EFFECT OF TILLAGE AND WEED CONTROL TREATMENTS ON MAIZE (ZEA MAYS L.) AND ASSOCIATED WEEDS

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Abstract

The aim of this work study the effect of weed control treatments in preceding crop rapeseed and weed control treatments on maize and associated weeds. Field experiments were conducted during 2012 and 2013 growing seasons at the Agricultural Research and Experiments Station, Faculty of Agriculture, Cairo University, Giza, Egypt. The preceding winter crop was canola. After canola harvest, maize experiments were conducted in the same land of canola, three weed control treatments in canola e.g. hoeing, pendimethlin and untreated check and maize experiment includes three wed control treatments e.g. hoeing twice, acetochlor and untreated check and two tillage systems no-tillage (NT) and conventional tillage (CT).The herbicide treatments did not superior to hoeing and hoeing with NT treatments were improved yield and yield components in maize, compared with untreated check, acteochlor with CT increased yield, compared to check treatments. The interaction between weed control treatments and tillage systems had significant on fresh weight and number of weeds/m^2, as well as, number of grains/ear, weight of grains/ear and grains yield per feddan (feddan=4200 m^2) however the highest yield obtained by hoeing in NT and acetochlor in CT, as well as, untreated check treatments in NT improved yield and yield components and weed characters, compared to untreated check treatments in CT.

1. INTRODUCTION

In the world, maize (Zea mays L.) covered about 150 million hectares following close to Rice and Wheat (Poienaru *et al.* 2005). In Egypt, maize the first cereal crop in summer season, the total area were cultivated 900,000 feddan (Feddan = 4200 m^2) during 2013 season, and the total grain yield 6, 5 million ton in 2013 (FAO, 2014).

Weeds represent one of the most costly and limiting factors in crop production and cause harvesting and storage problems (Rosskopf *et al*. 1999).The introduction and advances with herbicide-tolerant crops made in the last 15 years have greatly altered the herbicide needs in conservation systems for those who use these technologies; however in developing regions with limited access to herbicide options or in areas where herbicide-resistant weed species have compromised the use of herbicide-tolerant crops in conservation systems, early weed management tactics and control issues in reduced tillage practices remain relevant for growers.

No-tillage system is that it can improve population vertical distribution of the microclimate, with reduced illumination and air temperature at the heading stage and increased illumination and air temperature at the filling stage; in addition, relative humidity is higher under no-tillage than under conventional tillage at both the development stages (Han and Li, 2013).Conventional tillage is widely used to decrease weeds directly by burying weed seeds.

The soil surface coverage provided by cover crops mulches often correlate with weed suppression (Teasdale *et al*. 1991). The amount of soil surface coverage is important since mulches block the light stimulus that is required for the germination of many small seeded weed species (Barnes & Putnam 1983, Moore *et al*. 1994, Teasdale 1993). When cover crops, such as winter rye, are incorporated into the soil, the resulting weed control is often significantly reduced (Walters & Young 2010, Walters and Yang. 2008), which is most likely due to several factors including less soil surface coverage by mulch residues, bringing new weed seed to the soil surface, quicker decomposition of incorporated residues, and lower levels of allelochemicals in the weed seed germination zone (Masiunas 1998). Generally, once cover crop residues are incorporated into the soil, allelochemicals quickly decompose and are leached away from the upper soil levels where weed seeds germinate (Dias, 1991). In contrast, when

cover crop residues remain on the soil surface, weed growth is suppressed for a longer period of time since allelochemicals degrade slower (Masiunas 1998). The residues of many cover crops release allelechemicals that inhibit weed seed germination and growth (Creamer *et al*, 1996, Mwaja *et al*, 1995, Ohno *et al.*, 2000, Weston 1996 and Absy *et al*, 2014).

Conservation tillage, cover crops and crop rotation are important components of an integrated weed management (IWM) system (Swanton & Murphy, 1996). The influence of these components on weed species shifts varies. Several studies have reported the positive effect of cover crops on weed suppression. For example, rye cover crop suppressed certain broad-leaved and grass weeds (Shilling *et al.*, 1986). Similarly, hairy vetch (*Vicia villosaL.*) residue suppressed some weed species (Teasdale, 1993). Hence, crop rotation is recognized as an important tool for weed management because some crops in the rotations suppress weeds by competing for resources and causing allelopathic interference (Liebman & Dyck, 1993)

Weed infestation is of prime importance and uncontrolled weed population can substantially reduce maize yield. Spitters *et al* (1998) reported that unrestricted weed growth in maize reduced crop yield by 82%. Chemical weed control is a better supplement to conventional methods and the herbicides use is an essential component of successful maize production. Chemical weed control method is quick, more effective time and labor saving. No chemical weed control is generally regarded as less cost effective compared with chemical weed management that mainly due to the fact that all non chemical weed control methods required repeated treatments and may be labour intensive and costly. Chemical weed control is suggested by many researchers. Patle *et al* (2006) indicated that the application of the herbicides in maize field lead to excellent results in weed control and crop production, for this reasons, the chemical weed control in maize was granted a great attention by using different herbicides based on Atrazine, Alchlor. Acetochlor, Butilat, Pendimethalin, Dicamba and 2,4-D Therefore the objective of this study was to evaluate and compare the effect of the two herbicides Stomp 500 EC (pedimethalin), Gesaprim 80 WP and their mixture in controlling weed and consequent effect on weed and some maize growth and yield components.

2. MATERIALS AND METHODS

Two field experiments were carried out during successive summer seasons 2012 and 2013 at the Agricultural Research and Experiment Station, Faculty of Agriculture, Cairo University, Giza, Egypt. The preceding crop was Canola in winter season and weed control treatments in Canola were hoeing, pendimethalin and unweeded, after Canola harvest the successive crop was maize. Maize experiments carried out on the same land, using two tillage practices No-tillage (NT) and Conventional tillage (C T) and Maize weed control treatments were: hoeing twice once after 3 weeks from sowing date, using chemical Acetochlor (Harness 84%) with 1 L /feddan (4200m^2) as pre-emergence applied, and weedy check (Control).Maize (*Zea mays* L.) pioneer 30 K8, obtained from pioneer company for seeds. Maize seeds were sown on ridges 70 cm apart and leaving 20 cm between hills that were thinned to 1 seedling per hill. Each plot was 4 ridges, each ridge was 3.5 meters long. Seeds was growing using split plot in randomized complete block design with 3 replicates under NT and 3 replicates under CT. one weed sample using 0.5*0.5 quadrate meter frames was taken from each plot at 55 days after sowing (DAS). Weeds were identified, number and fresh weight of weeds were determined to the nearest g.$m.^2$

2.1. ACETOCHLOR (HARNESS 84%).

Chemical Name 2-chloro-N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) acetamide, Acute oral LD50 2.148 g /kg (rat), Acetochlor Formulations 90% E.C., 50% E.C. Acetochlor is a selective herbicide, absorbed mainly by the shoots of germinating plants.

2.2. PENDIMETHALIN (STOMP 45%).

Chemical Name N-(1-ethylpropyl)-2, 6-dinitro-3, 4-xylidine Pendimethalin Formulations: 33% w/v E.C.; 40% w/v E.C. Pendimethalin is a selective herbicide, absorbed by the roots and leaves. Affected plants die shortly after germination or following emergence from the soil.

2.3. CHARACTERS STUDIES AT HARVEST:

1. Number of weeds /m^2 at 55 DAS.
2. Fresh weight of weeds / m^2 at 55 DAS. (g).
3. Number of grains/ear (g) in maize.
4. Weight of grains/ear . (g) in maize.
5. Grain yield /feddan (ardab) in maize.

Table 1. Weed control treatments and tillage practices in maize of summer crops.

Weed control in Canola in winter season	**Weed control in Maize in summer season**	
	C T	**NT**
Hoeing	Hoeing	Hoeing
	Acetochlor	Acetochlor
	Unweeded	Unweeded
Pendimethalin	Hoeing	Hoeing
	Acetochlor	Acetochlor
	Unweeded	Unweeded
Unweeded	Hoeing	Hoeing
	Acetochlor	Acetochlor
	Unweeded	Unweeded

2.4. STATISTICAL ANALYSIS

Data were subjected to the proper analysis using F-value test according to Sendecor and Cochran, 1989. Treatments means were compared by the L.S.D. at the level of probability of 5%, M STAT-C software program was used.

3. RESULTS AND DISCUSSION

The major weeds presented on the experimental site of maize and soybean included common purslane (*Portulaca oleracea* L.) ; jungle rice (*Echinochloa colona* L.) ; nalta jute (*Corchorus olitorus*), purshne horse (*Trainthima portulacastrum*) ; spurg (*Euphorbia geniculata*) ; bromus (*Bromus indica*) ; cocklebur (*Xithansium brasilicum*) ; field sandbur (*Cenchrus ciliaris*) ; bindweed (*Convolvulus arvensis*) ; purple nutsedge (*Cyperus rotundus*) and Johnson grass (*Sorghum halepense*) according to the composite of weeds by the Weed Sci. of Soc. of Am. (1984).

3.1. NUMBER OF WEEDS AT 55 DAS.

Data presented in Table 2 and 3 indicated that the effect of weed control on preceding crop, as well as, weed control treatments and tillage CT /NT on number of weeds/m^2 at 55 DAS, was significant during 2012 and 2013 seasons.

Hoeing and chemical weed control treatments that effect to reduced number of weed plants in maize field after 55 DAS for all weed control treatments on maize. In addition, that chemical weed control treatments with CT were the best weed control treatments reduced the number of weeds. But, hoeing weed control treatments were the best with ZT compared to unweeded treatments, and hoeing weed control treatments of preceding crop (canola) were reduced number of weeds compared to the rest weed control trestments.

Table 2. Effect of weed control treatments in preceding crop (canola), as well as, tillage and weed control treatments on number of weeds/m^2 in maize field, in 2012 season.

Canola weed cont. (A)	Maize weed cont. (B)	Tillage systems (C)		Mean
		Conventional	Minimum	
Hoeing	**Hoeing**	19.66	16.32	17.99
	Acetochlor	10.99	42.05	26.52
	Unweeded	105.24	52.39	78.81
Mean		45.30	36.92	41.11
Pendimethalin	**Hoeing**	20.70	14.62	17.66
	Acetochlor	11.29	46.72	29.00
	Unweeded	107.17	58.20	82.68
Mean		46.29	39.85	43.07
Unweeded	**Hoeing**	21.21	18.42	19.82
	Acetochlor	14.67	52.37	33.52
	Unweeded	114.89	56.57	85.73
Mean		50.26	42.46	46.36
Hoeing		20.53	16.46	18.49
Acetochlor		12.22	47.05	29.63
Unweeded		109.10	55.72	82.41
Mean		47.28	39.74	
LSD $_{0.05}$ for:				
	A	2.18	A×B	3.78
	B	2.18	A×C	3.08
	C	0.0	B×C	3.08
			A×B×C	5.35

A: Weed control in rapeseed (preceding crop), B: Weed control in maize (crop), C: Tillage systems

Table 3. Effect of weed control treatments in preceding crop (canola), as well as, tillage and weed control treatments on number of weeds/m^2 in maize field, in 2013 season.

Canola weed cont. (A)	Maize weed cont. (B)	Tillage systems (C)		Mean
		Conventional	Minimum	
	Hoeing	21.32	15.60	18.46
Hoeing	**Acetochlor**	12.05	43.58	27.82
	Unweeded	113.73	57.48	85.61
Mean		49.03	38.89	43.96
	Hoeing	21.35	14.73	18.04
Pendimethalin	**Acetochlor**	11.34	46.84	29.09
	Unweeded	112.60	45.92	79.26
Mean		48.43	35.83	42.13
	Hoeing	22.36	21.88	22.12
Unweeded	**Acetochlor**	11.68	56.07	33.88
	Unweeded	117.68	58.72	88.20
Mean		50.57	45.56	48.06
Hoeing		21.68	17.40	19.54
Acetochlor		11.69	48.83	30.26
Unweeded		114.67	54.04	84.36
Mean		49.35	40.09	
LSD $_{0.05}$ for:				
	A	3.8	A×B	6.55
	B	3.8	A×C	5.35
	C	Sig	B×C	5.35
			A×B×C	9.27

A: Weed control in canola (preceding crop), B: Weed control in maize (crop), C: Tillage systems

Results showed chemical weed control plus CT was the best treatment which reduced number of weeds at 55 DAS, during both seasons. In the second rank, came hoeing weed control treatments with all tillage systems CT and ZT, but, hoeing weed control treatments with ZT were superior in decreasing number of weeds at 55 DAS. Although, chemical with CT was the best treatment, chemical weed control with ZT, did not reduce number of weeds during both seasons compared to chemical with CT

3.2. WEIGHT OF WEEDS AT 55 DAS.

Data in Tables 4 and 5 showed that the effect of weed control treatments of preceding crop, as well as, tillage practices and weed control treatments on successive crop maize was significant. Results indicated that chemical weed control treatments with CT plus application of chemical weed control on preceding crop was the best for weed control and decreased the fresh weight of weeds at 55 DAS, during 2012 and 2013 seasons. Moreover, hoeing weed control treatment with ZT had significantly decreased the fresh weight of weeds, compared with other ZT weed control treatments. Also, hoeing

and weedy with CT treatments resulted in decreased weight of weeds during 2011 and 2012 seasons. Hoeing and chemical weed control treatments that effect to reduced fresh weight of weed plants in maize field after 55 DAS for all weed control treatments on maize. In addition, that chemical weed control treatments with CT were the best weed control treatments reduced the fresh weight of weeds. But, hoeing weed control treatments were the best with ZT compared to unweeded treatments, and hoeing weed control treatments of preceding crop (canola) were reduced fresh weight of weeds compared to the rest weed control trestments of preceding crop.In the second rank, hoeing weed control treatment with ZT reduced fresh weight of weeds at 55 DAS and chemical weed control with CT was better than the rest CT weed control treatments in 2012/2013 season.In the second season, data in Table 5 showed that the chemical weed control with CT was the best treatment resulted in reduced fresh weight of weeds at 55 DAS. Many investigators found that weed control treatments reduced fresh weight of weeds Hafeezullah (2000); Khan *et al.* (2003) and Abdullah (2007) and this is in agreement with these of present study.

Table 4. Effect of weed control treatments in preceding crop (canola), as well as, tillage and weed control treatments on fresh weight of weeds (gm/m^2) in maize field, after 55 DAS maize in 2012 season.

Canola weed cont. (A)	**Maize weed cont. (B)**	**Tillage systems (C)**		**Mean**
		Conventional	**Minimum**	
	Hoeing	119.66	70.33	95.00
Hoeing	**Acetochlor**	57.09	287.17	192.13
	Unweeded	1376.53	457.21	916.87
Mean		517.76	238.24	378.00
	Hoeing	121.87	80.19	101.03
Pendimethalin	**Acetochlor**	65.75	322.51	194.13
	Unweeded	1471.33	506.85	989.09
Mean		549.65	303.18	426.42
	Hoeing	125.56	91.33	108.45
Unweeded	**Acetochlor**	73.86	449.51	261.69
	Unweeded	1455.00	521.25	988.13
Mean		544.81	354.03	449.42
Hoeing		122.37	80.62	101.49
Acetochlor		55.57	319.73	187.65
Unweeded		1434.29	495.10	964.70
Mean		537.41	298.48	
LSD $_{0.05}$ for:				
	A	29.30	A×B	50.75
	B	29.30	A×C	41.44
	C	0.0	B×C	41.44
			A×B×C	71.77

A: Weed control in canola (preceding crop), B: Weed control in maize (crop), C: Tillage systems

Table 5. Effect of weed control treatments in preceding crop (canola), as well as, tillage and weed control treatments on fresh weight of weeds (gm/m^2) in maize field, after 55 DAS in 2013 season.

Canola weed cont. (A)	Maize weed cont. (B)	Tillage systems (C)		Mean
		Conventional	Minimum	
	Hoeing	104.97	70.55	87.76
Hoeing	Acetochlor	64.43	213.02	138.73
	Unweeded	1413.63	348.73	931.18
Mean		534.34	244.10	389.22
	Hoeing	124.16	71.22	97.69
Pendimethalin	Acetochlor	57.97	309.86	183.92
	Unweeded	1483.76	493.60	988.68
Mean		555.30	291.56	423.43
	Hoeing	127.34	78.26	102.80
Unweeded	Acetochlor	55.05	420.88	237.97
	Unweeded	1495.95	503.83	999.89
Mean		559.45	334.33	446.89
Hoeing		125.49	73.34	99.42
Acetochlor		59.15	314.59	186.87
Unweeded		1464.45	482.06	973.25
Mean		549.70	290.00	
LSD $_{0.05}$ for:				
	A	10.69	A×B	18.51
	B	10.69	A×C	15.12
	C	Sig	B×C	15.12
			A×B×C	26.18

A: Weed cont. treat. in canola (preceding crop), B: Weed cont. treat. in maize (crop), C: Tillage syst.

3.3. NUMBER OF GRAINS / EAR (G).

Data shown in Tables 6 and 7 indicated that cultivation weed control treatments with ZT after cultivation in winter crop were the best treatment that increased number of grain per ear (gm) in 2012 and 2013 seasons compared with weedy treatment.Chemical weed control treatment, also, with CT, increased number of ear grains during two seasons, compared to weedy treatment with ZT surpassed weedy with CT, during 2011 and 2012 seasons.

The results presented herein could be confirmed with Jones et al., 1968 who reported that increased number of grains per ear and weight of grains ear in corn crop with ZT. In addition to similar findings were previously recorded by (Bottenburg *et al.,* 1997) who indicated that appling ZT and hoeing gave good control of weeds in maize and increased grains weight of ear. While Kruidhof *et al.,* 2007 found that weed control by herbicides increased weight of grains and number of grains per ear in maize crop.

Hoeing and chemical weed control treatments that effect to increased on number of grains /ear of maize in 2012 and 2013 season at harvest compared to all weed control treatments on maize Table 7. In addition, that chemical weed control treatment with CT was the best weed control treatment. But, hoeing weed control treatments came in the second rank with CT and with ZT compared to all weed control treatments with ZT.

Table 6. Effect of weed control treatments in preceding crop (canola), as well as, tillage and weed control treatments on number of grains /ear of maize in 2012 season.

Canola weed cont. (A)	**Maize weed cont.(B)**	**Tillage systems (C)**		
		Conventional	**Minimum**	**Mean**
	Hoeing	457.0	473.0	465.0
Hoeing	**Acetochlor**	466.0	322.0	394.0
	Unweeded	321.0	334.0	327.5
Mean		173.6	414.7	376.3
	Hoeing	442.0	478.0	460.0
pendimethalin	**Acetochlor**	464.0	342.0	403.0
	Unweeded	354.0	377.0	365.5
Mean		175.2	420.0	399.0
	Hoeing	468.0	482.0	475.0
Unweeded	**Acetochlor**	471.0	355.0	413
	Unweeded	354.0	375.0	364.5
Mean		171.76	431.0	404.0
Hoeing		204.38	446.2	481.3
Acetochlor		211.05	435.6	344.2
Unweeded		105.11	341.6	382.5
Mean		173.52	407.8	
LSD $_{0.05}$ for:				
	A	2.21	A×B	9.11
	B	2.21	A×C	8.16
	C	Sig	B×C	8.16
			A×B×C	16.15

A: Weed cont. treat. in canola (preceding crop), B: Weed cont. treat. in maize (crop), C: Tillage syst.

The interaction between weed control treatments in canola and weed control treatments in maize and tillage systems improved number of grains/ ear. Applied hoeing in canola then applied three weed control treatments in maize with CT and NT. The highest treatment increased number of grains /ear hoeing with NT and in the second rank acetochlor with CT without significantly differences with hoeing with CT. In addition that, applied pendimethalin in canola and hoeing with NT was the best treatment increased the number of grains/ear during season 2012 and 2013 respectively. Also, hoeing

with NT after untreated check plots in canola was the best treatment, for all NT and weed control treatments hoeing treatments were the best increasing number of grains/ear compared to untreated check treatments on the other hand, acetochlor and hoeing were the best treatments with CT increased number of grains per ear compared to untreated. In table 7 during 2013 season the highest treatment resulting increase number of grains was hoeing with NT for all weed control treatments with NT and in the second rank came hoeing and acetochlor with CT compared to untreated check treatments.

Table 7. Effect of weed control treatments in preceding crop (canola), as well as, tillage and weed control treatments on number of grains /ear of maize in 2013 season.

Canola weed cont. (A)	**Maize weed cont. (B)**	**Tillage systems (C)**		
		Conventional	**Minimum**	**Mean**
	Hoeing	477.5	497.9	487.7
Hoeing	**Acetochlor**	444.3	302.3	373.3
	Unweeded	280.6	322.7	301.6
Mean		400.02	400.8	374.3
	Hoeing	447.2	461.9	454.5
pendimethalin	**Acetochlor**	443.6	316.6	380.1
	Unweeded	233.7	374.3	304
Mean		374.79	374.8	384.3
	Hoeing	474.4	482.9	478.6
Unweeded	**Acetochlor**	489.5	381.2	435.3
	Unweeded	303.8	368.2	336
Mean		432.577	422.6	410.8
Hoeing		525.02	448.5	478.2
Chemical		444.02	444	338
Unweeded		308.35	328.4	360.4
Mean		425.79	407	
LSD $_{0.05}$ for:				
	A	2.16	A×B	6.19
	B	2.16	A×C	2.23
	C	Sig	B×C	2.23
			A×B×C	11.41

A: Weed cont. treat. in canola (preceding crop), B: Weed cont. treat. in maize (crop), C: Tillage syst.

3.4. WEIGHT OF GRAINS/ EAR (G).

Data shown in Table 8 and 9 indicated that effect of tillage practices and weed control treatments, as well as, weed control treatments in preceding crop on weight of grains /ear (g), during 2012 and 2013 seasons, respectively.

In the second rank, came chemical weed control treatments with conventional tillage (CT) that had significant increased weight of grains /ear compare to chemical weed control treatments with ZT and weedy treatments during both seasons. Zero tillage and weedy treatments caused significant increased in weight of grains /ear for both seasons, compared to weedy with CT, this may be due to CT stimulatory effect on weed seed in soil after CT applied. All conventional tillage and weed control treatments hoeing and chemical increased weight of grains /ear except weedy treatments.

Table 8. Effect of weed control treatments in preceding crop (canola), as well as, tillage and weed control treatments on weight of grains/ ear of maize (g) in 2012 season.

Canola weed cont. (A)	Maize weed cont. (B)	Tillage systems (C)		Mean
		Conventional	Minimum	
	Hoeing	231.77	260.15	245.96
Hoeing	**Acetochlor**	243.23	194.38	218.81
	Unweeded	140.53	187.14	163.83
Mean		205.18	213.89	209.53
	Hoeing	232.13	253.17	242.65
pendimethalin	**Acetochlor**	249.79	214.82	232.31
	Unweeded	148.20	195.84	172.02
Mean		210.04	221.28	215.66
	Hoeing	230.15	245.16	237.66
Unweeded	**Acetochlor**	239.82	199.81	219.81
	Unweeded	134.17	197.15	165.66
Mean		201.38	214.04	207.71
Hoeing		231.35	252.83	242.09
Acetochlor		244.28	203.00	223.64
Unweeded		140.97	193.38	167.17
Mean		205.53	216.40	

LSD 0.05 for:

A	3.5	A×B	6.05
B	3.5	A×C	4.94
C	Sig	B×C	4.94
		A×B×C	8.55

A: Weed cont. treat. in canola (preceding crop), B: Weed cont. treat. in maize (crop), C: Tillage syst.

Table 9. Effect of weed control treatments in preceding crop (canola), as well as, tillage and weed control treatments on weight of grains/ ear (g) of maize in 2013 season.

Canola weed cont. (A)	Maize weed cont. (B)	Tillage systems (C)		Mean
		Conventional	Minimum	
Hoeing	**Hoeing**	238.43	256.81	247.62
	Acetochlor	253.16	199.96	226.56
	Unweeded	147.90	190.18	169.04
	Mean	205.18	213.16	215.65
pendimethalin	**Hoeing**	237.82	247.14	242.48
	Acetochlor	253.85	201.53	227.69
	Unweeded	144.16	213.17	178.67
	Mean	210.04	211.94	220.61
Unweeded	**Hoeing**	234.18	216.81	225.50
	Acetochlor	242.49	200.47	221.48
	Unweeded	140.49	188.25	164.37
	Mean	201.38	205.72	201.85
Hoeing		231.35	236.81	240.25
Acetochlor		244.28	249.83	200.65
Unweeded		140.97	144.18	197.20
Mean		210.28	212.70	
LSD $_{0.05}$ for:				
A		6.79	A×B	11.77
B		6.79	A×C	9.61
C		Sig	B×C	9.61
			A×B×C	16.65

3.5. GRAIN YIELD PER / FEDDAN (ARDAB).

Data presented in Table 10 and 11 indicated the effect of weed control treatments of preceding crop (canola) and two tillage systems (CT, NT), as well as, weed control treatments on (maize) successive crop effect on grain yield / ardab (ardab= 140 kg) during 2012 and 2013 seasons. It was clear that, hoeing weed control treatment with NT, showed the best increase of grain yield per feddan which surpassed the other weed control treatments, during both seasons. In the second order, came chemical and hoeing weed treatments with CT which increased grain yield. However, chemical weed control plus NT did not increase grain yield, compared to weedy with NT. Results showed that weedy with ZT had significant increase of grain yield per feddan, during both seasons, compared to weedy with CT. In addition, the means of weed control treatments with ZT surpassed CT weed control treatments, except chemical weed control treatments.Hoeing and chemical weed control treatments that effect to improved grain yield of maize at harvest compared to all weed control treatments on maize Table 10. In addition, that chemical weed control treatment with CT was the best weed control treatment in grain yield. But, hoeing weed control treatments came in the second rank with CT and with NT

compared to chemical weed control with NT and unweeded treatments, and unweeded treatment with NT had incresed grain yield compared to unweeded with CT and without siginificantly diffrences by chemival weed control with NT.

Table 10. Effect of weed control treatments in preceding crop (canola), as well as, tillage and weed control treatments on maize yield (ardab/feddan), in 2012 season.

Canola weed cont. (A)	Maize weed cont. (B)	Tillage systems (C)		
		Conventional	Zero	Mean
Hoeing	Hoeing	24.55	26.90	25.73
	Acetochlor	26.70	16.78	21.74
	Unweeded	10.65	14.68	12.66
Mean		20.63	19.45	20.04
Pendimethalin	Hoeing	25.59	26.78	26.18
	Acetochlor	26.79	14.95	20.87
	Unweeded	11.29	14.54	12.92
Mean		21.22	18.76	19.99
Unweeded	Hoeing	23.99	25.67	24.83
	Acetochlor	25.77	16.15	20.96
	Unweeded	10.98	15.14	13.06
Mean		20.25	18.99	19.62
Hoeing		24.71	26.45	25.58
Acetochlor		26.42	15.96	21.19
Unweeded		10.97	14.79	12.88
Mean		20.70	19.07	
LSD $_{0.05}$ for:				
	A	0.44	A×B	0.82
	B	0.44	A×C	0.67
	C	Sig	B×C	0.67
			A×B×C	1.16

A: Weed cont. treat. in canola (preceding crop), B: Weed cont. treat. in maize (crop), C: Tillage syst.

Results in Table 11, showed that effect of weed control treatments and tillage systems on grain yield of maiz /fed. during 2012 and 2013 season. Chemical weed control treatments were the best increased grain yield, and, ZT with hoeing weed control treatments increased grain yield / fed. compared to all weed control treatments. The interaction between weed control treatments and tillage systems improved grain yield, all weed control treatments with CT improved grain yield compared to untreated without significantly differences among hoeing and acetochlor. Also, weed control treatments with NT improved grain yield with hoeing and untreated check compared to acetochlor, the highest grain yield

with hoeing under NT during both season, these findings agreement with Shilling *et al*, 1986 and Patle *et al*. 2006.

Table 11. Effect of weed control treatments in preceding crop (canola), as well as, tillage and weed control treatments on maize yield (ardab/feddan), in 2013 season.

Canola weed cont. (A)	Maize weed cont. (B)	Tillage systems (C)		Mean
		Conventional	Zero	
	Hoeing	26.06	27.25	26.66
Hoeing	**Acetochlor**	27.62	15.62	21.62
	Unweeded	11.38	15.01	13.20
Mean		21.69	19.29	20.49
	Hoeing	24.37	25.66	25.02
Pendimethalin	**Acetochlor**	26.13	15.38	20.76
	Unweeded	11.43	14.60	13.02
Mean		20.64	18.55	19.60
	Hoeing	24.12	24.79	24.45
Unweeded	**Acetochlor**	26.30	15.33	20.82
	Unweeded	11.78	14.23	13.00
Mean		20.73	18.11	19.42
Hoeing		24.85	25.90	25.37
Acetochlor		26.69	15.44	21.06
Unweeded		11.53	14.61	13.07
Mean		21.02	18.65	
LSD $_{0.05}$ for:				
	A	0.40	A×B	0.70
	B	0.40	A×C	0.57
	C	Sig	B×C	0.57
			A×B×C	0.99

A: Weed cont. treat. in canola (preceding crop), B: Weed cont. treat. in maize (crop), C: Tillage syst.

4. CONCLUSION

- The best weed control treatment that increased weight of grains ear (gm) was hoeing, but, chemical weed control was the best as weed control in preceding crop. The interaction between hoeing under NT and hoeing in preceding crop was the best treatment which increased weight of grains ear, during 2011and 2012 seasons.
- Chemical weed control with conventional tillage increased grin yield per feddan but, the best weed control was interaction between hoeing under NT and hoeing in preceding crop during 2011

season. In the second season, chemical weed control under CT and hoeing in preceding crop was the best.

- The interaction between weed control under CT and hoeing weed control on preceding crop was the best weed control collection that decreased number of weeds/m^2 during 2012 season. In the second season, chemical weed control in maize plots decreased number of weeds/m^2 at 55 DAS and, the interaction between chemical under CT and hoeing weed control in preceding crop was the best for weed control. Chemical weed control under CT and hoeing weed control in preceding crop decreased fresh weight of weeds/ m^2 at 55 DAS, but, in general, the interaction between hoeing weed control treatment in maize plots and hoeing under NT was the best weed control during both seasons.

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