J. Plant Production, Mansoura Univ., Vol. 5 (10): 1729 - 1743, 2014

EFFECT OF SOME WEED CONTROL TREATMENTS ON YIELD, ASSOCIATED WEEDS AND CHEMICAL COMPOSITION FOR MAIZE GRAINS.

Soliman, I. E. [1] **and Amany M. Hamz** [2]
1- **Weed Res. Cent. Lab., Agric. Res. Cent., Giza, Egypt.**
2- Pesticides dept., Fac. Agric. Kafrelsheikh University 33516 Egypt.

ABSTRACT

Two field experiments were conducted during the two successive seasons of 2012 and 2013 at Sakha Agricultural Research Station, Kafrelsheikh to investigate the efficacy of some weed control treatments for controlling total annual weeds as well as yield and chemical composition for maize grains. The weed control treatments were acetochlor, fluroxypyr and bentazone plus one hand hoeing at 30 days after sowing in addition to the hand hoeing twice.

Results indicated that the hand hoeing twice or the herbicides (acetochlor, fluroxypyr and bentazone) plus one hand hoeing were effective in controlling broad-leaved, grassy and total annual weeds at two surveys in both seasons. Whereas, these treatments suppressed dry weight of total annual weeds at least by 93.3 % than un-weeded control treatment. Also, the results revealed that all weed control treatments increased maize plant height, ear length, ear diameter; ear grains weight, shelling percentage, 100- grain weight and grain yield/fed.

The results showed that all treatments gave a noticeable increase in protein and oil contents of the grains, and a decrease in phenols content. Also, all treatments affected slightly carbohydrates, starch%, amino acids contents and fatty acids composition of maize grains as comparing with the control treatment.

It can be concluded that all the applied weed control treatments, whether, hand hoeing twice or (acetochlor, fluroxypyr and bentazone) plus one hand hoeing could be recommended for optimum weed control and grain yield of single hybrid maize c.v. single cross 10 (SC_{10}). These practices gave a promising reduction of total annual weeds and increased maize yield and its components. Thus, these herbicidal treatments can replace hand hoeing for the control of total annual weeds in maize crop.

INTRODUCTION

Maize (*Zea mays L.*) is one of the important strategic cereal crops in Egypt and the world. Growing high yielding varieties and improving the cultural practices are very important to increases the productivity per unit area. Weeds are considered as a major problem in maize fields. Management practices that increase competitive ability of crops with weeds can be important components of integrated weed management system (Blackshaw and Brandt, 2008). Other researcher's mentioned that maize yield losses caused by weed competition have been amounted by 30% (Rahman, 1985), 66% (Abouziena *et al.,* 2007) and 90% (Dalley *et al.,* 2006).

Many investigators have studied the effect of herbicides on crop characters, weed control and chemical composition of the grains. Snel *et al.* (1987) mentioned that fluroxypyr gave excellent control in cereal crops dicotyledonous weed. Allans and Zhang (1997) reported that in general, bentazon/atrazine applied at early stages (7 days after emergence) of the development of corn seedlings at high or intermediate rate (1.6 or 0.8 kg a.i./ha) maintained low weed densities, with a relatively small range of variation over years. Delay in time (14 or 21 days after emergence) or reduction in herbicide rate (0.4 kg a.i./ha) increased the risk of high weed pressure, although it was not always associated with yield loss.

Several researchers have shown that fluroxypyr as post- emergence herbicide can control weeds in maize (Yehia *et al.,* 1992; El-Metwally *et al.,* 2001 and Abouziena *et al.,* 2007). Ahmed *et al.* (2008) showed that fluroxypyr provided the best treatment in controlling broad-leaved weeds. Acetochlor can also control weed in maize as pre-emergence herbicide (Armel *et al.,* 2003; Markovic *et al.,* 2008 and Mphundi, 2009).

Integration between chemical and mechanical weed control methods in maize was recently recommended. Hussein *et al.* (2008) revealed that grain yield was improved with fluroxypyr applied 2 WAS maize followed by one hand hoeing 6 WAS. However, the highest yields were obtained by hoeing two times during the growing season. Soliman and Gharib (2011) reported that hand hoeing twice and herbicides (acetochlor or fluroxypyr) plus one hand hoeing resulted in the best controlling for broadleaf, grassy and total annual weeds at 50 and 65 days after sowing.

Herbicidal treatments may alterate chemicalconstituens of maize grains. In this respect Shaban *et al.* (1991) showed that the herbicidal combinations involving metribuzin or bentazon were slightly effect inproleinand oil content in maize and soybean seeds. El-Metwally (2002) reported that bentazon at 0.75 1/fed and fluroxypyr at 0.2 1/fed sprayed after 3 weeks from sowing significantly increased grain protein and oil percentages of maize. Kobeasy *et al.* (2005) showed that herbicides fluroxypyr and bentazon gave a significant increase in protein and oil contents of the grains, while decrease in phenols and tannins contents. Also, all treatments affected slightly on carbohydrates, amino acids contents and fatty acids in composition of sorghum grains comparison with the control. Soliman and Gharib (2011) showed that hand hoeing twice and herbicides (acetochlor or fluroxypyr) plus one hand hoeing significantly produced the greatest grain yield/fed and crude protein content in grains of maize cv. SC_{10} as compared with control treatment.

Therefore the objectives of this investigation were to study the effect of some weed control treatments namely: Acetochlor, fluroxypyr, hand hoeing and their integrations on weeds, yield and chemical composition for maize grains cv. (SC_{10}).

MATERIALS AND METHODS

Two field experiments were carried out at Sakha Agricultural Research Station, Kaferelshiekh, Egypt during 2012 and 2013 summer seasons, to study the effect of some weed control treatments on yield, associated weed and chemical composition for maize grains, c.v. single cross 10 (SC_{10}). The preceding crop was wheat in both seasons.

The experimental soil was clay in texture with pH 8.1- 8.4, organic matter 1.74 - 1.56% and available nitrogen 18.2 - 18.6 ppm in the two seasons. Mineral nitrogen was applied as urea (46.5% N) at the rate of 112 kg N/fed in two equal protion, just before the first and second irrigations. Phosphorus fertilizer was added as calcium super phosphate (15.5% P_2O_5) at the rate of 100 kg/fed before planting. Potassium was added at the recommended rate of 24 kg K_2o/fed after thinning.

The experiments were laid out in a complete randomized block design with four replication, where five experimental treatments were used as follow:

1- Harness (acetochlor 84% EC): 2-chloro-N-(ethoxymethyl)-N-(2-ethnyl-6-methylphenyl) acetamide, at the rate of 1.0 L/fed was applied on soil surface directly after sowing and before irrigation, followed by one hand hoeing at 30 days after sowing .
2- Starane (fluroxypyr 20% EC) : 1-methylheptyl (4-amino-3,5-dichloro-6-fluoro-2-pyridinyl) oxy) acetate, at the rate of 0.2 L/fed. was applied as post-emergence after 15 days from sowing, followed by one hand hoeing at 30 days after application.
3- Basagran (bentazone 48% EC): 3 – (1 – methylethyl0 – 1H – 2, 13 – benzothiadiazin – 4 (3H) one 2,2, - dioxide, at the rate of 1.0 L/fed was applied as post-emergence after 15 days from sowing, followed by one hand hoeing at 30 days after application.
4- Hand hoeing twice at 18 and 30 days after sowing.
5- Control (untreated).

Herbicides in both field experiments were sprayed by knapsack sprayer CP_3 with water volume of 200 liters per faddan. The plot size was 25 m2 and consisted of 6 ridges each 6 m log and 0.7 m in width.

Sowing took place at 25^{th} and 23^{th} May in 2012 and 2013, respectively. seeds of maize (*Zea mays* L.) "single cross 10" cultivar were sown in hills on one side of ridge at the rate of 2-3 grains per hill with 25 cm between hills. One plant per hill was maintained by thinning at 18 days after sowing.

Other cultivar practices of growing maize were conducted as recommended. The two outside ridges were left to avoid border effects and the two following ridges were used for estimating growth, while the two inner ridges were used for the determination of grain yield and it's components.

The collected data were recorded as follow:

On weeds:

Weeds were hand pulled from one square meter in each plot after 60 and 80 days from sowing and classified into two categories (broad-leaved and grassy weeds). Weeds were air-dried, then oven dried to constant weight for 48 hours at 70°C. The percent of weed reduction (R) was calculated using the following equation:

$R = (A - B)/ A \times 100$

Where: A and B refer to dry weight of weeds in the untreated and treated plots, respectively.

On crop characters and yield components:

At harvest, 10 maize plants from each plot was taken to determine plant height, ear length (cm), ear diameter (cm), ear grains weight, shelling % and 100- grain weight (g). Maize plants of the two inner ridges of each plot were harvested to determine grain yield per faddan.

Grains chemical analysis:

Determination of crude protein in the grain:

The total nitrogen was determined by Microkjeldah/method according to (A.O.A.C, 2000) by distilling the ammonia into 4% boric acid and titration with standard Hcl (0.01 N). The nitrogen content was multiplied by the factor 5.70, to obtain the protein content.

Determination of oil content:

The oil content of the grains was determined according to the procedures reported in the A.O.A.C. (2000).

Determination of total hydrolysable, soluble and insoluble carbohydrates:

Carbohydrates were determined calorimetrically according to the method of Smith *et al.* (1956).

Determination of starch:

Starch content of maize grains was determined according to the direct acid hydrolysis method of A.O.A.C. (2000).

Determination of total polyphones:

Phenolic compounds were determined by colourimetric method described by Snell and Snell (1953).

Determination of total amino acids:

Protein hydrolysis was carried out according to the method of Gehrke *et al*. (1985). Amino acids analysis were performed on an Eppdrof-Germany LC_{3000} Amino Acid Analyzer.

Determination of fatty acids:

Portions from the extracted oil were converted into their fatty acid methyl ester (FAME) according to the method of Egan *et al*. (1981). Fatty acid composition was performed by Gas Liquid Chromatography (Schimaduzu Gas Chromatograph Model 4 C M. Kyoto, Japan) equipped with a Flame Ionization Detector (F I D). The fatty acid composition similituded their retention time with the retention times of known stardards.

Statistical analysis:

The obtained data were subjected to proper statistical analysis of variance according to Snedecor and Cochran (1980), and the least significant differences (LSD) at 5% level of significance were calculated, All statistical analysis was performed using analysis of variance technique by means of MSTATC computer software package.

RESULTS AND DISCUSSION

Effect of weed control treatments on dry weight of weeds:

The most dominant weeds in maize field were (*Corchorus olitorius* L.), (*Xanthium brasilicum* L.), (*Amaranthus albus* L.), (*Portulaca oleraceae* L.), (*Solanum nigrum* L.) as broad-leaved weeds and (*Echinochloa colonum* L.), (*Dinobra retroflexa* L.), (*Cynodon dactylon* L.), (*Cyperus rotundus* L.) as grass weeds in both 2012 and 2013 seasons.

Table 1 shows means of dry weight of broad-leaved, grassy and total weeds of the two weed surveys as affected by different weed control treatments as compared with the control treatment in both seasons.

Results indicated that the differences between weed control treatments were significant in dry weight (g/m^2) of broad-leaved, grassy and total annual weeds as compared with control treatment at the two sampling dates in both seasons. In this respect, the reduction in total annual weeds was ranged from (91.3 : 88.5 %) for acetochlor/ one hoeing, (89.8 : 83.3 %) for fluroxypyr/ hoeing, (87.0 : 81.1%) for bentazon/ hoeing and (93.3 : 93.4 %) for hand hoeing twice in the first season as compared with control treatment at 60 and 80 days after sowing, respectively. These results have the same trand in the second season.

Also, data showed that additional for one hand hoeing improved drastically the efficiency of herbicides at the two surveys in both seasons. This means that applying one supplementary hand hoeing was necessary to eliminate the weed plants that survived or escaped from the herbicides, particularly (*Xanthium barasilicum* L.).

Table 1: Dry weight (g/m^2) of annual weeds at 60 and 80 days after sowing (DAS) as affected by weed control treatments during 2012 and 2013 summer seasons.

Weed control treatments	Rate (1/fed)	2012 season					
		Days after sowing (DAS)					
		60			80		
		Broad-leaved (g/m^2)	Grass (g/m^2)	Total weeds (g/m^2)	Broad-leaved (g/m^2)	Grass (g/m^2)	Total weeds (g/m^2)
Acetochlor / H.H*	1.0	47.6	21.6	69.2	59.4	41.3	100.7
Fluroxypyr / H.H	0.2	48.3	32.7	81.0	71.6	63.8	145.4
Bentazon / H.H	1.0	53.6	50.3	103.0	87.5	77.4	164.9
Hand hoeing	Twice	28.2	14.8	53.0	19.9	37.7	57.6
Control (untreated)		455.2	335.6	790.8	495.3	377.2	872.5
L S D at 5%		66.5	45.6	67.3	72.4	44.7	
	2013 season						
Acetochlor / H.H	1.0	31.6	19.7	51.3	49.2	42.4	91.6
Fluroxypyr / H.H	0.2	48.4	21.2	69.6	68.7	57.5	121.2
Bentazon / H.H	1.0	52.7	32.4	85.1	71.2	69.5	140.7
Hand hoeing	Twice	7.3	3.4	10.7	14.6	11.3	25.9
Control (untreated)		396.4	277.3	673.7	421.7	328.8	750.5
L S D at 5%		49.4	39.4	46.3	43.2	35.2	51.6

***H.H = Hand hoeing**

Comparision between the efficiency of the opplied weed control treatments on weed groups and total maize weed clear that conventional hand hoeing twice treatment was the potent treatment in this respect. Meanwhile, acetochlor/hoeing treatment shightly exceeded other comparative chemical weed control treatments in controlling maize weeds.

The efficiency of hand hoeing twice in controlling annual weeds could be attributed to the continuous destroying effect of the sequential application of hand hoeing during vegetation growth. Also, control efficiency of weeds obtained from the integration of mechanical injury due to manual hoeing and mortality due to phytotoxic effect of herbicides on weeds. These results are in harmony with those obtained by Dalley *et al.* (2006) and Abouziena *et al.* (2008).

Effect of weed control treatments on maize yield and it's components:

Weed control treatments had a substantial effect on all yield attributes and grain yield/fed except shelling percentage in both seasons (Table 2).

All chemical and mechanical weed control treatments resulted in a significant increase in plant height, ear length, ear diameter, ear grains weight, 100 - grain weight and grain yield/fed as compared with control treatment in both seasons. The increments in grain yield were ranged from (101.69: 100.82 %) for acetochlor/ one hoeing, (95.79 : 96.52 %) for fluroxypyr/ one hoeing, (87.43 : 89.33 %) for bentazon/one hoeing and (109.84 : 105.48 %) for hand hoeing twice in the two seasons, respectively as compared with control treatment.

Data in Table 2 show that the combination of acetochlor, fluroxypyr and bentazon herbicides plus one hand hoeing were superior to control treatment in grain yield/fed and all yield attributes in both sowing seasons. The maximum grain yield/fed and its attributes was obtained from hand hoeing twice without significant differences between it and the combination of pre or post herbicides with one hoeing in both seasons. Such increases in grain yield/fed obtained from the mentioned treatments may be attributed to successful control weeds which reduced competition and consequently favored growth of maize plants, yield attributed (plant height, ear length, ear diameter, ear grains weight, and 100-grain weight) and consequently grain yield. These results are in harmony with those mentioned by Dalley *et al.* (2006) and Gana *et al.* (2008).

This drop in grain yield/fed under the control treatment might be attributed to the reduction in the values of growth characters, which occurred as a result of the competition between maize and weed plants for the essential environmental resources i.e. light, water and nutrients.

Table 2: Effect of weed control treatments on maize yield and yield components at harvest during 2012 and 2013 summer seasons.

Weed control treatments	Rate (1/fed)	Plant height (cm)	Ear length (cm)	Ear diameter (cm)	Grain weight (g/ear)	Shelling %	100-grain weight (g)	Grain yield ardab/ fed
		2012 season						
Acetochlor/H.H*	1.0	278	19.8	5.23	171	77.08	32.75	28.72
Fluroxypyr/H.H	0.2	275	19.9	5.13	167	76.70	31.44	27.88
Bentazon /H.H	1.0	270	18.7	4.94	158	73.33	31.05	26.69
Hand hoeing	Twice	309	20.8	5.73	192	79.84	38.31	29.88
Control (untreated)		241	14.5	3.61	95	68.68	19.86	14.24
L S D at 5%		31.2	5.61	1.68	32.6	-	7.99	4.72
		2013 season						
Acetochlor/H.H*	1.0	261	20.0	5.5	180	79.88	34.38	29.36
Fluroxypyr/H.H	0.2	257	19.2	5.1	172	78.12	32.73	28.73
Bentazon /H.H	1.0	259	19.0	4.93	161	75.75	31.06	27.68
Hand hoeing	Twice	292	20.3	5.56	198	81.83	36.98	30.04
Control (untreated)		229	15.1	3.42	102	66.50	19.91	14.62
L S D at 5%		21.3	6.21	1.27	29.8	-	6.53	4.98

***H.H =Hand hoeing**

Data showed that the highest grain yield/fad (29.88 and 30.04 ardab/fed) was achieved from hand hoeing twice in both seasons, respectively followed by each of acetochlor, fluroxypyr and bentazon plus one hoeing (28.72, 27.88 and 26.69 ardab/fed) in the first season and (29.36, 28.73 and 27.68 ardab/fed) in the second season,respectivily. This may be due to that applying one supplementary hoeing was necessary to eliminate weed plants, which survived or escaped from the herbicides and assure the importance of using the suitable herbicides due to the expected problem of weed flora.

Effect of weed control treatments on the chemical composition of maize grains:

- Protein content:

Data in Table 3 indicate that hand hoeing twice and all herbicidal treatments gave a noticeable increase in protein content of maize grains as compared with the control treatment (8.52%). Fluroxypyr/hoeing recorded the highest increase in protein content (12.17%), followed by hand hoeing twice (12.04%) and acetochlor/hoeing (11.66%), while bentazon/ hoeing gave the lowest protein content (10.45%), in the first season. These results had the same trend in second season. The results are accordance with those reported by **Ahmed (1999) and El-Metwally *et al.* (2001)**.

- Oil content:

It is clear from the data in Table 3, that all weed control treatments gave a increase in oil content of the grains as compared with control treatment. Hand hoeing twice recorded the highest increase in grain oil content (5.22%), followed by fluroxypyr/hoeing (5.14%) and acetochlor/hoeing (5.10%), while Bentazon/hoeing gave the lowest increase in oil content (4.46%) compared to the control treatment (4.06%), in the first season. This results had the same trend in the second season. Shaban *et al.* (1991) found that herbicidal combinations involving metribuzin at (0.140 kg a.i./fed) or bentazone at (0.720 kg a.i./fed) were markedly differed from hand hoeing treatment in protein and oil contents in maize grains and soybean seeds. All weed control treatments including hand hoeing significantly surpassed the unweeded check in seed protein and oil content. El-Metwally (2002) found that bentazone at the rate of 0.75 L/fed and fluroxypyr at the rate of 0.20 L/fed sprayed after 3 weeks from sowing or bentazone at the rate of 0.375 L/fed + urea 1% and fluroxypyr at rate of 0.1 L/fed+ urea 1% sprayed after 4 weeks from sowing gave a markedly increase in protein and oil percentages than the unweeded treatment of maize grains cv Single Cross Wattania 4.

Phenol content :

All weed control treatments decreased phenols content of maize grains as compared with the control treatment (2.81%). Bentazone gave a negligible decrease in phenol content (2.78%) in comparison with the control treatment. Hand hoeing twice gave the lowest value of phenol content (2.29%), acetochlor/ hoeing (2.63%) and fluroxypyr/hoeing (2.65%), in the first season. This results had a same trend in second season. These, results were in complete agreement with those obtained by **Kobeasy *et al.* (2005)** who found that Basagran 400 ml/fed after 15 days from sowing gave decrease in phenol content (2.962%), while the hand hoeing gave the lowest value of phenol content (1.803%).

Table 3: Effect of weed control treatments on protein, oil and phenols % of maize grains (SC_{10}) during 2012 and 2013 summer seasons.

Weed control treatments	Rate (1/fed)	2012 season			2013 season		
		Protein %	Oil %	Phenols %	Protein %	Oil %	Phenols %
Acetochlor / H.H	1.0	11.66	5.10	2.63	11.69	4.71	2.27
Fluroxypyr / H.H	0.2	12.17	5.14	2.65	11.98	4.81	2.65
Bentazon / H.H	1.0	10.45	4.46	2.78	10.63	4.41	2.87
Hand hoeing	Twice	12.04	5.22	2.29	11.89	5.06	2.15
Control (untreated)		8.52	4.06	2.81	8.23	3.55	2.94

***H.H = Hand hoeing**

Carbohydrates content:

The data in Table 4 show that acetochlor/hoeing, hand hoeing twice, fluroxypyr/ hoeing and bentazon/ hoeing recorded an obvious increase in the total hydrolysable carbohydrate of maize grains (72.64, 72.45, 71.77 and 71.62%) respectively, compared to the control treatment (57.18%).

Soluble carbohydrate:

Hand hoeing twice gave a increase in the soluble carbohydrates content (7.57%) in comparison with control treatment (4.92%), fluroxypyr gave increase (6.99%), followed by bentazone (6.48%), while acetochlor/hoeing gave slight increase in soluble carbohydrates content (5.74%) as compared with control treatment.

Insoluble carbohydrates:

All weed control treatments gave a marked increase in insoluble carbohydrates of maize grain compared to the control treatment (52.26%). It is clear that acetochlor/ hoeing recorded the highest increase insoluble carbohydrate content (66.73%), followed by bentazone/ hoeing (56.14%), hand hoeing twice (64.88%) and fluroxypyr/hoeing (64.79%). This results agreed with that of Kobeasy *et al.* (2005).

Starch content:

Data in Table 4 indicated that acetochlor/hoeing and hand hoeing twice gave a noticeable increase in starch content of maize grains (55.95 and 53.65%) respectively, in comparison with the control treatment (50.92%), while fluroxypyr/hoeing and bentazone/hoeing gave a slight increase in starch content (52.76 and 51.61%), this results had the same trend in second season. From the obtained results it can be concluded that herbicides treatments kill broad-leaved and grassy weeds, and stimulate photosynthesis activity and thus increased the total hydrolysable carbohydrates and starch contents.

Table 4: Effect of weed control treatments on carbohydrates and strach contents of maize grains during 2012 and 2013 summer season.

Weed control treatments	Rate (1/fed)	2012 season				2013 season			
		Total hydrol-ysable carboh-ydrates %	Soluble carboh-ydrates %	Insoluble carboh-ydrates %	Starch %	Total hydrol-ysable carboh-ydrates %	Soluble carboh-ydrates %	Insoluble carboh-ydrates %	Starch %
Acetochlor	1.0	72.46	5.74	66.73	55.95	71.44	5.41	66.03	53.97
Fluroxypyr	0.2	71.77	6.99	64.79	52.76	69.81	6.41	64.40	52.64
Bentazon	1.0	71.62	6.48	65.14	51.61	68.68	6.03	65.05	51.58
Hand hoeing	Twice	72.45	7.57	64.88	53.65	70.91	6.49	64.82	53.14
Control (untreated)		57.18	4.92	52.26	50.95	66.24	4.86	51.38	49.36

***H.H = Hand hoeing**

Amino acids:

Data in Table 5 show that all weed control treatments increased proline and valine content of maize grains as compared to the control treatment, also all weed control treatments except bentazon/ hoeing increased phenylalanine. Lysine content increased with all herbicidal treatments except fluroxypyr/hoeing, while bentazone/ hoeing, fluroxypyr/ hoeing and acetochlor/hoeing and hand hoeing twice increased glutamic acid (18.76, 11.53, 11.76 and 15.77%) in first season, respectively as compared to the control treatment (10.87%). Also, (bentazone, fluroxypyr, acetochlor)/ hoeing and hand hoeing twice increased leucine content (10.22, 11.43, 14.71 and 13.13%) respectively as compared to the control treatment (9.12%) in the first season, whereas, isoleucine increased only with bentazone/ hoeing and hand hoeing twice (4.70 and 4.03%) as comparison with the control treatment (3.94%). Methionine also increased only with bentazone/hoeing (0.58%) as compared to the control (0.48%) whereas cytine decreased with all treatments compared to control. These results are in a good agreement with those of Sharaky and Ashour (1982), who reported that Stomp at (0.8 kg a.i./fed) gave the highest contents of glycine, valine, serine, tryptophan and lysine of maize grains. While atrazine (0.8 kg a.i./fed) increased alanine, isoleucine, leucine, cysteine, tyrosine, aspartic, arginine and histidine amino acids of maize grains. Atrazine + Stomp combination gave the highest increases in phenylalanine, threonine and cystine. Herbicides caused profound changes of most essential and non-essential amino acid. glycine, valine, lysine and histidine amino acid content increased as Stomp dose increased, whereas, alanine, leucine, isleucine, systeine, methionine, tyrosine, aspartic, glutamic and arginine contents decreased as the herbicide dose increased. Hoeing treatment had a favourable effect on the content of glycine, alanine, leucine, isoleucine, serine, cystine, tyrosine, arginine and histidine, amine acids in comparison to control and hand hoeing treatments.

Fatty acid:

As shown in Table 6 it is obvious that bentazone/ hoeing increased lauric acid (C 12 : 0) (0.122), oleic acid (C 18 : 1) (37.24), linolenic acid (C 18 : 3) (45.65) and Tu/Ts (6.02) as compared to the control (0.056, 31.42, 41.81 and 6.28), respectively, while the other fatty acids were decreased. Fluroxypyr/hoeing increased lauric acid (C 12 : 0), oleic acid (C 18 : 1) (34.44) and Tu/Ts (6.34) while decreased the other fatty acids as compared to the control treatment. Whereas acetochlor/hoeing and hand hoeing twice increased all fatty acids in maize grains as compared to the control treatment. These results agreed with those obtained by Kobeasy *et al*. (2005) who found that bentazone at 0.40 kg a.i./fed at 60 days from sowing decreased the ratio between total unsaturated fatty acids to saturated fatty acids (Tu/Ts) while bentazone at 0.20 kg a.i./fed and (benzoylpropethyl + bentazone) at 0.60+ 0.20 kg a.i./fed increased Tu/Ts as compared to the control of sorghum seed oil. There was a negative relation between 18 : 1 and 18 : 3.

5

6

REFERENCES

Abouziena, H.F.; M.F. El-Karmany; M. Singh and S.D. Sharma (2007). Effect of nitrogen rates and weed control treatments on maize yield and associated weeds in sandy soils. Weed Techn., 21 : 1049- 1053.

Ahmed, S.A. (1999). Effect of plant population and some weed control treatments on maize and its associated weeds. J. Agric. Sci., 24 (10): 5605 – 5625.

Ahmed, S.E.; H.M. Shams; I.M. El-Metwally; M.N. Shehata and M.A. El-Wakeel (2008). Efficiency of some weed control treatments on growth, yield and it attributes of maize (*Zea mays* L.) plants and associated weeds. J. Agric. Sci. Mansoura Univ., 33 (7): 4777-4789.

Allans, H. and J. Zhang (1997). Rate and time of bentazon/ atrazine application of broadleaf weed control in corn (*Zea mays* L). Weed Techn., 11 : 549-555.

A.O.A.C. (2000). Method of Analysis- Association of Official Agriculture Chemists 17th ed., Washington D.C. USA.

Armel, G.R.; H.P. Wilson; R.J. Richardson and T.E. Hins (2003). Mesotrione, acetochlor and atrazine for weed management in corn (*Zea mays* L). Weed Techn., 17 (2): 284-290.

Blackshaw, R.E. and R.N. Brandt (2008). Nitrogen fertilizer rate effects on weed competitiveness is species dependent. Weed Sci., 56 (5): 743-747.

Dalley, C.D.; M.L. Bernards and J.J. Kells (2006). Effect of weed removal timing and row spacing on soil moisture in corn (*Zea mays L*). Weed Techn., 20: 399-409.

Egan, H.; R. S. Kirk and R. Sawyer (1981). Pearsons Chemical Analysis of Food. Churchill Livingstone, Edinurgh, London, Melborne and New York.

El-Metwally, I.M. (2002). Efficacy of adding urea on some herbicides efficiency in controlling weeds associate in maize crops. Zagazig. J. Agric. Res., 29 (4): 1093-1112.

El-Metwally, I.M.; S.A. Ahmed and S.A.S. El-Din (2001). Nitrogen fertilizer levels and some weed control treatments effects on maize and its associated weeds. J. Agric. Sci. Mansoura Univ., 26 (2): 585-601.

Gana, A.K.; J.A. Adigum; K.O. Adejonwo; B.W. Ndahi and L.D. Busari (2008). Evaluation of pre-emergence herbicides for popcorn (Zea mays L.) production in the northern guinea savanna of Nigeria African Scientist, 9 (1): 9 – 12.

Gehrke, C.W.; L.L.Wall; J.S. Absheer; F.E. Kaiser and R.W. Zumwalt (1985). Amino acids: Acid hydrolysis of proteins. J. Assoe. off. Anal. Chem., 68: 811.

Hussein, H.A.; H.F. Abouziena; I.M. El-Metwally and E.R. El-Desoki (2008). Effect of plant spacing and weed control treatments on maize yield and associated weeds in sandy soils. American- Eurasian. J. Agric. and Environ. Sci., 4 (1): 9-17.

Kobeasy, M.I.; Ragaa O. Osman; E.R. El-Desoki and Safaa R. El-Lethy (2005). Effect of Basagran and Starane herbicides on chemical composition and crop characters of sorghum grains. J. Agric. Sci. Mansoura Univ., 30 (3): 1755-1771.

Markovic, M.; R. Protic and N. Protic (2008). Efficiency and selectivity of herbicides in maize (*Zea mays* L.) Romanian Agric. Res., 25: 77-82.

Mphundi, P.M. (2009). Factors affecting maize (*Zea mays* L.) sensitivity to acetochlor. Master Thesis in Agronomy, Dep. of Soil, Crop and Climate Sci., Fac of Natural and Agricultural Sci., Univ., of the Free State Bloemfontein. (C.F. computer Search).

Rahman, A. (1985). Weed control in maize in New Zealand. Pp 37-45 In: Maize- Management to Market, H.A. Eagles and G.S. Wratt (Eds). Agron. Soc. N.Z., Special Pub. No. 4, Palmerston North, New Zealand.

Shaban, A. Sh.; A.A. Metwally; N.I. Ashour and E.M. Abd El-Lattef (1991). Studies on selected herbicidal combinations in intercr-oppppping maize and soybeans. 11- growth and chemical analysis. Egypt. J. Agron., Special Issue, PP. 47-59.

Sharaky, M.M. and M.B. Ashour (1982). Effect of some herbicides on chemical composition of maize grains and broad bean seeds. Zagazig, J. Agric. Res., 9(1): 177 – 195.

Smith, F.; M.A. Gilles, J.K. Hamilton and P.A. Godees (1956). Colorimetric method for determination of sugar related substances. Anal. Chem., 28 : 390.

Snedecor, D. W. and W. Cochran (1980). Statistical Methods. Seventh Ed., Towa State University Press, Iowa, UAA.

Snel, M.J.B.; U. Bund; P. Heimbach and C.M. Schryer (1987). Stranae a new post emergence herbicide for the control of dicotyledonous weeds in cereals. German Crop Protection Conference. (C.F. Weed Abst. 36 (6): 1552).

Snell, F.D. and C.T. Snell (1953). Colorimetric Method. Vol. 111-organic. 606 pp. D. Van Nostrand Company. Inc. Torontto, New York, London.

Soliman, I.E. and H.S. Gharib (2011). Response of weeds and maize (*Zea mays* L.) to some weed control treatments under different nitrogen fertilizer rates. Zagazig J. Agric. Res., 38 (2): 249-271.

Yehia, Z.R.; H.R. El-Wekil; G.M. Mekhail and M.S. Twefik (1992). Control of atrazine tolerant broad-leaved weeds in maize by fluroxypyr. Assiut J. Agric. Sci., 23: 159-170.

تـأثير بعـض معـاملات مكافحـة الحشـائش علـى المحصـول والحشـائش المصـاحبة والتركيب الكيماوى للحبوب فى الذرة الشاميـة

إبراهيم السيد سليمان[1] وأمانى محمد حمزة[2]
١- المعمل المركزى لبحوث الحشائش- مركز البحوث الزراعية- الجيزة- مصر.
٢- قسم المبيدات- كلية الزراعة- جامعة كفرالشيخ- مصر.

أجريت تجربتـان حقليتـان بالمزرعـة البحثيـة بمحطـة البحـوث الزراعيـة بسـخا- كفرالشيخ خلال موسمى الزراعة ٢٠١٢ و٢٠١٣م لدراسة تـأثير معـاملات مكافحـة الحشـائش علـى المحصـول والحشائش المصاحبة له والتركيب الكيماوى للحبوب فى الذرة الشامية. تم استخدام خمسة معاملات لمكافحـة الحشـائش هـى : المقارنـة بـدون معاملـة - عزيـق مـرتين ومبيـدات الحشـائش (اسـتيوكلور، فلوروكسبير، بنتازون) متبوعة بعزقة يدوية واحدة.

وتتلخص أهم النتائج فيما يلى :

أظهرت النتـائج أن جميـع معـاملات مكافحـة الحشـائش قد أحدثت انخفـاض معنـوى فـى الـوزن الجاف للحشائش عريضة وضيقة الأوراق و الحشـائش الكليـة عن معاملـة المقارنـة (بـدون معاملـة). وقد تم الحصول على مكافحة عاليـة (٨٥ – ٩٥%) للحشـائش عريضـة وضيقة الأوراق والحشـائش الكلية من استخدام العزيق اليدوى مرتين أو أحد مبيدات الحشـائش إلـى جانـب العزيـق مـرة واحـدة. حيث سجلت هذه المعاملات انخفاضا واضحا فى الوزن الجاف للحشائش فى كـلا موسـمى الزراعـة. وقد انعكست كفاءة تلك المعاملات على مكونات محصول الذرة الشامية حيث أدت إلـى زيـادة ارتفـاع النبات، طول الكوز، وزن الحبوب فى الكوز، نسبة التفريط ، وزن ال ١٠٠ حبـة ومحصـول الحبـوب للفدان عن معاملة المقارنـة (بدون معاملة).

كمـا أظهـرت النتـائج أن جميـع معـاملات مكافحـة الحشـائش أدت إلـى زيـادة ملحوظـة فـى نسـبة البروتين والزيت وانخفـاض فـى نسـبة الفينـولات فـى حبـوب الـذرة الشـامية مقارنـة بمعاملـة الكنتـرول وايضا أدت جميـع معـاملات مكافحـة الحشـائش إلـى زيـادة نسـبة الكربوهيدرات القابلـة للتحلل المـائى ونسبة النشا وذلك بسبب المكافحة الجيدة للحشائش.

أدت جميـع معـاملات مكافحـة الحشـائش إلـى زيـادة بعـض الأحمـاض الأمينيـة الضـرورية مثـل الفينايل ألانين، الهستدين، الليسين، الليوسـين، ايزوليوسـين، المثينـونين و الـى زيـادة فـى نسـبة بعـض الأحماض الدهنية غير المشبعة الضرورية مثل اللينوليك واللينولينيك.

من نتائج هذا البحث يمكن التوصية باستخدام أحد مبيدات الحشـائش (اسيتوكلور- فلـوروكبير- بنتازون) متبوعة بعزقة يدوية واحدة بعد ٣٠ يوم من الزراعة كبديل مضـاهى لعمليـة العزيـق مـرتين وذلك للحصول على أفضل مكافحة للحشائش وأعلى محصول من حبوب الذرة الشامية وقيمـة غذائيـة مرتفعة للحبوب.

Table 5: Effect of weed control treatments on amino acids composition of maize grains (g/100g protein) during 2012 and 2013 summer seasons.

Amino acids (g/100g protein)	2012 season					2013 season				
	Acetochlor (1.0 1/fed) /H.H*	Fluroxypyr (0.2 1/fed) /H.H*	Bentazon (1.0 /fed) / H.H*	Hand hoeing twice	Control (untreated)	Acetochlor (1.0 1/fed) /H.H*	Fluroxypyr (0.2 1/fed) /H.H*	Bentazon (1.0 /fed) / H.H*	Hand hoeing twice	Control (untreated)
Threonine	3.67	2.28	2.93	3.07	1.86	3.40	2.63	2.67	3.23	2.14
Serine	3.42	3.24	3.56	3.73	2.83	3.21	2.59	4.60	3.37	3.27
Glutamic	11.76	11.53	18.76	15.77	10.87	12.45	12.27	15.00	14.89	11.24
Proline	9.06	10.58	9.30	6.11	6.01	9.87	9.39	9.40	5.83	5.49
Glycine	3.63	4.96	3.13	6.51	2.58	2.94	3.78	2.51	6.14	2.01
Alanine	10.33	6.11	6.44	9.23	5.31	9.99	7.3	7.19	9.01	6.14
Cystin	0.05	0.02	0.04	-	0.06	0.02	-	0.03	-	0.04
Valine	6.28	3.33	4.72	5.08	2.17	5.67	3.17	4.62	4.93	2.01
Methionine	0.46	0.43	0.58	0.35	0.48	0.36	0.31	0.59	0.39	0.43
Leucine	14.71	11.43	10.22	13.13	9.12	13.38	12.75	11.72	12.79	10.93
Phenyalanine	6.27	3.54	3.69	5.08	3.99	5.79	3.46	4.54	4.97	4.63
Lysine	4.40	3.37	4.61	3.61	3.45	3.52	3.42	4.84	3.83	3.64
Isoleucine	3.86	3.34	4.70	4.03	3.94	3.44	3.77	3.15	3.89	3.01
Tyrosine	3.47	1.91	1.75	2.24	1.11	3.86	2.36	2.13	2.57	1.79

Agrinine	3.85	4.87	3.30	3.40	2.63	3.71	4.59	3.81	3.77	3.14

H.H* = Hand hoeing

Table 6: Effect of weed control treatments on relative percentage of fatty acids in maizegrains oil during 2012 and 2013 summer seasons.

Fatty acids %	2012 season					2013 season				
	Acetochlor (1.0 1/fed) /H.H*	Fluroxypyr (0.2 1/fed) /H.H*	Bentazon (1.0 /fed) / H.H*	Hand hoeing twice	Control (untreated)	Acetochlor (1.0 1/fed) /H.H*	Fluroxypyr (0.2 1/fed) /H.H*	Bentazon (1.0 /fed) / H.H*	Hand hoeing twice	Control (untreated)
Carpic ($c_{10:0}$)	-	-	-	0.071	0.062	-	-	-	0.060	0.049
Lauric ($c_{12:0}$)	0.127	0.080	0.122	0.121	0.056	0.120	0.094	0.094	0.118	0.048
Myristic ($c_{14:0}$)	0.069	0.065	0.08	0.086	0.073	0.061	0.047	0.044	0.092	0.066
Palmitic ($c_{16:0}$)	11.89	11.62	11.82	13.58	11.67	11.62	11.98	11.20	13.63	11.82
Stearic ($c_{18:0}$)	0.183	0.186	0.147	0.181	0.171	0.097	0.079	0.083	0.163	0.089
Total saturated fatty acids (TS)	14.31	13.91	14.26	14.04	11.90	14.03	14.20	13.63	14.07	12.05
Oleic ($c_{18:1}$)	35.74	34.44	37.24	36.21	31.42	36.12	33.49	32.59	35.42	30.64
Lenoleic ($c_{18:2}$)	47.32	51.29	45.65	49.34	41.81	45.89	49.84	51.80	47.23	41.72
Linolenic ($c_{18:3}$)	1.69	1.63	1.56	1.73	1.82	1.58	1.67	1.77	1.81	1.80
Total unsaturated fatty acids (Tu)	84.75	88.09	85.75	87.28	74.75	83.59	85.80	86.36	84.46	73.82
TU/TS	5.93	6.34	6.02	6.22	6.29	5.96	6.05	6.34	6.01	6.13

H.H*=Handhoeing