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RESPONSE OF MAIZE AND ASSOCIATED WEEDS TO SOME POST-EMERGENCE HERBICIDES

Saad El-Din, Samia A.; Nadia K. Messiha and G.M. Metwally
Botany Department, National Research Centre, Dokki, Cairo, Egypt.

ABSTRACT

Two field experiments were conducted at the Experimental Farm of National Research Centre at Shalakan, Kalubia Governorate, Egypt, through two successive seasons of 2002 and 2003, to study the effect of some post-emergence herbicides on maize plants and associated weeds. The results showed that hand hoeing twice (21 and 35 days from sowing and Bentazone at 0.230 kg a.i./fed. applied as post-emergence were the best treatments in controlling total annual weeds up to 75 days after maize sowing, compared to the other treatments. Fluroxypyr at 0.080 kg a.i./fed., Triclopyr at 0.192 kg a.i./fed. or Bentazone at 0.230 kg a.i./fed. each applied post-emergence as well as two hand hoeing treatment gave the best broad leaved weed control more than the other treatments. While, hand hoeing twice and post-emergence application of Bentazone at 0.230 kg a.i./fed. as well as Mo at 0.800 a.i.fed., gave acceptable control of annual grass weeds, compared to the other treatments. Hand hoeing treatment as well as Fluroxypyr, Triclopyr and Bentazone at the high rates improved the growth of maize plants and resulting in the longest ears, the highest number of grains/row, the heaviest weight of 100-grain, the highest grain yield per plant and per feddan as compared with unweeded control. All tested herbicides including hand hoeing treatment significantly increased oil content in maize grains when compared with unweeded control.

INTRODUCTION

Weeds are considered as a major problem in maize fields. The reduction of maize yield due to weed infestation reached 32.4 to 50 % (Varshney, 1991; Vizantinopoulos and Katranis, 1998; Sharma *et al.*, 2000 and Saad El-Din (2003). In Egypt, hand hoeing is still a traditional method for weed control, however, it has become uncommon because labour is becoming either ineconomical or unavailable when needed. Chemical weed control play an important role in improving the growth and productivity of maize plants, which is consider one of the vital in Egypt. Many workers have been reported that, herbicides application tended to provided a great weed control and maximum yield of maize (Schlotter and Schuster, 1992; Rapparini, 1995; Roushdy, 1997 and El-Metwally *et al.*, 2001) by using Fluroxypyr, (El-Gazzar *et al.*, 1996, Hamill *et al.*, 1997 and Corkern *et al.*, 1999) with Bentazone and (Metwally, 1990; Singh *et al.*, 1991 and Scott and Neal, 1995) in respect to Triclopyr. Therefore, the aim of this investigation was to study the effect of some post-emergence herbicides on maize growth, yield, yield components and on the associated weeds.

MATERIALS AND METHODS

Two field experiments were conducted during two successive seasons of 2002 and 2003 in the Experimental Station of National Research Centre at Shalakan, Kalubia Governorate, Egypt, to study the effect of some post-emergence herbicides on growth, yield, yield components of maize and associated weeds. The soil texture was a clay loam with 1.87 % organic matter and pH 7.8. The experimental plot consisted of six ridges, 5 m long and 70 cm apart. The plot area was 21 m^2 (1/200 feddan). Grains of maize (*Zea mays*, L.) cv. "Single cross hybrid 10" were sown in hills 25 cm apart on June 3th and May 30th in both seasons, respectively. All the normal cultural practices of growing maize recommended for the region were followed. The common, trade and chemical names of each herbicide used are shown in Table (1).

Table (1) : The common, trade and chemical names of herbicide used during two successive seasons of 2002 and 2003.

Common name	Trade name	Chemical name
Triclopyr	Garlon 48 %	[(3,5,6-trichloro-2-pyridinyl)oxy] acetic acid
Fluroxypyr	Starane 20 %	[(4-amino-3,5-dichloro-6-fluoro-2-pyridinyl)oxy] acetic acid
Mo	CNP 20 %	2,4,6-trichlorophenyl-4-nitrophenyl ether
Bentazone	Basagran 48%	3-isopropyl-1 H-2,1,3-benzothiadiazin-4(3H)-one 2,2-dioxide

Each experiment included 10 treatments, were arranged in a Randomized Complete Block Design with four replications. Rates of herbicides used, time and method of application are listed in Table (2).

Table (2) : Weed control treatments, rates of herbicides, time and method of application during 2002 and 2003 seasons.

Treatments	Rates (kg a.i./fed.)	Time and method of application
Triclopyr	0.096	Post-emergence (21 days from sowing)
Triclopyr	0.192	" " (21 " " ")
Fluroxypyr	0.040	
Fluroxypyr	0.080	" " (21 " " ")
		" " (21 " " ")
Mo	0.400	
Mo	0.800	" " (21 " " ")
		" " (21 " " ")
Bentazone	0.115	
Bentazone	0.230	" " (21 " " ")
		" " (21 " " ")
Hand hoeing twice	-	21 and 35 days from sowing
Unweeded check	-	Left without weed removal

The formulated herbicides were sprayed by knapsack sprayer using 200 liters water/fed. Two weed samples were randomly taken from an area of one square meter from each plot at 45 and 75 days from sowing. Weeds were identified and classified into annual broad leaved and annual grasses. The dry weight of weed species was recorded. At harvest, samples of five maize plants were randomly collected from each plot to study the following characters : Plant height (cm), Stem diameter (cm), ear length and its diameter (cm); number of rows per ear; number of grains per row; 100-grain weight (g) and grain yield per plant (g). Grain yield was estimated from the grain yield per plot and then calculated in ardab/fed. For determining oil content duplicated samples were analyzed according to the method described by Bedov (1970), using Soxhlet equipment. All data were statistically analyzed and the combined analysis of the two seasons was calculated according to Little and Hills (1978).

RESULTS AND DISCUSSION

A. Effect on weeds :

A.1. Annual broad-leaved weeds :

The most common broad-leaved weeds in maize field through the two experimental seasons were :

Portulaca oleracea, L.; *Xanthium strumarium,* L.; *Corchorus olitorius*, L.; *Hibiscus trionum,* L. and *Amaranthus lividus*, L. Data in Table (3) revealed that all weed control treatments decreased significantly the dry weight of annual broad-leaved weeds compared to the unweeded check after 45 and 75 days from sowing in both seasons.

Table (3) : Effect of some post-emergence herbicides on dry weight of annual weeds (g/m²) 45 and 75 days from sowing. (Combined analysis for two seasons).

Treatments	Rates kg a.i./fed.	Days from sowing					
		45 days			75 days		
		Broad leaved	Grasses	Total ann. weeds.	Broad leaved	Grasses	Total ann. weeds.
Triclopyr	0.096	11.67 cd	36.12 b	47.79 bc	12.41 cd	58.54 b	70.95 bc
Triclopyr	0.192	2.46 d	32.79 bc	35.25 cd	6.74 de	54.35 bc	61.09 cd
Fluroxypyr	0.040	6.30 cd	31.02 bc	37.32 cd	10.37 cde	56.03 bc	66.40 bc
Fluroxypyr	0.080	1.68 d	27.61 cd	29.29 de	2.38 e	47.85 c	50.23 d
Mo	0.400	31.22 b	20.30 de	51.52 b	38.36 b	36.69 d	75.05 b
Mo	0.800	25.85 b	16.80 e	42.65 bcd	34.82 b	31.30 de	66.12 bc
Bentazone	0.115	14.44 c	18.50 e	32.94 de	19.54 c	32.25 de	51.75 d
Bentazone	0.230	7.00 cd	13.85 ef	20.85 ef	11.15 cde	23.89 ef	35.04 e
Hand hoeing twice	-	6.18 cd	7.81 f	13.99 f	8.75 de	14.80 f	23.55 e
Unweeded check	-	61.22 a	58.18 a	119.40 a	70.20 a	93.94 a	164.14 a

At 45 days from sowing, fluroxypyr and Triclopyr at the high rates showed the best control of annual broad-leaved weeds (97.26 and 95.98 %, respectively) as compared with unweeded check. While, hand hoeing twice achieved 89.91 % control. On the other hand, Mo at low and high rates gave significantly the least control of annual broad-leaved weeds (49.0 and 57.78

%), respectively compared to the other weed control treatments. Except, Bentazone at the low rate, the rest herbicidal treatments were statistically equal with hand hoeing twice giving 80.94 – 89.71 % control (Table 4).

Table (4) : Efficiency (%) of some post-emergency herbicides for annual weeds 45 and 75 days after sowing. (Combined analysis for two seasons).

Treatments	Rates kg a.i./fed.	Days from sowing					
		45 days			75 days		
		Broad leaved	Grasses	Total ann. weeds.	Broad leaved	Grasses	Total ann. weeds.
Triclopyr	0.096	80.94	37.92	59.97	82.32	37.68	56.77
Triclopyr	0.192	95.98	43.64	70.48	90.40	42.14	62.78
Fluroxypyr	0.040	89.71	46.68	68.74	85.23	40.36	59.55
Fluroxypyr	0.080	97.26	52.54	75.47	96.61	49.06	69.40
Mo	0.400	49.00	65.11	56.85	45.36	60.94	54.28
Mo	0.800	57.78	71.12	64.28	50.40	66.68	59.72
Bentazone	0.115	76.41	68.20	72.41	72.17	65.67	68.47
Bentazone	0.230	88.57	76.19	82.54	84.12	74.57	78.65
Hand hoeing twice	-	89.91	86.58	88.28	87.54	84.25	85.65
Unweeded check	-	0.0	0.0	0.0	0.0	0.0	0.0

At 75 days from sowing, the same trend for controlling annual broad-leaved weeds was observed. It could be concluded that post-emergence application of Fluroxypyr at 0.080 kg a.i./fed., Triclopyr at 0.192 kg a.i./fed. and Bentazone at 0.230 kg a.i./fed. as well as hand hoeing treatment showed superiority in controlling annual broad-leaved weeds up to 75 days after maize sowing. These results are in agreement with those obtained by Rapparini (1995) and Scott and Neal (1995); Roushdy (1997); Vizantinopoulos and Katranis (1998); El-Mersawy and El-Mashad (2000); El-Metwally *et al.* (2001); Attalla (2002) and El-Metwally (2002).

A.2. Annual grass weeds :

The most dominant grass weeds during the two successive seasons were : *Echinochloa colona*, L.; *Dactyloctenium aegyptium*, L. and *Dinebra retroflexa* (Forssk).

Data in Table (3) showed that all various treatments significantly reduced the dry weight of annual weeds at 45 and 75 days from sowing in both seasons.

At 45 days from sowing, the highest efficiency against annual grasses was obtained by hand hoeing twice and Bentazone at high rate (86.58 and 76.19 %, respectively). On the other side, Triclopyr and Fluroxypyr at all rates gave the lowest control of annual grasses (37.92 – 52.54 %) as compared to unweeded check. While Mo at the two rates gave (65.11 – 71.12%) control.

At 75 days from sowing hand hoeing treatment and Bentazone at high rate were more effective in controlling grasses than the other treatments. They gave 84.25 and 74.57 % control, respectively. While, Triclopyr and Fluroxypyr at the two rates gave poor control of annual grasses (37.68 – 49.06 %) as compared to unweeded check. Moreover, Mo treatments were in the second rank (60.94 – 66.68 %) Table (4).

It is then quite clear that hand hoeing twice (21 and 35 days from sowing) and Bentazone at 0.230 kg a.i./fed. applied as post-emergence were the most effective against the annual grass weeds in maize fields. Similar results were obtained by El-Desoky (1985); Moshtohry *et al.* (1995), El-Gazzar *et al.* (1996), El-Moursy and Badawi (1998) and Attalla (2002).

A.3. Total annual weeds :

Data presented in Tables (3 and 4) show that significant differences among the various weed control treatments for the two tested stages in both seasons. All herbicidal treatments and hand hoeing treatment significantly reduced the dry weight of annual weeds than the unweeded check.

Generally, the two tested samples (after 45 and 75 days from sowing), through the two successive seasons showed that the two hoeing treatment as well as Bentazone at 0.230 kg a.i./fed. applied post-emergence were the best treatments to control of annual weeds (78.65 – 88.28 %), compared to the unweeded check. Such superiority of hand hoeing treatment may be due to attributable efficiency of hoeing in stunting of weeds. Also, may be due to inhibition effect of Bentazone on growth of annual broad leaved weeds and annual grasses (Tables 3 and 4). Whereas, the all other herbicidal treatments were significantly lower efficiency than the two hoeing treatment. They gave efficiency control ranged from 54.28 to 75.47 % in both stages as compared with unweeded control. These results are in concordance with those obtained by Rout and Satapathy (1996); Hussein 1997); Sarpe *et al.* (1998); Ahmed (1999); Abd El-Samie (2000) as well as Attalla (2002) who reported that hand hoeing twice gave the highest reduction of total annual weeds in maize fields. Also, Rapparini (1995); Hamill *et al.* (1997) and Corkern *et al.* (1999) showed that Bentazone as post-emergence application gave effective control of annual weeds in maize fields.

B. Effect on plant growth :

B.1. Plant height :

Data recorded in Table (5) show that all weed control treatments significantly surpassed unweeded check in both seasons. Plant height ranged from 185.26 to 229.10 cm. Hand hoeing treatment as well as Fluroxypyr at 0.080 kg a.i./fed. and Bentazone at 0.230 kg a.i./fed. applied as post-emergence, were significantly gave the tallest maize plants compared to all the other treatments. This, might be attributed to the better weed control for these treatments. On the other hand, the shortest maize plants was obtained by unweeded check. Similar results were reported by El-Moursy and Badawi (1998), Ahmed (1999), El-Metwally *et al.* (2001) and Attalla (2002).

B.2. Stem diameter :

Data in Table (5) demonstrated that all tested herbicides including hand hoeing treatment were significantly thicker than the unweeded check in both seasons. The largest stem diameter values were achieved by hand hoeing treatment, followed by Bentazone at 0.230 kg a.i./fed., Fluroxypyr at 0.080 kg a.i./fed., Bentazone at 0.115 kg a.i./fed. and Triclopyr at 0.192 kg a.i./fed. compared to unweeded check. It may be due to good weed control as a result of using these treatments. While, the rest other herbicidal treatments were significantly gave stem diameter lower than the hoeing

treatment. Similar results were obtained by Ahmed (1999); Attalla (2002) and El-Metwally (2002).

Table (5) : Plant growth and yield components of maize at harvest as affected by some post-emergence herbicides. (Combined analysis for two seasons).

Treatments	Rates kg a.i./fed.	Plant height (cm)	Stem diameter (cm)	Ear length (cm)	Ear diameter (cm)	No. of rows per ear	No. of grains per row	Seed index (g)	Grain yield per plant (g)
Triclopyr	0.096	205.35 de	2.82 de	19.02 c	4.81 de	12.82 a	41.88 c	34.93 e	180.49 c
Triclopyr	0.192	214.11 c	2.89 b-e	19.85 abc	4.98 bc	13.15 a	44.65 b	36.04 bc	190.13 abc
Fluroxypyr	0.040	212.5 c	2.81 de	19.46 bc	5.00 abc	12.87 a	46.88 a	35.87 cd	184.77 c
Fluroxypyr	0.080	224.4 ab	3.09 abc	20.75 a	5.13 a	13.30 a	48.13 a	37.37 a	199.27 ab
Mo	0.400	206.46de	2.88 cde	17.89 d	4.71 e	12.21 a	38.97 d	34.04 f	143.36 d
Mo	0.800	202.00e	2.77 e	19.28 c	4.87 cd	12.68 a	40.72 cd	33.62 f	138.20 d
Bentazone	0.115	210.75d	3.01 a-d	19.37 c	4.95 bcd	12.77 a	43.94 b	35.49 d	178.70 c
Bentazone	0.230	219.82b	3.11 ab	20.44 ab	5.08 ab	13.22 a	47.50 a	36.29 bc	187.28 bc
Hand hoeing twice	-	229.10a	3.12 a	20.68 a	5.07 ab	13.29 a	48.32 a	36.42 b	202.27 a
Unweeded check	-	185.26f	2.41 f	16.63 e	4.34 f	11.70 a	36.80 e	33.01 g	103.73 e

C. Effect on maize yield and its components :

C.1. Ear length and diameter :

Significant differences among various treatments were detected in both ear length and its diameter (Table, 5). All weed control treatments significantly surpassed the weedy check. The tallest ears were given by Fluroxypyr at 0.080 kg a.i./fed. and hand hoeing treatment respectively, compared to the weedy check. Moreover, Bentazone at 0.230 kg a.i./fed. and Triclopyr at 0.192 kg a.i./fed. were statistically similar with hand hoeing treatment. On the other side, Mo at 0.400 kg a.i./fed., was significantly lower ear length than other weed control treatments. The rest treatments were significantly shorter ears than the hoeing treatment.

In respect to ear diameter, the data in the same table showed that all weed control treatments produced ears significantly thicker than those given with the weedy check treatment. The most thicker ears were obtained by using hand hoeing treatment as well as Fluroxypyr, Bentazon and Triclopyr at the high rate. These treatments showed satisfactory control of annual weeds (Tables 3 and 4) and consequently minimizing the competition effects on crop, leading to improvement the ear characters. While, the remaining other treatments were significantly lower than hand hoeing treatment. Confirming results were obtained by El-Gazzar *et al.* (1996), Mosalem and Shady (1996); El-Moursy and Badawi (1998), Ahmed (1999) and El-Metwally *et al.* (2001).

C.2. Number of rows/ear :

No significant differences were found among the treatments in number of rows/ear through the two successive seasons (Table 5). This mean that those treatments did not effect on this trait.

C.3. Number of grains/row :

The combined analysis of data in Table (5) showed that all herbicidal treatments as well as hand hoeing treatment significantly increased number of grains/row compared to the weedy check treatment. The greatest number of grains/row was achieved by hand hoeing treatment, followed by Fluroxypyr at 0.080 kg a.i./fed., Bentazone at 0.230 kg a.i./fed., and Triclopyr at 0.192

kg a.i./fed., compared to all other herbicidal treatments. This results, might be due to better weed control for the previous treatments. On the other hand, the least number of grains/row was achieved by unweeded check. Similar results were reported by El-Gazzar *et al.* (1996), El-Moursy and Badawi (1998), Ahmed (1999), El-Metwally *et al.* (2001) and El-Metwally (2002).

C.4. 100-grain weight :

Data in Table (5) demonstrated that all weed control treatments significant increased the weight of 100-grain compared with unweeded control. The highest values of 100-grain weight was recorded from Fluroxypyr at 0.080 kg a.i./fed. compared with both hand hoeing treatment and unweeded control. This results, may be due to excellent weed control of this treatment. However, Bentazone at 0.230 kg a.i./fed. and Triclopyr at 0.192 kg a.i./fed. were statistically similar with the hoeing treatment. Whereas, the other treatments were significantly less equal to the hoeing treatment. The above findings were in agreement with those of Mosalem and Shady (1996), Rout and Satapathy (1996), El-Moursy and Badawi (1998), Ahmed (1999), El-Metwally *et al.* (2001) and El-Metwally (2002).

C.5. Grain yield/plant :

As shown in Table (5), the grain yield/plant of all tested treatments were significantly greater than unweeded control. The highest grain yield/plant was produced by hand hoeing treatment, followed by Fluroxypyr at 0.080 kg a.i./fed. and Triclopyr at 0.192 kg a.i./fed. as compared with unweeded control. It is worthy to mention that these treatments, showed high efficiency of annual weeds. (Tables 3 and 4). On the contrary, Mo at the two rates significantly gave the least grain yield/plant among all other weed control treatments, although it was still significantly higher than the unweeded control. This, may be attributed to its less weed control efficiency against the natural populations of maize fields (Tables 3 and 4). The rest treatments were significantly lower than the hoeing treatment. These results are in accordance with those obtained by Mosalem and Shady (1996), Ahmed (1999), Attalla (2002) and El-Metwally (2002).

C.6. Grain yield/fed. :

Significant differences were found among the various treatments in grain yield/fed., in both seasons (Table 6).

In general, the herbicidal treatments and hand hoeing treatment increased to great extent the maize grain yield relative to the weedy check treatment. Fluroxypyr at 0.080 kg a.i./fed. as well as hand hoeing twice, followed by that of Triclopyr at 0.192 kg a.i./fed. and Bentazone at 0.230 kg a.i./fed. were the best treatments, they provided significant increase in grain yield/fed. by about 108.8, 105.7, 96.3 and 93.3 % respectively, as compared to unweeded check. Such superiority might be mainly due to higher suppression effect on prevailing weeds, which helped in minimizing the competition between maize plants and associated weeds particularly in the early stage of maize growth, leading to higher grain yield per unit area and its related components. On the contrary, the lowest increase in grain yield/fed. was obtained by herbicide Mo at the two rates as compared to all other weed control treatments. This, might be attributed to less weed control efficiency (Tables 3 and 4). The rest other herbicidal treatments were significantly produced lower grain yield/fed. than

the hoeing treatment. The above results are in harmony with those obtained by Scott and Neal (1995), Rout and Satapathy (1996), Hussein (1997), El-Moursy and Badawi (1998), Corkern *et al.* (1999), Abd El-Samie (2000), El-Metwally *et al.* (2001) and Attalla (2002).

C.7. Oil content of grains :

From data in Table (6), it is evident that all tested herbicides including hand hoeing treatment cause significant increases in grain oil content over the unweeded check. The highest oil percentage was observed from Fluroxypyr at 0.080 kg a.i./fed. as well as hand hoeing twice, Triclopyr and Bentazone at the high rate compared to the other herbicidal treatments. While, the least oil percentage was observed with unweeded check. Superiority of oil percentage in maize grains as a result of the application of some weed control treatments may be due to higher weed control efficiency, which helped to a great extent in minimizing weed competition for environmental factors particularly nutrients. Similar results were obtained by Ahmed (1999) and El-Metwally *et al.* (2001).

Table (6) : Grain yield of maize and oil percentage in grains as affected by some post-emergence herbicides (Combined analysis for two seasons).

Treatments	Rates kg a.i./fed.	Grain yield per feddan (ardab)	Relative yield (%)	Oil % of grains
Triclopyr	0.096	19.338 c	186.3	4.62 c
Triclopyr	0.192	20.371 abc	196.3	4.87 ab
Fluroxypyr	0.040	19.797 c	190.7	4.65 c
Fluroxypyr	0.080	21.672 a	208.8	4.92 a
Mo	0.400	15.360 d	148.0	4.53 de
Mo	0.800	14.807 d	142.7	4.48 e
Bentazone	0.115	19.146 c	184.5	4.55 d
Bentazone	0.230	20.065 bc	193.3	4.84 b
Hand hoeing twice	-	21.350 ab	205.9	4.89 ab
Unweeded check	-	10.379 e	100.0	4.33 f

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استجابة محصول الذرة الشامية والحشائش المصاحبة له لبعض مبيدات الحشائش المضافة بعد الانبات

سامية امين سعدالدين – نادية خليل مسيحة و جمال الدين مصطفى متولى
قسم النبات – المركز القومى للبحوث – الدقى – القاهرة – مصر.

اجريت تجربتان حقليتان بمزرعة المركز القومى للبحوث بشلقان بمحافظة القليوبية فى موسمى ٢٠٠٢ و ٢٠٠٣ لدراسة تأثير بعض مبيدات الحشائش المضافة بعدالانبات (الفلوركسى بير ، التراى كلوبير ، البنتازون ، مو) بالاضافة الى معاملة العزيق مرتين (٢١ و ٣٥ يوم من الزراعة) ومعاملة بدون مقاومة (كنترول) على محصول الذرة الشامية ومكوناته والحشائش المصاحبة له .ويمكن تلخيص النتائج المتحصل عليها فيمايلى :

- اظهرت معاملة العزيق مرتين اواستخدام البنتازون بالتركيز العالى كفاءة عالية فى مكافحة الحشائش الحولية الكلية خلال ٧٥ يوم من زراعة الذرة الشامية بالمقارنة بالمعاملات الاخرى وذلك خلال الموسمين .
- اعطت معاملات الفلوركسى بير بتركيز ٠,٠٨٠ كجم مادة فعالة/فدان ، التراى كلوبير بتركيز ٠,١٩٢ كجم مادة فعالة /فدان ، البنتازون بتركيز ٠,٢٣٠ كجم مادة فعالة /فدان بعد الانبات وكذلك معاملة العزيق مرتين افضل مكافحة للحشائش الحولية العريضة بالمقارنة بالمعاملات الاخرى خلال الموسمين .
- ادت معاملة العزيق مرتين وكذلك معاملة البنتازون بتركيز ٠,٢٣٠ والمو بتركيز ٠,٨٠٠كجم مادة فعالة /فدان بعد الانبات الى مقاومة مقبولة فى مكافحة الحشائش الحولية النجيلية بالمقارنة بالمعاملات الاخرى خلال الموسمين.
- ادت معاملة العزيق مرتين وكذلك معاملات الفلوركسى بير والتراى كلوبير والبنتازون عند التركيزات العالية الى تحسين نمو نباتات الذرة الشامية والحصول على اطول كيزان ، وكذا اعلى عدد من الحبوب بالصف ، اعلى وزن ١٠٠ حبة ، اعلى محصول حبوب للنبات ، اعلى محصول حبوب للفدان .
- ادت كل معاملات مبيدات الحشائش المختبرة وكذلك معاملة العزيق مرتين الى زيادة معنوية فى محتوى الحبوب من الزيت مقارنة بمعاملة بدون مكافحة (الكنترول) خلال الموسمين .