J. Agric. Sci. Mansoura Univ., 34 (8): 9001 - 9013, 2009

CULTURAL AND MANUAL WEED MANAGEMENT IN SESAME

Saudy, H.S. and W.R. Abd El-Momen
Agron. Dept., Fac. Agric., Ain Shams Univ., Cairo, Egypt.

ABSTRACT

Two field experiments were conducted at the Research and Experimental Station Farm, Faculty of Agriculture, Ain Shams University at Shalakan, Kalubia Governorate, Egypt, during 2006 and 2007 growing seasons to study the response of three cultivars (Toshka, Shandawel-3 and Shansawel-4) of sesame yield and the associated weeds to four weed management practices (adding false irrigation followed by light hoeing with either two hoeing {W_1} or without hoeing {W_2} as well as without adding false irrigation with either two hoeing {W_3} or without hoeing {W_4}), and two sowing methods (drilling seeds in ridges or in rows). Data revealed that W_1 or W_2 exceeded W_3 or W_4 for reducing dry weights of broadleaf and total weeds at 3 WAS. Moreover, W_1 recorded the lowest dry weight values of broad leaf and total weeds (at 6 and 12 WAS) and grassy weeds (at 12 WAS), while W_3 gave the minimal dry weight of grassy weeds (at 6 WAS). W_1 was the best practice for enhancing plant height, capsules number and weight/plant, seeds weight/plant, weight of 1000 seeds, oil % as well as biological, seed and oil yields/fed.

Broad leaf and total weeds (at 12 WAS) showed the minimal dry weight when sesame plants were grown in ridges than in rows. While, sowing methods had no significant effect on sesame yield and its components as well as oil % and yield/fed.

At 12 WAS, Shandawel-3 along with Shandawel-4 was less infested with grassy and total weeds recording the minimum dry weight values. Shandawel-3 was the potent cultivar for producing the highest values of plant height, capsules and seeds weight/plant as well as biological, seed and oil yields/fed.

W_1 x ridges x Shandawel-3 combination possessed the least dry weight at all stages, and recorded the highest values of seeds weight/plant, seed yield and oil yield/fed.

Seed yield of the three tested cultivars, i.e. Toshka, Shandawel-3 and Shandawel-4 was correlated negatively and highly significant with dry weight of total weeds (at 6 and 12 WAS). Plant height, capsules number and weight/plant and seeds weight/plant of the three cultivars were correlated positively and highly significant with seed yield.

Finally, it could be recommended that the combination of false irrigation followed by light hoeing and accompanied with hoeing twice at 25 and 45 days from sowing of sesame c.v. Shandawel-3 that was sown in ridges is the best practice for weed suppression and higher yield potentiality.

Keywords: Sesame, Weeds, Sowing methods, Cultivars

INTRODUCTION

One of the oldest cultivated plants in the world is sesame. It is a highly prized oil crop. Its seeds and their constituents (approximately 50 % oil and 25 % protein) are used in food industries. Moreover, seed meal is an excellent high-protein (34 - 50 %) feed for poultry and livestock.

Sesame plants are poor competitors against weeds, especially at early growth stages, so controlling weeds since the planting crop is significance. The production per unit area is quite low because of weed infestation. Singh *et al.* (2003) reported that weeds reduced sesame seed yield by 20.6 %.

Under the current directions to produce safely healthy food, many farms are organically managed and this requires exclusion the application of synthetic chemicals. Herein, use a wide variety of compatible weed control tools and strategies (without herbicides) is the most efficient and acceptable approach to combat weeds. In this respect, hand hoeing still the potent effective pattern with regard to weed elimination and also as a safety clean non-chemical weed control method in the point of view of environmental conservation. Hand weeding twice reduced density and dry matter of weeds by 57.5 and 60.4%, respectively (Kumar and Thakur, 2005).

Besides, sowing method may affect the crop growth vigor, reflecting on its competitiveness against weeds. Weed control efficiency markedly varied with various sowing methods in sesame (Kumar and Thakur, 2005 and Imoloame *et al.*, 2007).

Moreover, crop cultivars can differ substantially in their response to weed competition, with those that canopy earlier and provide more shading being the most competitive. Varietal differences in sesame yield and its attributes were stated by Sootrakar, *et al.,* (1995) and Subrahmaniyan *et al.,* (2001).

Consequently, the present investigation was planned to determine the best weed management package (involved cultural and manual weed control) for sesame crop.

MATERIALS AND METHODS

Two field experiments were conducted at the Research and Experimental Station Farm, Faculty of Agriculture, Ain Shams University at Shalakan, Kalubia Governorate, Egypt, during 2006 and 2007 growing seasons to study the response of three sesame cultivars (Toshka, Shandawel-3 and Shansawel-4) yield and the associated weeds to two sowing methods (drilling seeds in ridges or in rows), and four weed management practices (adding false irrigation followed by light hoeing after 8 days with either two hoeing at 25 and 45 days from sowing {W_1} or without hoeing {W_2} as well as without adding false irrigation with either two hoeing at 25 and 45 days from sowing {W_3} or without hoeing {W_4}).

A strip plot design was used with four replicates. Weed management practices were arranged in the vertical plots, sowing method treatments were allocated in the horizontal plots, and cultivars occupied the sub plots. The experimental unit area was 12.96 m^2 and contained 6 ridges or rows (3.6 m length and 60 cm apart).

The soil texture of the experimental site was clay loam, with 2.0 % organic matter, 0.15 % total nitrogen and pH of 7.3. The preceding crop was berseem in both seasons.

Seeds of sesame cultivars were sown in hills, 20 cm apart at a rate of 3.0 kg/fed, then sowing irrigation was applied. The sowing date was May 13th and 19th in the 1st and 2nd seasons, respectively. At 25 days after sowing, plants were thinned to secure two plants per hill followed by irrigation. Phosphorus fertilizer (in the form of calcium super phosphate, 15 % P_2O_5) was applied during the soil preparation at the rate of 100 kg/fed. Also, nitrogen fertilizer (in the form of ammonium sulfate, 20 % N) was applied at the rate of 30 kg/fed at three equal portions: after thinning, before the second and the third irrigation.

All other recommended cultural practices were adopted throughout the two seasons.

Assessments:-

Weeds:

Weeds were hand pulled three times from one length meter of middle ridge or row of each experimental unit at 3, 6 and 12 weeks after sowing (WAS). The dry weights/m^2 of broadleaf, grassy and total weeds were estimated after air drying for 7 days and oven drying at 105° C for 24 hours.

Sesame:

Five guarded plants were taken randomly from each experimental plot at harvest to measure plant height, branches number/plant, capsules number and weight/plant, seeds weight/plant and weight of 1000 seeds. Moreover, plants of one middle ridge or row of each experimental plot were collected to evaluate biological and seed yields/fed.

Seed oil percentage was determined by extraction the oil using Soxhlet Apparatus with hexane as an organic solvent according to A.O.A.C. (1995), then oil yield was calculated.

Simple correlation:

All possible coefficients of simple correlation (r) were calculated (according to Snedecor and Cochran, 1980) between sesame seed yield and each of dry weight of total weeds (at 3, 6 and 12 WAS), sesame plant height, branches number/plant, capsules number and weight/plant, seeds weight/plant and weight of 1000 seeds, under each studied cultivar.

Statistical analysis:

All the obtained data from each season were exposed to the proper statistical analysis of variance according to Gomez and Gomez (1984). The combined analysis of variance for the data of the two seasons was performed after testing the error homogeneity and LSD at 0.05 level of significance was used for the comparison between means.

RESULTS AND DISCUSSION

I- Weed growth

During both growing seasons the dominant annual broad leaf weeds were common purslane (*Portulaca oleracea*, L.) and malta jute (*Chorchorus olitorius* L.), while the major grassy weeds were jungle rice (*Echinochloa colonum* (L.) Link.) and crowfoot grass (*Dactyloctenium aegyptium* (L.) P. Beauv.).

a-Effect of the individual factors:

The impacts of weed management, sowing methods and sesame cultivars on dry weights of broad leaf, grassy and total weeds at different growth stages, i.e. 3, 6 and 12 WAS are presented in Table 1.

Dry weights of broad leaf, grassy and total weeds were markedly affected by weed management treatments at all stages, except grassy weeds at 3 WAS (Table, 1). Herein, W_1 or W_2 exceeded W_3 (the two hoeing were not performed yet) or W_4 for reducing dry weights of broad leaf and total weeds at 3 WAS. Moreover, W_1 recorded the lowest dry weight values of broad leaf and total weeds (at 6 and 12 WAS) and grassy weeds (at 12 WAS), while, W_3 gave the minimal dry weight of grassy weeds (at 6 WAS).

1

Such findings divulge that false irrigation enhanced the germination of weed seeds just before the crop sown, and the germinated weeds are killed by light hoeing, so decreasing population of weed emerged after sowing. Also, hoeing removed weeds grown during the critical period which reflected to reducing weed biomass. Hoeing achieved high weed control efficiency in sesame as reported by Ibrahim *et al.* (1988), Chauhan and Gurjar (1998) and Yadav (2004).

Sowing methods of sesame has a significant effect on dry weight of broad leaf weeds at 6 WAS as well as broad leaf, grassy and total weeds at 12 WAS (Table, 1). Sesame plants were grown in ridges showed the lowest dry weight of such weed groups. Sowing sesame in ridges may give the crop a good head start over the weeds as well, resulting in more shade. In the literature, it has been found that weed growth was markedly affected by sowing methods of sesame (Kumar and Thakur, 2005).

As illustrated in Table 1, dry weight of broad leaf, grassy and total weeds statistically varied with sesame cultivars at all growth stages, except total weeds at 6 WAS which was not affected. In this concern, the lowest dry weight of broad leaf weeds was produced with Shandawel-4 at 3 and 6 WAS as well as with Toshka at 12 WAS. Moreover, the lowest dry weight of grassy weeds (at 3 and 6 WAS) and total weeds (at 3 WAS) were achieved in plots included Shandawel-3 and Toshka plants, respectively. At 12 WAS, Shandawel-3 along with Shandawel-4 was less infested with grassy and total weeds recording the minimum dry weight values. It could be concluded that through the period between the 6^{th} and 12^{th} week of sesame growth, total dry weight of weeds was increased by 3.62, 2.91 and 3.27 with Toshka, Shandawel-3 and Shandawel-4, respectively. Such finding means that Shandawel-3 is more competitiveness cultivar for weeds being suppressed weeds by 19.6 and 11.0 % than Toshka, and Shandawel-4, respectively. Varietal differences among sesame cultivars in photosynthetic area and growth habit may influence the suppressing ability of crop plants on weeds, in addition to their allelopathic effects. Cultivars which possess rapid growth and development and adaptive abilities perform better in suppressing weed growth and compete well with weeds (Rao, 1999).

b-Effect of the interactions:

Weed dry weights at 3, 6 and 12 WAS were markedly affected by the first order interactions (Table, 2) and the second order one (Table, 3) of the three studied factors, i.e. weed management, sowing methods and cultivars.

Weed management x sowing methods:

Total weeds at all growth stages in addition to broad leaf ones at 12 WAS recorded the minimum dry weight with the combination of W_1 x ridges. While, W_1 x rows produced the lowest dry weight of broad leaf weeds at 3 and 6 WAS and grassy weeds at 12 WAS. Moreover, W_3 x rows gave the lowest value of grassy weeds dry weight at 3 and 6 WAS (Table, 2).

Weed management x cultivars:

W_1 x Shandawel-4, W_3 x Shandawel-3 and W_1 x Shandawel-3 possessed the lowest dry weight of broad leaf, grassy and total weeds, respectively, at 3 WAS (Table, 2).

T2

Under W_1, broad leaf and total weeds at 6 WAS (in Shandawel-4 plots) as well as broad leaf, grassy and total weeds at 12 WAS (in Shandawel-3 plots) recorded the minimum dry weight. Also, with W_3, Toshka was the less infested by grassy weeds at 6 WAS.

Sowing methods x cultivars:

In ridged plots, Shandawel-3 was the less infested cultivar with grassy weeds at all growth stages and total weeds at 6 WAS. In addition to, broad leaf at all growth stages and total weeds at 12 WAS were weak with Shandawel-4. Moreover, total weeds at 3 WAS produced the lowest dry weight with Toshka grown in rows (Table, 2).

Weed management x sowing methods x **cultivars**:

At 3 WAS, W_3 or W_4 gave the minimal dry weight of broad leaf weeds which associated with Shandawel-4 plants that were grown in ridges (Table, 3). While, W_1 x rows x Shandawel-4 or W_1 x ridges x Shandawel-3 recorded the lowest dry weight of broad leaf weeds at 6 and 12 WAS, respectively. Under the weeded practice of W_3, rows x Shandawel-3 (at 3 WAS), rows x Toshka (at 6 WAS) and ridges x Shandawel-3 (at 12 WAS) interactions showed the best grassy weed elimination, recording the lowest dry weight. Concerning the dry weight of total weeds, W_1 x ridges x Shandawel-3 combination possessed the least dry weight at all stages.

Table 3. Weeds dry weight at 3, 6 and 12 weeks after sowing (WAS) as affected by the second order interaction among weed management, sowing methods and cultivars.

Trait / Treatment			Weeds dry weight (g/m^2)								
			At 3 WAS*			At 6 WAS			At 12 WAS		
			Broad leaf	Grassy	Total	Broad leaf	Grassy	Total	Broad leaf	Grassy	Total
W_1*	Ridges	Toshka	42.0	32.8	74.8	18.5	28.5	47.0	135.6	49.2	184.8
		Shandawel-3	39.8	19.6	59.4	17.3	26.9	44.2	73.0	49.6	122.6
		Shandawel-4	32.5	58.2	90.8	10.0	49.7	59.7	150.0	58.8	208.8
	Rows	Toshka	34.6	52.6	87.3	13.0	52.6	65.7	132.8	66.0	198.8
		Shandawel-3	35.4	56.8	92.2	20.8	50.9	71.7	136.8	26.4	163.2
		Shandawel-4	42.4	36.1	78.5	8.2	37.7	45.9	116.4	47.6	164.0
W_2	Ridges	Toshka	42.0	33.8	75.8	60.0	55.3	115.3	286.8	294.0	614.0
		Shandawel-3	39.8	20.6	60.4	58.0	42.0	83.3	452.0	252.0	704.0
		Shandawel-4	32.5	59.2	91.8	50.3	80.6	131.0	223.3	188.2	411.6
	Rows	Toshka	36.6	53.6	90.3	52.6	74.6	127.3	326.4	373.2	699.6
		Shandawel-3	37.4	57.8	95.2	53.3	79.3	132.6	366.8	194.0	560.8
		Shandawel-4	44.4	37.1	81.5	60.6	58.6	119.3	446.4	270.0	716.4
W_3*	Ridges	Toshka	48.2	40.6	88.9	30.2	45.2	75.4	163.2	52.0	215.2
		Shandawel-3	64.2	42.5	106.8	38.1	34.2	72.4	165.2	4.0	169.2
		Shandawel-4	20.8	97.8	118.6	11.0	46.9	58.0	139.2	103.2	242.4
	Rows	Toshka	51.8	21.4	73.3	54.8	26.0	80.8	87.6	122.0	209.6
		Shandawel-3	76.8	10.5	87.3	58.1	37.7	95.8	150.0	101.2	251.2
		Shandawel-4	63.7	32.0	95.7	13.3	40.5	53.8	245.2	41.2	286.4
W_4	Ridges	Toshka	48.2	41.6	89.9	66.3	62.6	129.0	166.4	534.4	700.8
		Shandawel-3	64.2	43.5	107.8	82.3	64.6	147.0	124.0	304.0	428.0
		Shandawel-4	20.8	98.8	119.6	39.0	120.3	159.3	224.4	259.6	484.0
	Rows	Toshka	53.8	22.4	76.3	70.0	44.0	114.0	190.4	475.6	666.0
		Shandawel-3	78.8	12.2	91.0	94.6	33.6	128.3	330.8	308.4	639.2
		Shandawel-4	65.7	33.0	98.7	82.0	54.3	136.3	324.0	426.4	750.4
LSD at 0.05			**21.4**	**28.6**	**35.0**	**19.1**	**26.2**	**29.8**	**75.2**	**81.0**	**114.8**

*** The two hoeing were not performed yet up to this date.**

II- Sesame yield, yield components and seed oil content:
a-Effect of the individual factors:

All yield and its attributes were significantly affected by weed management treatments and sesame cultivars except capsules number/plant which was not differed among the three proved cultivars (Table, 4). Moreover, sowing methods had no significant effect on sesame yield and its components as well as oil % and yield/fed.

Table 4. Yield, yield attributes and seed oil content of sesame as affected by weed management, sowing methods and cultivars.

Trait / Treatment	Plant height (cm)	Branches number /plant	Capsules/plant		Seeds weight /plant (g)	Weight of 1000 seeds (g)	Yield/fed		Oil	
			Number	Weight (g)			Biological (ton)	Seed (kg)	%	Yield (kg/fed)
Weed management										
W_1	140.3	1.70	56.5	21.6	7.40	3.867	2.31	684.7	51.56	352.7
W_2	91.9	1.00	15.8	9.3	1.89	3.715	0.46	294.2	48.09	141.6
W_3	133.7	1.77	46.5	18.4	5.61	3.602	1.96	574.3	51.13	293.5
W_4	99.5	1.00	18.5	10.9	2.14	3.854	0.54	343.4	48.72	167.3
LSD at 0.05	**4.3**	**0.12**	**5.9**	**2.0**	**0.98**	**0.128**	**0.18**	**65.9**	**3.19**	**11.4**
Sowing methods										
Ridges	115.0	1.29	33.7	14.3	3.91	3.765	1.24	461.4	50.39	234.7
Rows	117.7	1.44	34.8	15.8	4.61	3.754	1.40	486.9	49.36	242.8
LSD at 0.05	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**
Cultivars										
Toshka	111.4	1.01	34.5	15.7	4.41	3.971	1.36	470.6	47.56	227.8
Shandawel-3	120.0	1.05	34.1	15.8	4.62	3.681	1.40	508.9	49.87	256.4
Shandawel-4	117.7	2.04	34.2	13.7	3.74	3.626	1.20	443.0	52.20	232.1
LSD at 0.05	**2.4**	**0.13**	**N.S**	**1.2**	**0.63**	**0.074**	**0.11**	**33.8**	**2.14**	**7.7**

In this concern, W_1 was the potent practice for enhancing plant height, capsules number and weight/plant, seeds weight/plant, weight of 1000 seeds, oil % as well as biological, seed and oil yields/fed. While, W_3 recorded the maximum value of branches number/plant, without statistical difference with W_1 in this respect. Contrarily, such traits recorded the minimal values with W_2 followed by W_4. Clean bed from weeds since sowing sesame as a result of eliminating the emerged weeds before planting (by applying light hoe) accompanied with hoeing twice after emergence minimizes weed competition and enables crop plants to utilize light, water, nutrients, CO_2 and other environmental resources. This in turn increases the amount of metabolites synthesized, enhancing crop plant growth, and consequently yield and its attributes and seed oil content. Similar observations were obtained by Chauhan and Gurjar (1998), Yadav (2004) and Kumar and Thakur (2005).

Shandawel-3 was the potent cultivar for producing the highest values of plant height, capsules and seeds weights/plant as well as biological, seed and oil yields/fed, but significantly equaled with Shandawel-4 (in plant height) and with Toshka (in capsules and seeds weight/plant and biological yield/fed). Moreover, Shandawel-4 surpassed Toshka and Shandawel-3 in branches number/plant and oil %. Potency in weight of 1000 seeds was achieved with Toshka, exceeding the other two cultivars (Table, 4).

Differences among sesame cultivars in yield and its attributes were reported by Tiwari and Namdeo (1997), Subrahmaniyan and Arulmozhi (1999), Basavarai *et al.* (2000) and Kathiresan (2002).

b-Effect of the interactions:

Weed management x sowing methods:

All yield and its components were substantially affected by the interaction between weed management and sowing methods, except seed oil % which did not affect (Table, 5). W_1 x rows gave the highest values of plant height, branches number/plant, capsules number and weight/plant and biological yield/fed. While the maximum seeds weight/plant, seed yield and oil yield/fed were achieved with W_1 x ridges. The heaviest weight of 1000 seeds was obtained with W_4 x ridges.

Weed management x cultivars:

Considerable influence of the interaction between weed management x cultivars on sesame yield and its traits was obtained (Table, 5). Plots of Shandawel-3 which were treated with W_1 produced the maximum values of plant height, seeds weight/plant, seed yield and oil yield/fed. Moreover, Shandawel-4 with W_3 (for branches number/plant) and with W_1 (for oil %) recorded the highest values. Capsules number and weight/plant and biological yield/fed showed the maximum values in W_1 x Toshka plots. Additionally, W_4 x Toshka gave the highest weight of 1000 seeds value.

Sowing methods x cultivars:

With the exception of capsules number/plant, all sesame yield and its attributes and seed oil content were statistically influenced by the interaction between sowing methods and cultivars (Table, 5). Under rows pattern, plant height and biological yield/fed (with Shandawel-3), branches number/plant (with Shandawel-4) as well as capsules weight/plant, seeds weight/plant, weight of 1000 seeds, and seed yield/fed (with Toshka) recorded the highest values. In ridges plots, oil % and oil yield/fed showed the maximum values with Shandawel-4 and Shandawel-3, respectively.

Weed management x sowing methods x cultivars:

The interaction among the three tested factors had remarkable effects on yield and its components and seed oil content of sesame (Table, 6). In rows x W_1 plots, Shandawel-4 produced the highest values of plant height and branches number/plant, Toshka possessed the maximum capsules number and weight/plant as well as Shandawel-3 gave the heaviest biological yield/fed. W_4 x ridges x Toshka and W_4 x ridges x Shandawel-4 recorded the maximum weight of 1000 seeds and oil %, respectively. Moreover, W_1 x ridges x Shandawel-3 recorded the highest values of seeds weight/plant, seed yield and oil yield/fed.

Generally, it could be recommended that the combination of false irrigation followed by light hoeing and accompanied with hoeing twice at 25 and 45 days from sowing of sesame c.v. Shandawel-3 that was sown in ridges is the best practice for weed suppression and higher yield potentiality.

Table 5. Yield, yield attributes and seed oil content of sesame as affected by the first order interactions between weed management, sowing methods and cultivars.

Treatment \ Trait		Plant height (cm)	Branches number /plant	Capsules/plant		Seeds weight /plant (g)	Weight of 1000 seeds (g)	Yield/fed		Oil	
				Number	Weight (g)			Biological (ton)	Seed (kg)	%	Yield (kg/fed)
Weed management x sowing methods											
W_1	Ridges	138.2	1.40	53.2	20.1	7.44	3.838	2.15	696.9	51.97	362.0
	Rows	142.4	2.00	59.7	23.1	7.36	3.896	2.48	672.5	51.16	343.4
W_2	Ridges	94.4	1.00	18.8	10.1	1.67	3.721	0.51	311.7	49.09	152.9
	Rows	89.4	1.00	12.8	8.5	2.11	3.709	0.42	276.7	47.09	130.4
W_3	Ridges	129.7	1.77	47.1	17.1	4.87	3.504	1.83	525.5	51.18	268.9
	Rows	137.7	1.77	45.9	19.6	6.34	3.699	2.09	623.1	51.09	318.1
W_4	Ridges	97.5	1.00	15.9	9.7	1.66	3.996	0.46	311.5	49.32	155.0
	Rows	101.5	1.00	21.0	12.2	2.62	3.712	0.61	375.4	48.12	179.6
LSD at 0.05		**6.9**	**0.19**	**11.8**	**4.5**	**1.09**	**0.197**	**0.44**	**85.3**	**N.S**	**28.1**
Weed management x cultivars											
W_1	Toshka	134.6	1.06	60.8	23.2	7.44	4.076	2.45	696.8	49.90	347.5
	Shandawel-3	143.6	1.06	50.1	22.4	8.16	3.919	2.40	744.9	51.75	385.7
	Shandawel-4	142.8	2.96	58.6	19.3	6.60	3.605	2.09	612.4	53.04	324.8
W_2	Toshka	93.0	1.00	15.9	9.7	2.92	4.052	0.49	298.7	44.67	133.7
	Shandawel-3	91.4	1.00	15.7	8.9	1.37	3.530	0.45	291.9	48.77	142.5
	Shandawel-4	91.3	1.00	15.7	9.3	1.37	3.564	0.45	292.0	50.83	148.6
W_3	Toshka	123.6	1.00	44.2	18.8	5.12	3.615	1.96	541.8	50.36	272.5
	Shandawel-3	142.4	1.13	50.4	20.2	6.69	3.652	2.16	646.2	50.90	329.1
	Shandawel-4	135.1	3.20	44.9	16.1	5.01	3.538	1.76	534.9	52.15	279.0
W_4	Toshka	94.5	1.00	17.4	11.0	2.16	4.140	0.54	344.9	45.32	157.5
	Shandawel-3	102.7	1.00	20.4	11.6	2.28	3.624	0.57	352.8	48.04	168.4
	Shandawel-4	101.4	1.00	17.6	10.2	1.98	3.797	0.50	332.6	52.78	175.9
LSD at 0.05		**4.8**	**0.26**	**5.6**	**2.5**	**1.27**	**0.149**	**0.23**	**67.7**	**4.28**	**15.4**
Sowing methods x cultivars											
Ridges	Toshka	110.8	1.00	32.6	14.2	3.33	3.949	1.25	422.7	47.58	205.0
	Shandawel-3	118.8	1.01	34.6	14.8	4.57	3.789	1.31	505.4	50.54	257.2
	Shandawel-4	115.3	1.86	34.0	13.8	3.83	3.557	1.15	456.0	53.04	241.8
Rows	Toshka	112.1	1.03	36.5	17.1	5.49	3.993	1.47	518.4	47.54	250.6
	Shandawel-3	121.2	1.08	33.7	16.7	4.68	3.574	1.48	512.5	49.19	255.6
	Shandawel-4	120.0	2.21	34.4	13.7	3.65	3.695	1.24	429.9	51.35	222.3
LSD at 0.05		**3.4**	**0.18**	**N.S**	**1.7**	**0.90**	**0.105**	**0.16**	**47.8**	**3.02**	**10.9**

III- Correlation relationships:

All possible correlation coefficients between sesame seed yield and each of dry weight of total weeds (at 3, 6 and 12 WAS), sesame plant height, branches number/plant, capsules number and weight/plant, seeds weight/plant and weight of 1000 seeds were computed under each studied cultivar (Table, 7). Seed yield of the three cultivars, i.e. Toshka, Shandawel-3 and Shandawel-4 was correlated negatively and highly significant with dry weight of total weeds (at 6 and 12 WAS). Moreover, the associations between seed yield of Shandawel-3 and each of branches number/plant and weight of 1000 seeds were positive, reaching the 5 % level of significance. Additionally, all the involved sesame traits of the three cultivars were correlated positively and highly significant with seed yield, except weight of 1000 seeds of Toshka and Shandawel-4 which was not markedly correlated. Similar trend was obtained by Olowe (2007) and Sarwar *et al.* (2007).

Table 6. Yield, yield attributes and seed oil content of sesame as affected by the second order interaction among weed management, sowing methods and cultivars.

Treatment / Trait			Plant height (cm)	Branches number /plant	Capsules/plant		Seeds weight /plant (g)	Weight of 1000 seeds (g)	Yield/fed		Oil	
					Number	Weight (g)			Biological (ton)	Seed (kg)	%	Yield (kg/fed)
W_1	Ridges	Toshka	134.4	1.00	53.4	21.9	7.25	4.045	2.35	683.1	50.69	346.3
		Shandawel-3	146.0	1.06	53.4	20.9	8.75	3.908	2.22	784.0	52.25	409.7
		Shandawel-4	134.4	2.13	52.8	17.6	6.34	3.561	1.88	622.9	52.97	329.0
	Rows	Toshka	134.8	1.13	68.1	24.6	7.64	4.107	2.56	709.8	49.12	348.7
		Shandawel-3	141.2	1.06	46.7	23.9	7.58	3.931	2.58	705.8	51.25	361.8
		Shandawel-4	151.2	3.80	64.3	21.0	6.86	3.649	2.29	602.0	53.10	319.7
W_2	Ridges	Toshka	99.3	1.00	19.8	11.4	1.80	4.107	0.58	320.3	45.47	145.7
		Shandawel-3	93.0	1.00	19.0	9.1	1.65	3.464	0.46	310.2	49.58	153.8
		Shandawel-4	91.1	1.00	17.6	10.0	1.56	3.592	0.48	304.7	52.22	159.1
	Rows	Toshka	86.8	1.00	12.0	8.1	4.04	3.996	0.40	277.2	43.88	121.7
		Shandawel-3	89.8	1.00	12.5	8.7	1.10	3.596	0.43	273.6	47.96	131.3
		Shandawel-4	91.6	1.00	13.9	8.7	1.19	3.535	0.42	279.4	49.44	138.2
W_3	Ridges	Toshka	120.6	1.00	45.0	15.7	3.12	3.473	1.69	408.1	50.58	206.4
		Shandawel-3	137.7	1.00	50.8	19.8	6.41	3.688	2.11	627.4	50.21	315.1
		Shandawel-4	130.8	3.33	45.4	16.0	5.10	3.351	1.69	540.9	52.76	285.4
	Rows	Toshka	126.6	1.00	43.4	22.0	7.13	3.757	2.24	675.5	50.14	338.7
		Shandawel-3	147.1	1.26	50.0	20.5	6.97	3.616	2.21	664.9	51.59	343.1
		Shandawel-4	139.4	3.06	44.4	16.2	4.92	3.725	1.82	528.9	51.53	272.6
W_4	Ridges	Toshka	88.9	1.00	12.1	8.1	1.17	4.168	0.38	278.6	43.61	121.6
		Shandawel-3	98.6	1.00	15.3	9.5	1.49	4.096	0.46	300.1	50.11	150.4
		Shandawel-4	105.2	1.00	20.4	11.6	2.33	3.724	0.56	355.8	54.23	193.0
	Rows	Toshka	100.2	1.00	22.7	13.9	3.16	4.112	0.70	411.1	47.04	193.4
		Shandawel-3	106.8	1.00	25.6	13.7	3.08	3.152	0.69	405.5	45.98	186.5
		Shandawel-4	97.7	1.00	14.9	8.9	1.63	3.871	0.44	309.4	51.34	158.9
LSD at 0.05			**6.8**	**0.37**	**8.0**	**3.5**	**1.80**	**0.211**	**0.33**	**95.7**	**6.05**	**21.7**

Table 7: Simple correlation coefficient between sesame seed yield and each of total dry weight of weeds (at 3, 6 and 12 WAS), plant height, branches number/plant, capsules number and weight/plant, seeds weight/plant and weight of 1000 seeds.

Parameters	Seed yield (kg/fed)		
	Toshka	Shandawel-3	Shandawel-4
1-Total dry weight of weeds ($g.m^{-2}$)			
At 3 WAS	-0.110	0.110	-0.059
At 6 WAS	-0.604**	-0.657**	-0.633**
At 12 WAS	-0.752**	-0.721**	-0.741**
2-Plant height (cm)	0.875**	0.912**	0.888**
3-Branches number/plant	0.437**	0.307*	0.848**
4-Capsules number/plant	0.859**	0.872**	0.859**
5-Capsules weight/plant (g)	0.968**	0.918**	0.923**
6-Seeds weight/plant (g)	0.908**	0.992**	0.981**
7-Weight of 1000 seeds (g)	0.108	0.336*	0.065

*** and **: Significant at 0.05 and 0.01 level of probability, respectively; WAS: weeks after sowing.**

REFERENCES

A.O.A.C. (1995). Association of Official Agriculture Chemists. Official Methods of Analysis 16th Ed., Washington, DC, USA.

Basavarai, B.; R.A. Shetty and C.S. Hunshl (2000). Nutrient content and uptake by sesame varieties to fertilizer and population levels under summer irrigated conditions. Karnataka J. Agric. Sci., 13 (1): 141-143.

Chauhan, D.V.S. and B.S. Gurjar (1998). Mechanical and chemical weed control in sesame(*Sesamum indicum*). Indian J. Agron., 43 (3): 480-483.

Gomez, K. A. and A. A. Gomez (1984). Statistical Procedures for Agriculture Research. A Wiley- Inter Science Publication, John Wiley & Sons, Inc. New York, USA.

Ibrahim, A.F.; H.R. El-Wekil; Z.R. Yehia and Sh. A. Shaban (1988). Effect of some weed control treatments on sesame *(Sesamum indicum* L.) and associated weds. J.Agron. & Crop Sci., 162: 319-324.

Imoloame, E.O.; N.A. Gworgwor and S.D.Joshua (2007). Sesame (*Sesamum indicum* L.) weed infestation, yield and yield components as influenced by sowing method and seed rate in a Sudan Savanna agro-ecology of Nigeria. African J.Agric. Res., 2 (10): 528-533.

Kathiresan, G. (2002). Response of sesame (*Sesamum indicum*) genotypes to levels of nutrients and spacing under different seasons. Indian J. Agron., 47 (4): 537-540.

Kumar A. and K.S. Thakur (2005). Effect of sowing method and weed control practices on production potential of sesame (*Sesamum indicum*)-based intercropping system under rainfed conditions. Indian J.Weed Sci., 37 (1-2): 133-134.

Olowe, V.I.O. (2007). Optimum planting date for sesame (*Sesamum indicum*) in the transition zone of south west Nigeria. Agricultura Tropica et Subtropica, 40 (4); 156-164.

Rao, V.S. (1999). Principles of Weed Science. 2nd Ed., Science Publishers, Inc, NH, USA, p. 51.

Sarwar, G.; M. A. Haq; M. B. Chaudhry and I. Rabbani (2007). Evaluation of early and high yielding mutants of sesame (*Sesamum indicum*) for different genetic parameters. J. Agric. Res., 45 (4):125-133.

Singh, B.P.; Om Prakash and P.K.Singh (2003). Dry-matter accumulation in weeds and qualitative characters of sesame (*Sesamum indicum*) as influenced by nitrogen levels and weed-control measures. Indian J. Agron., 48 (2): 120-123.

Snedecor, G.W. and W.G.Cochran (1980). Statistical methods 7th Ed. Iowa State Univ.USA.

Sootrakar, B.P.; K.N. Namdeo and L.J. Khare (1995). Effect of weed control on productivity of sesame (*Sesamum indicum*). Indian J. Agron., 40 (3): 454-458.

Subrahmaniyan, K. and N. Arulmozhi (1999). Response of sesame (*Sesamum indicum*) to plant population and nitrogen under irrigated conditions. Indian J. Agron., 44 (2): 413-415.

Subrahmaniyan, K.; N. Arulmozhi and P. Kalaiselven (2001). Influence of plant density and NPK levels on the growth and yield of sesame (*Sesamum indicum* L.). Agric. Sci. Digest, 21 (3): 208-209.

Tiwari, K.P. and K.N. Namdeo (1997). Response of sesame (*Sesamum indicum*) to planting geometry and nitrogen. Indian J. Agron., 42 (2): 365-369.

Yadav, S.S. (2004). Integrated weed management in sesame (*Sesamum indicum* L.) under rainfed conditions of Rajasthan. Haryana J.Agron., 20 (1-2): 120-121.

المكافحة الزراعية و اليدوية للحشائش فى السمسم

هانى صابر سعودى و وصفى رمضان عبد المؤمن

قسم المحاصيل- كلية الزراعة- جامعة عين شمس- شبرا الخيمة- القاهرة- مصر.

أقيمت تجربتان حقليتان خلال موسمى ٢٠٠٦ و٢٠٠٧ بمحطة التجارب و البحوث الزراعية بشلقان - كلية الزراعة - جامعة عين شمس - محافظة القليوبية لدراسة استجابة محصول ثلاثة أصناف من السمسم (توشكى ، شندويل-٣ و شندويل-٤) و الحشائش المصاحبة لطريقتين للزراعة (الزراعة فى خطوط و الزراعة فى سطور) و أربع معاملات من مكافحة الحشائش (رية كدابة اتبعت بعزقة خفيفة+عزيق مرتين [W_1] ، رية كدابة اتبعت بعزقة خفيفة فقط [W_2] ، العزيق مرتين[W_3] و بدون مكافحة [W_4]).

أوضحت النتائج تفوق معاملتى W_1 و W_2 فى خفض الوزن الجاف للحشائش عريضة الأوراق و الكلية بعد ثلاثة أسابيع من الزراعة ، كما سجلت معاملة W_1 أكبر نقص فى الوزن الجاف للحشائش عريضة الأوراق و الكلية (بعد ستة و اثنى عشر أسبوع من الزراعة) و الحشائش ضيقة الأوراق (بعد اثنى عشر أسبوع من الزراعة) ، بينما أعطت معاملة W_3 أقل وزن جاف للحشائش ضيقة الأوراق (بعد ستة أسابيع من الزراعة). كانت معاملة W_1 هى الأفضل فى احداث زيادة فى ارتفاع النبات ، عدد و وزن الكبسولات /نبات ، وزن البذور /نبات ، وزن ال ١٠٠٠ بذرة ، نسبة الزيت بالبذرة ، و المحصول البيولوجى ، البذور و الزيت / فدان.

أظهرت الحشائش عريضة الأوراق و الكلية (بعد اثنى عشر أسبوع من الزراعة) أقل وزن جاف عند زراعة السمسم فى خطوط مقارنة بالزراعة فى سطور.بينما لم يكن لطرق الزراعة تأثير معنوى على محصول السمسم و مكوناته و كذلك محتوى البذور من الزيت.

عند عمر اثنى عشر أسبوع من الزراعة كانت الحشائش ضيقة الأوراق و الكلية أقل انتشارا مع الصنف شندويل-٣ و شندويل-٤ مسجلة أقل وزن جاف لها. كان الصنف شندويل-٣ هو المتفوق فى اعطاء أكبر القيم فى ارتفاع النبات ، وزن الكبسولات و البذور /نبات ، و المحصول البيولوجى ، البذور و الزيت / فدان.

أدى تطبيق الرية الكدابة والتى اتبعت بعزقة خفيفة+عزيق مرتين [W_1] مع زراعة الصنف شندويل-٣ على خطوط الى تسجيل أقل وزن جاف للحشائش الكلية خلال جميع مراحل النمو (بعد ثلاثة و ستة و اثنى عشر أسبوع من الزراعة) مع اعطاء أعلى وزن بذور /نبات ومحصول بذور و زيت / فدان.

أظهر معامل الارتباط البسيط وجود ارتباط سالب و عالى المعنوية بين محصول بذور الثلاثة أصناف تحت الدراسة مع الوزن الجاف للحشائش الكلية (بعد ستة و اثنى عشر أسبوع من الزراعة). بينما كان الارتباط بين محصول بذور تلك الأصناف موجب و عالى المعنوية مع كل من ارتفاع النبات ، عدد و وزن الكبسولات /نبات و وزن البذور /نبات.

و وفقا لتلك النتائج يمكن التوصية بأن الرية الكدابة و اتباعها بعزقة خفيفة مع اجراء العزيق مرتين عند عمر ٢٥ و ٤٥ يوم من زراعة السمسم صنف شندويل-٣ و المنزرع فى خطوط هى أفضل ممارسة زراعة كونها أحدثت أعلى تثبيط للحشائش المصاحبة مع ارتفاع المحصول.

Table 1: Weeds dry weight at 3, 6 and 12 weeks after sowing (WAS) as affected by weed management, sowing methods and sesame cultivars.

Trait / Treatment	Weeds dry weight (g/m^2)								
	At 3 WAS*			At 6 WAS			At 12 WAS		
	Broad leaf	Grassy	Total	Broad leaf	Grassy	Total	Broad leaf	Grassy	Total
Weed management									
W_1*	37.8	42.7	80.5	14.6	41.0	55.7	124.1	49.6	173.7
W_2	38.8	43.7	82.5	55.8	65.1	118.1	350.2	261.9	617.7
W_3*	54.2	40.8	95.1	34.2	38.4	72.7	158.4	70.6	229.0
W_4	55.2	41.9	97.2	72.3	63.2	135.6	226.6	384.7	611.4
LSD at 0.05	**10.0**	**N.S**	**7.5**	**13.6**	**12.8**	**10.7**	**41.6**	**25.4**	**56.6**
Sowing methods									
Ridges	41.2	49.9	90.4	40.1	54.7	93.4	191.9	179.0	373.7
Rows	51.8	35.4	87.3	48.4	49.1	97.6	237.8	204.3	442.1
LSD at 0.05	**N.S**	**N.S**	**N.S**	**6.1**	**N.S**	**N.S**	**29.1**	**16.1**	**21.2**
Cultivars									
Toshka	44.7	37.4	82.1	45.7	48.6	94.3	186.1	245.8	436.1
Shandawel-3	54.6	32.9	87.5	52.8	46.1	96.9	224.8	154.9	379.7
Shandawel-4	40.3	56.5	96.9	34.3	61.1	95.4	233.6	174.3	408.0
LSD at 0.05	**7.6**	**10.1**	**12.4**	**6.7**	**9.2**	**N.S**	**26.6**	**28.5**	**40.6**

*** The two hoeing were not performed yet up to this date.**

Table 2. Weeds dry weight at 3, 6 and 12 weeks after sowing (WAS) as affected by the first order interactions between weed management, sowing methods and cultivars.

Trait / Treatment		Weeds dry weight (g/m^2)								
		At 3 WAS*			At 6 WAS			At 12 WAS		
		Broad leaf	Grassy	Total	Broad leaf	Grassy	Total	Broad leaf	Grassy	Total
Weed management x sowing methods										
W_1*	Ridges	38.1	36.8	75.0	15.2	35.0	50.3	119.5	52.5	172.0
	Rows	37.5	48.5	86.0	14.0	47.1	61.1	128.6	46.6	175.3
W_2	Ridges	38.1	37.8	76..0	56.1	59.3	109.8	320.7	244.7	576.5
	Rows	39.5	49.5	89.0	55.5	70.8	126.4	379.8	279.0	658.9
W_3*	Ridges	44.4	60.3	104.8	26.4	42.1	68.6	155.8	53.0	208.9
	Rows	64.1	21.3	85.4	42.0	34.7	76.8	160.8	88.1	249.0
W_4	Ridges	44.4	61.3	105.8	62.5	82.5	145.1	171.6	366.0	537.6
	Rows	66.1	22.5	88.6	82.2	44.0	126.2	281.7	403.4	685.2
LSD at 0.05		**8.3**	**10.1**	**18.3**	**19.4**	**12.7**	**29.1**	**50.7**	**78.7**	**65.8**
Weed management x cultivars										
W_1*	Toshka	38.3	42.7	81.0	15.8	40.6	56.4	134.2	57.6	191.8
	Shandawel-3	37.6	38.2	75.8	19.0	38.9	58.0	104.9	38.0	142.9
	Shandawel-4	37.4	47.2	84.6	9.1	43.7	52.8	133.2	53.2	186.4
W_2	Toshka	39.3	43.7	83.0	56.3	65.0	121.3	306.6	333.6	656.8
	Shandawel-3	38.6	39.2	77.8	55.6	60.6	108.0	409.4	223.0	632.4
	Shandawel-4	38.4	48.2	86.6	55.5	69.6	125.1	334.8	229.1	564.0
W_3*	Toshka	50.0	31.0	81.1	42.5	35.6	78.1	125.4	87.0	212.4
	Shandawel-3	70.5	26.5	97.0	48.1	36.0	84.1	157.6	52.6	210.2
	Shandawel-4	42.2	64.9	107.2	12.2	43.7	55.9	192.2	72.2	264.4
W_4	Toshka	51.0	32.0	83.1	68.1	53.3	121.5	178.4	505.0	683.4
	Shandawel-3	71.5	27.8	99.4	88.5	49.1	137.6	227.4	306.2	533.6
	Shandawel-4	43.2	65.9	109.2	60.5	87.3	147.8	274.2	343.0	617.2
LSD at 0.05		**15.2**	**20.2**	**24.8**	**13.5**	**18.5**	**21.1**	**53.2**	**57.3**	**81.2**
Sowing methods x cultivars										
Ridges	Toshka	45.1	37.2	82.3	43.7	47.9	91.7	188.0	232.4	428.7
	Shandawel-3	52.0	31.5	83.6	48.9	41.9	86.7	203.5	152.4	355.9
	Shandawel-4	26.6	78.5	105.2	27.6	74.4	102.0	184.2	152.5	336.7
Rows	Toshka	44.2	37.5	81.8	47.6	49.3	96.9	184.3	259.2	443.5
	Shandawel-3	57.1	34.3	91.4	56.7	50.4	107.1	246.1	157.5	403.6
	Shandawel-4	54.0	34.5	88.6	41.0	47.8	88.8	283.0	196.3	479.3
LSD at 0.05		**10.7**	**14.3**	**17.5**	**9.5**	**13.1**	**14.9**	**37.6**	**40.5**	**57.4**

*** The two hoeing were not performed yet up to this date.**