معاملات مكافحة الحشائش (بدون مقاومة – العزيق مرتين – مبيد فلوركسيبير) وكذلك الرش ببعض اسمدة العناصر الصغرى (جرينست – ستيمفول) على النمو والمحصول ومكوناته والتركيب الكيميائى والحشائش المصاحبة لنبات الذرة وكانت النتائج كالآتى:

١- ادى استخدام معاملات الحشائش سواء بمفردها او مع العناصر الصغرى الى حدوث نقص معنوى فى الوزن الكلى الغض والجاف للحشائش المصاحبة للذرة واظهرت معاملة العزيق مع جرينست او مع ستيمفول اعلى كفاءة فى مكافحة الحشائش تليها المعاملة بمبيد الحشائش فلوركسيبير مع جرينست او مع ستيمفول.

٢- اظهرت كل من معاملات مكافحة الحشائش والتسميد بالعناصر الصغرى تفوقا واضحا فى صفات النمو (طول النبات – عدد الاوراق – الوزن الغض والجاف للنبات – مساحة الورقة) وكذلك المحصول و مكوناته (عدد الكيزان – طول وقطر الكوز – وزن الكوز – عدد الحبوب بالسطر – وزن حبوب الكوز – وزن ١٠٠ حبة وزن الحبوب للفدان بالاردب) والتركيب الكيميائى للبذور (% زيت - % بروتين% الكربوهيدرات الكلى) وحيث اعطت المعاملة بالعزيق مع جرينيست او مع ستيمفول اعلى قيم فى الصفات الباقية يليها معاملة فلوروكسيبير مع جرينيست او مع ستيمفول وعلى العكس من ذلك ادت معاملة الكنترول الى اقل القيم فى الصفات التى درست.