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EFFECT OF COMPETITIVE ABILITIES OF SOME SOYBEAN GENOTYPES, PLANT DENSITIES AND WEED CONTROL TREATMENTS ON SOYBEAN (*GLYCINE MAX* L.) AND IT'S ASSOCIATED WEEDS.

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ABSTRACT

Two field experiments were conducted during the two successive seasons of 2013 and 2014 at Sakha Agricultural Research Station, to evaluate the efficiency of plant densities, genotypes and weed control treatments on soybean and associated weeds. Split- split plot design with four replications was used. The main plots included three plant densities (168000, 144000 and 120000 plants/ fed), the sub plots included two soybean genotypes (Giza 111 and Toano). Meanwhile, the sub-sub plots included six weed control treatments (prometryne at 1.0 L/fed; pendimethalin at 1.5 L/fed) plus one hand hoeing; (prometryne and pendimethan) followed by fluzifop-p-buty at of 1.0 L/fed, hand hoeing twice and unweeded control treatment.

Results showed that increasing plant density reduced dry weight of broad-leaved, grassy and total weeds under combined, reduced dry weight of broad- leaved, grassy and total weeds by 26.4, 27.9 and 26.9%, to Toano. However, Giza 111 suppressed the growth of broad- leaved, grassy and total weeds by 28.7, 24.7 and 27.3%, respectively, and increased soybean seed yield by 6.67%.

All weed control treatments reduced dry weight of broad-leaved, grassy and total weeds as compared with control treatment. Yield losses under control treatment were estimated by 39.66% as compared with prometryne/ one hand hoeing treatment. Seed yield (ton/fed) was positively correlated with yield components and negatively correlated with most weeds in combined analysis.

Thus, weed control of soybean depended on weed control integrated in this crop. Whereas plant density reduced the weeds by 26.9%, genotypes by 27.3% and prometryne/one hand hoeing by 89.8%. Meanwhile, the integration between such factors as plant density, genotypes and weed control treatments reduced the weeds by 94.0%.

INTRODUCTION

Soybean (*Glycine max* L.) is the most important oil seeds and seed legume crops in the world, so special attention should be directed towards the proper choice of management practices to increase both seed yield and oil production. Soybean is an important food crop for human consumption because of its high nutritive value containing about 42 - 45% protein and 20 - 25% oil.

Weeds are considered as a major problem in soybean fields. Successful weed control is one of the most important practices for economical soybean production. Losses due to weeds have bean one of the major limiting factors in soybean production, where weeds complete with soybean for light, moisture and nutrients with early-season competition, being the most critical. The presence of weeds in soybean fields reduces crop yield from 40 to 50% depending on the intensity of weed infestation (Bhan *et al.,* 1972).

Several researchers have shown that prometryne, hand hoeing twice and pendimethalin gave a favorites effect on weeds in soybean fields (Singh *et al.,* 1973; Moursi *et al.,* 1980 and Fayed *et al.,* 1983). Kurchania *et al.* (2001); Singh *et al.* (2003) and Silva *et al.* (2005) found that fluazifop-p-butyl at 0.12 kg/ha post-emergency 15 days after sowing gave the best level of grasses weed control. Likewise, Jadhav *et al.* (2003); Galal, (2004); Guriqbal, (2005) and Pandya *et al.* (2006) showed that two hand weeding at 20 and 40 days after sowing gave the lowest value of the dry weight of total weeds and recorded approximately 88% weed control efficiency in controlling grassy as well as brood-leaved weeds. Regnault (1986) found that applying Fusillade (fluazifop-butyl) for weed control in soybean increased yield by 17 - 29%. Eweida *et al.* (1980) indicated that Amex (butralin) at 1.5 L/fed they reported that it gave yields significantly higher than the unweeded control.

Abdel – Hamid and El- Metwally (2008) and Sikkema *et al.* (2008) found that the fresh and dry weights of weeds were significantly reduced by using pre-emergence herbicides. Concerning post-emergence herbicides, Sikkema *et al.* (2008) reported that application of post-emergence herbicides reduced dry weight of weeds especially the season weeds, either brod-leaved or grassy weeds in soybean fields. With regard to herbicides combinations, either as pre- or post-emergence only, or pre + post-emergence combination, several researchers, indicated that the herbicides combination were more effective for weed control in soybean than individual herbicide applications (Sarah *et al.* 2002; Reddy *et al.*, 2003 and Saudy and El-Metwally, 2009).

Application of herbicides may have a positive effect on growth and seed yield and its components of soybean. Hassanein *et al.* (2002) indicated that the application of pre + post-emergence herbicides significantly increased plant height, number of leaves of soybean plants,dry weight of leaves and total dry weight of plant and gave the heighest weight of pods/plant, 100-seed weight and seed yield/ fed, compared with the unweeded treatment. Reddy *et al.* (2003) reported that pre + post-emergence program gave higher seed yield , while, the pre- only or post- only reduced the yield by 9 and 10% respectively. Abdel – Hamid and El – Metwally(2008) indicated that the number of pods/ plot, weight of pod/ plant, number of seeds/ plant, seed yield per plant and biological yield (g/plant), seed protein %, seed oil% were affected by different treatments, including the pre-herbcides (oxadiargyl and prometryne), hand hoeing twice and unweeded control. Ekram and Mohamed (2008) indicated that plant height, pods weight, number of seeds/plant, seed index and seed yield/fed of soybean genotypes, in newly reclaimed lands of Egypt, were positively increased using pre-herbicides.

Not only weed control methods but also the plant density are among the factors that have an important role in keeping soybean fields free of weeds. Gurnah (1978) showed that very high plant population gave better weed control than lower populations. Rizk *et al*, (1985) showed that the total fresh weight of weeds was significantly decreased at 5 cm distance between plants as compared with those at 10 cm distance. The effect of the interaction between weed control treatments and distance between plants caused a significant effect on fresh weight of weeds. The effects of hoeing (twice) on fresh weight of weeds at narrow plant distance was greater than that at 10 cm distance. Moreover, soybean yield was significantly affected by its densities and the yield increased as density increased up to 40 plants/m^2 (Raei *et al.*, 2008). El-Gizawy *et al.*, (2012) found that the sowing 175000 plants/fed gave the lowest weight for dry weight for annual weeds and the tallest plants in both sowing seasons. The plant density (105000 plants/fed) gave the best values of number of branches and seeds weight/plant in both sowing seasons. The plant density (140000 plant/fed) gave the highest value of number of seeds pod, weight of 100- seed and yield (ton/fed) in the two sowing seasons.

Thus, the objective of this study was to evaluate the integration effects of plant densities, genotypes and weed control treatments as well as their interactions on yield and yield components of soybean genotypes and associated weeds.

MATERIALS AND METHODS

Two field experiments were conducted at Sakha Research Station Farm at Kafr El-Sheikh Governorate, Egypt during 2013 and 2014 summer seasons to evaluate the effect of plant density, genotypes and weed control treatments on soybean productivity and growth of associated weeds. The experimental soil was clay in both seasons as shown in Table a.

Table a: Mechanical and chemical analysis of soil.

Season	Organic matter %	Soil pH	Sand %	Silt %	Clay %	Textural class	N (ppm)	P (ppm)	K (ppm)
2013	1.81	7.9	20.00	33.81	51.43	Clay	27.15	16.90	280.0
2014	1.73	7.88	19.27	29.91	49.40	Clay	22.37	18.45	277.10

Split-split-plot design with four replications was used in this study, the main plots included three plant densities, the sub plots were assigned to two soybean genotypes, while the six weed control treatments were assigned in sub-sub-plots.

A. Plant densities:

D_1- 168000 plants/faddan.

D_2- 144000 plants/faddan.

D_3- 120000 plants/faddan.

These densities were obtained from sowing soybean plants on 70 cm between ridges and 15, 20 and 25 cm between hills for D_1, D_2 and D_3, respectively on two side of the ridge with leaving two plants in the hill.

B. Genotypes:

G_1- Giza 111. G_2- Toano.

C. Weed control treatments:

1- Gesagard (prometryne 50% FW) [N,N-bis (1-methylethyl)-6-(methylthio)-1,3,5-triazine-2,4- diamine], at the rate of 1.0 L/fed, soil surface application directly, (after sowing and before irrigation), followed by Fusilade super (fluazifop-p-butyl 12.5% EC) [butyl (R)-2-[4-[[5-trifluoron methyl)-2-pyridinyl] oxy] phenoxy] propanoate] at the rate of 1.0 L/fed, (applied at 30 days after sowing).
2- Stomp (pendimethalin 50% EC) [N-(1-ethylpropyl)-3,4 diethyl- 2,6-dinitrobenzenamine], at the rate of 1.7 L/fed, soil surface application directly, (after sowing and before irrigation), followed by Fusilade super at the rate of 1.0 L/fed, (applied at 30 days after sowing).
3- Gesagard (prometryne 50% FW), at the rate of 1.0 L/fed., followed by one hand hoeing at 30 days after sowing.
4- Stomp (pendimethalin 50% EC), at the rate of 1.7 L/fed., followed by one hand hoeing at 30 days after sowing.
5- Hand hoeing twice (carried out at 18 and 30 days after sowing).
6- Control (unweeded).

Each sub-sub-plot consisted of five ridges of 6 m long and 70 cm apart (area 21 m^2). The soybean genotypes were sown on June 13^{th} and 18^{th} for the first and second seasons and harvested on 15^{th} October for the both two seasons, respectively. Herbicides in both field experiments were sprayed by Knapsack sprayer CP_3 with water volume of 200 liters per fed. In both seasons, the preceding winter crop was Egyptian clover (*Trifolium alexandrinum* L.). All agronomic practices such as land preparation, fertilization and irrigation were done as recommended during the two seasons.

Data recorded:

- **On weeds**:

Weeds were hand pulled at random from one square meter for each plot after 75 days from sowing and classified into three categories (broad-leaved, grassy and total weeds), the dry weight of each group was estimated as (g/m^2). Dry weight was determined after drying weeds in a forced draft oven at 70°C for 48 hours. Weed control was evaluated in the form of percent reduction (%R) in the dry weight of each of broad-leaved, grassy and total weeds. Percent of reduction (%R) was calculated according to Topps and Wain (1957) formula as following:

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

Where:

A = The dry weight of weeds in untreated plot.

B = The dry weight of weeds in treated plot.

- **On soybean yield and its components:**

At harvest, a random sample of 10 soybean plants was taken from each plot to determine; plant height (cm), weight of seeds/plant (g) and weight of 100-seeds (g). In addition, seed yield (ton/fed) was estimated from the whole plot.

- Chemical analysis:

*** Oil content**:

Random samples of seeds were taken randomly from each treatment to determine oil content according to method described by the (A.O.A.C. 1990), using petroleum ether (40-60°C) in Soxhlet apparatus.

*** Protein content:**

Protein was determined as total nitrogen by micro- Kjeldahl methods, according to A.O.A.C. (1980), then, N was multiplied by 6.25 (Tripathi *et al.*, 1971) to obtain protein content in soybean seeds.

- Statistical analysis:

Data were statistically analyzed according to Gomez and Gomez (1984) for each season and combined over seasons analysis. The comparisons of means were carried out using Duncan's multiple range test (DMRT) at 5% probability level. Bartle test of homogeneity for error indicated that the variance of data of both seasons was insignificant. Thus, the combined analysis was carried out.

RESULTS AND DISCUSSION

- Effect of plant density:

- On weeds:

The most dominant weeds accompanied with soybean plants were; (*Portulaca oleracea* L.), (*Xanthium brasilicum* L.), (*Corchorus Olitorius* L.), (*Solanum nigrum* L.), (*Amaranthus albus* L.), (*Chenopodium album* L.) as broad-leaved weeds and (*Echinochloa colonum*), (*Setaria virids*) and (*Dinebra retroflexa*) as grassy weeds in both growing seasons.

Data presented in Table 1 indicated that increasing plant density from 120000 to 168000 plants/fed reduced dry weight of broad-leaved, grassy and total annual weeds by 26.4, 27.9 and 26.9%, respectively, under combined analysis. This may be due to the less inter-specific competition between soybean/weeds plants in the lowest density as compared to the high density which be cause decreasing light transmittance through the leaf canopy of crops planted in narrow rows or at high populations could suppress growth and development of weeds. These results are in the same line with those obtained by Raei *et al.* (2008) and El-Gizawy *et al.* (2012).

Table 1: Effect of plant densities on dry weight of weeds (g/m^2) at 75 days from sowing in 2013 and 2014 seasons and their combined analysis.

Plant densities (plants/fed)	Dry weight of weeds (g/m^2)								
	Broad-leaved weeds			Grassy weeds			Total weeds		
	2013	2014	Comb.	2013	2014	Comb.	2013	2014	Comb.
168000	98.2^C	90.0^C	94.1^C	56.6^B	52.2^B	54.4^c	154.8^C	142.2^C	148.5^C
144000	116.0^B	105.0^B	110.5^B	62.5^B	61.3A^B	61.9^B	178.5^B	166.3^B	172.4^B
120000	135.4^A	120.2^A	127.8^A	79.6^A	71.2^A	75.4^A	215.0^A	191.4^A	203.2^A

- On soybean yield and yield components:

Data of combined analysis showed that effect of plant density on yield was statistically significant (Table 2). For yield (ton/fed), it increased by 20.47% under plant density 144000 plants/fed. as compared to plant density 168000 plants/fed. This result may be due to the increases in plant height, seed yield/plant and weight of 100 seeds by 2.51, 4.60 and 10.94%, respectively, in this plant density. This may be also due to intra-specific competition between soybean plants in the higher density which reduced significantly early soybean growth and offset any gain in yield from reduced weed competition. These results are in the same line with those obtained by El-Gizawy *et al.* (2012).

Table 2: Effect of plant densities on soybean seed yield and yield components in 2013 and 2014 seasons, and their combined analysis.

Plant densities (plants/fed)	Yield components											
	Plant height (cm)			Seed yield/plant (g)			Weight of 100 seeds (g)			Seed yield (ton/fed)		
	2013	2014	Comb.	2013	2014	Comb.	2013	2014	Comb.	2013	2014	Comb.
168000	99.3	97.7^{B}	98.5^{B}	35.5^{C}	36.1^{c}	35.8^{C}	16.0^{C}	18.2^{B}	17.1^{B}	1.37^{B}	1.35^{B}	1.36^{C}
144000	102.8	100.5^{A}	101.7^{A}	39.5^{A}	38.7^{A}	39.1^{A}	19.3^{A}	18.1^{A}	19.2^{A}	1.74^{A}	1.68^{A}	1.71^{A}
120000	97.0	94.5^{B}	95.8^{B}	38.4^{B}	38.2^{B}	38.3^{B}	17.6^{B}	18.7^{B}	18.2^{B}	1.54^{A}	1.48^{A}	$1.51A^{b}$

- Effect of genotypes:

- On weeds:

Data presented in Table 3 revealed that genotype, Giza 111 suppressed the growth of broad- leaved, grassy and total annual weeds by 28.7, 24.7 and 27.3%, respectively, than Toano genotype as average of the two seasons. This might indicate that competitive ability of Giza 111 genotype against weeds is more strengther than that of Toano genotype which attributed to the greater and plant height of Giza 111 genotype plants and consequently shading effect.

Table 3: Effect of soybean genotypes on dry weight of weeds (g/m^2) at 75 days from sowing in 2013 and 2014 seasons and their combined analysis.

Genotypes	Dry weight of weeds (g/m^2)								
	Broad-leaved weeds			Grassy weeds			Total weeds		
	2013	2014	Comb.	2013	2014	Comb.	2013	2014	Comb.
Giza 111	95.4^{B}	88.2^{B}	91.8^{B}	55.2^{B}	50.6^{B}	52.9^{B}	150.6^{B}	138.8^{B}	144.7^{B}
Toano	132.4^{A}	125.2^{A}	128.8^{A}	73.1^{A}	67.3^{A}	70.2^{A}	205.5^{A}	192.5^{A}	199.0^{A}

- On yield and yield components:

The results in Table 4 indicated that the effect of genotypes on yield and its component were significantly on plant height (cm), seed yield/plant (g) and seed yield (ton/fed). Genotype Giza 111 gave the better values of seed yield by 14.29% as compared to genotype Toano under combined analysis. This result may be due to the increases in seed yield/plant and weight of 100-seeds by 15.52 and 6.38%, respectively, in this genotype.

Table 4: Effect of genotypes on seed yield and its components of soybean in 2013 and 2014 seasons, and their combined analysis.

Genotypes	Yield components											
	Plant height (cm)			Seed yield/plant (g)			Weight of 100 seeds (g)			Seed yield (ton/fed)		
	2013	2014	Comb.	2013	2014	Comb.	2013	2014	Comb.	2013	2014	Comb.
Giza111	105.7^{A}	102.5^{A}	104.1^{A}	38.7^{A}	41.5^{A}	40.6^{A}	20.02^{A}	19.28^{A}	18.8^{A}	1.72^{A}	1.84^{A}	1.78^{A}
Toano	82.5^{B}	79.0^{B}	80.8^{A}	37.9^{B}	32.7^{B}	35.3^{B}	17.15^{B}	18.06^{B}	17.6^{B}	1.47^{B}	1.41^{B}	1.44^{B}

- Effect of weed control treatments:

- On weeds:

Data presented in Table 5 indicated that dry weight of broad- leaved, grassy and total annual weeds were significantly affected by weed control treatments in both seasons. All studied herbicides in its combinations with hoeing were highly effective for reducing the dry weight of total annual weeds than that of control treatment. This means that applying one supplementary hoeing was necessary to eliminate the weed plants that survived or escaped from herbicides, Particularly, (*Xanthium brasilicum* L.). Similar results were obtained by Sarah *et al.* (2002); Reddy *et al.* (2003) and Saudy and El – Metwally (2009). They reported that pre- emergence herbicides plus either one hand hoeing or post-emergence herbicides were the potent weed control treatments particularly under heavy weed infestation. While the post-emergence application of fluazifop-p-butyl followed by one hoeing were the best treatment against grassy weeds. These results were in agreement with those of Singh *et al.* (2003) and Silva *et al.* (2005).

Table 5: Effect of weed control treatments on dry weight of weeds (g/m^2) at 75 days from sowing in 2013 and 2014 seasons and their combined analysis.

Weed control treatments (L/fed)	Dry weight of weeds (g/m^2)								
	Broad-leaved weeds			Grassy weeds			Total weeds		
	2013	2014	Comb.	2013	2014	Comb.	2013	2014	Comb.
Prometryne+ fluzifop-p-butyl	31.2^{C}	30.0^{BC}	30.6^{BC}	52.2^{BC}	50.2^{B}	51.2^{B}	83.4^{BC}	80.2^{BC}	81.8^{BC}
Pendimethalin+ fluzifop-p-butyl	39.4^{BC}	32.2^{BC}	35.8^{BC}	54.3^{B}	45.3^{BC}	49.8^{BC}	93.7^{BC}	77.5^{BC}	85.6^{BC}
Prometryne+ hand hoeing	30.3^{C}	29.1^{BC}	24.7^{C}	45.2^{C}	35.2^{C}	40.2^{C}	75.5^{C}	64.3^{C}	64.9^{C}
Pendimethalin+ hand hoeing	30.0^{C}	27.2^{C}	28.6^{BC}	47.2^{BC}	40.6^{BC}	43.9^{BC}	77.2^{BC}	67.8^{BC}	72.5^{BC}
Hand hoeing (2)	49.0^{B}	40.0^{B}	44.5^{B}	50.0^{BC}	43.2^{BC}	46.6^{BC}	99.0^{B}	83.2^{B}	91.1^{B}
Control (unweeded)	565.0^{A}	430.0^{A}	497.5^{A}	152.2^{A}	121.0^{A}	141.6^{A}	717.2^{A}	551.0^{A}	639.1^{A}

Hand hoeing twice reduced the dry weight of total weeds which recorded the control percentage of 85.75%, under combined analysis. The superiority of two hoeing application and herbicide combination with hoeing could be attributed to the continuous destroying effect of the sequential application of hoeing during vegetative growth. Similar results were obtained by Guriqbal, (2005) and Pandya, (2006).

- On yield and yield components:

Data in Table 6 revealed that weed control treatments had a significant effect on final seed yield/fed in both the two seasons and their combined analysis. Dense weeds growing with soybean plants all over the growing seasons in control plots resulted in the lowest yield (0.95 ton/fed) and seed yield losses, reached to 38.93% as compared to seed yield harvested from plots treated by prometryne plus one hand hoeing. This drop in seed yield/fed under the control plots might be attributed to the reduction in the values of growth characters, which occurred as a results of the competition between soybean and weed plants for the essential environmental resources i.e., light, water and nutrients.

Data showed that all tested herbicides were superior significantly over the unweeded treatment in seed yield/fed. pre- emergence herbicides followed with either one hand hoeing or post emergence herbicides was superior in increasing seed yield/fed of soybean than hand hoeing twice and unweeded (control) treatments. Similar results were obtained by Abdel – Hamid and El – Metwally (2008) and Ekram and Mohamed (2008).

In this respect, due to its combination with one hand hoeing, the highest seed yield/fed (1.73 ton/fed) was achieved from prometryne plus one hand hoeing, followed by pendimethalin plus one hand hoeing (1.70 ton/fed) under combined analysis. This may be due to that applying one supplementary hoeing was necessary to eliminate the weed plants, which survived or escaped from the herbicides and assure on the important by using the suitable herbicides due to the expected problem of weed flora.

Table 6: Effect of weed control treatments on soybean seed yield and yield components in 2013 and 2014 seasons, and combined analysis.

Weed control treatments (L/fed)	Yield components											
	Plant height (cm)			Seed yield/plant (g)			Weight of 100 seeds(g)			Seed yield (ton/fed)		
	2013	2014	Comb.	2013	2014	Comb.	2013	2014	Comb.	2013	2014	Comb.
Prometryne+ fluzifop-p-butyl	96.1^{AB}	94.0B^{C}	95.1^{BC}	38.3^{AB}	38.7^{AB}	38.5^{AB}	18.5^{AB}	18.9^{AB}	18.7^{AB}	1.68^{AB}	1.56^{AB}	1.62^{AB}
Pendimethalin+ fluzifop-p-butyl	94.0^{AB}	91.3^{BC}	92.7^{BC}	37.7^{AB}	37.9^{AB}	37.8^{AB}	18.3^{AB}	18.6^{AB}	18.5^{AB}	1.66^{AB}	1.58^{AB}	1.62^{AB}
Prometryne+ hand hoeing	103.5^{A}	99.0^{A}	101.3^{A}	39.3^{A}	39.3^{A}	39.3^{A}	19.1^{A}	19.5^{A}	19.3^{A}	1.77^{A}	1.69^{A}	1.73^{A}
Pendimethalin+ hand hoeing	98.7^{B}	97.8^{B}	98.3^{B}	38.7^{AB}	39.2^{A}	39.0^{AB}	18.8^{AB}	19.2^{AB}	19.0^{A}	1.74^{AB}	1.66^{AB}	1.70^{AB}
Hand hoeing (2)	91.3^{AB}	93.0^{AC}	92.2^{C}	35.4^{B}	35.7^{B}	35.6^{B}	17.7^{B}	18.3^{B}	18.0^{B}	1.64^{AB}	1.46^{B}	1.55^{B}
Control (unweeded)	74.5^{C}	76.2^{C}	75.4^{C}	23.8^{C}	24.2^{C}	24.0^{C}	11.1^{C}	9.5^{C}	10.3^{C}	0.98^{C}	0.92^{C}	0.95^{C}

- Interactions:

- Effect of interactions between plant densities and genotypes.

All interactions effects between plant densities and soybean genotypes on weeds soybean seed, yield and its components under combined analysis were not significant at 5% level meaning that the two factors act independent and their data were excluded.

- Effect of interactions between plant densities and weed control treatments.

Data in Table 7 indicated that the effect of interactions between plant densities and weed control treatments on dry weight of total weeds and soybean grain yield (ton/fed) were significant at 5% level. Total annual weeds tended to decrease under high densities than under low densities, this may be attributed to the less light transparency which falls on weeds and consequently weed growth was decreased. The greatest weed reduction was obtained from the interaction between high plant density (198000 plants/fed) with weed control treatments followed by medium plant density (144000 plants/fed) as compared to low plant density (120000 plant/fed) with the same weed control treatments under the combined analysis.

Also, the results indicated that all interactions between plant densities and weed control treatments significantly soybean seed yield (ton/fed). The highest seed yield (1.96 ton/fed) was obtained from the interaction between medium plant density (144000 plants/fed) with prometryne plus one hand hoeing treatment, followed by pendimethalin plus one hand hoeing, prometryne/fluzifop-p-butyl, pendimethalin plus one hand hoeing and hand hoeing twice. The lowest seed yield (0.91 ton/fed) was resulted from the interaction between high plant density (168000 plants/fed) with control treatment. These results may be attributing to the improving in the growth of soybean under the integration between plant densities and mechanical or chemical control methods. Meanwhile, plant density slightly diminished weed competition in unweeded plots under control treatment referring to the limited role of increasing plant densities alone compared with mechanical and chemical weed control treatments

Table 7: Effect of the interaction between plant densities and weed control treatments on dry weight of weeds (g/m²) and soybean seed yield (ton/fed) in combined analysis.

Treatments		Combined analysis			
Plant densities (plants/fed)	Weed control treatments	Brad-leaved weeds (g/m²)	Grassy weeds (g/m²)	Total weeds (g/m²)	Seed yield (ton/fed)
168000	Prometryne+ fluzifop-p-butyl	23.6^{FG}	37.5^{G}	61.1^{FG}	1.44^{ED}
	Pendimethalin+ fluzifop-p-butyl	28.3^{FG}	43.6^{EF}	71.9^{EF}	1.46^{ED}
	Prometryne+ hand hoeing	17.5^{H}	27.3^{GH}	44.8^{I}	1.49^{E}
	Pendimethalin+ hand hoeing	22.4^{FG}	31.4^{FE}	53.8^{H}	1.48^{ED}
	Hand hoeing (2)	37.2F	29.7^{H}	66.9^{G}	1.38^{F}
	Control (unweeded)	435.3C	126.7^{C}	562.0^{C}	0.91^{C}
144000	Prometryne+ fluzifop-p-butyl	31.5^{EF}	50.3^{ED}	81.8E^{D}	1.82^{C}
	Pendimethalin+ fluzifop-p-butyl	36.8^{EF}	46.4^{EF}	83.2^{ED}	1.81^{BC}
	Prometryne+ hand hoeing	25.4F^{G}	41.5^{EF}	66.9^{G}	1.96^{A}
	Pendimethalin+ hand hoeing	26.9^{G}	44.2^{EF}	73.8^{F}	1.92^{AB}
	Hand hoeing (2)	46.9^{E}	48.3^{F}	95.2^{E}	1.73^{DC}
	Control (unweeded)	492.6B	140.8^{B}	633.4^{B}	1.03F^{G}
120000	Prometryne+ fluzifop-p-butyl	36.8^{EF}	65.8^{D}	102.6^{ED}	1.61^{BC}
	Pendimethalin+ fluzifop-p-butyl	42.4^{DE}	59.3^{E}	101.7^{ED}	1.59^{D}
	Prometryne+ hand hoeing	31.2^{EF}	51.7^{ED}	82.9^{ED}	1.73^{AB}
	Pendimethalin+ hand hoeing	33.7^{EF}	56.2^{ED}	89.9^{ED}	1.69^{B}
	Hand hoeing (2)	58.3^{D}	61.7^{ED}	120.0^{ED}	1.54^{DC}
	Control (unweeded)	564.6^{A}	157.4^{A}	721.0^{A}	0.93^{G}

- Effect of interactions between genotypes and weed control treatments:

Data presented in Table 8 showed that broad-leaved, grassy, total weeds and seed yield (ton/fed) were significantly by affected by the interaction between soybean genotypes and weed control treatments. The greatest reduction for total weeds were obtained by the interaction between Giza 111 genotype with prometryne plus one hand hoeing treatment followed by pendimethalin / hand hoeing,prometryne / fluzifop – p - butyl, pendimethalin/fluzifop-p-butyl and hand hoeing twice as compared to Toano genotype with the same weed control treatments. The highest seed yield (1.9 ton/fed) was obtained from the interaction between Giza 111 genotype with prometryne plus one hand hoeing treatment, while, the lowest seed yield (0.92 ton/fed) was resulted from the interaction between Toano genotype with control treatment. This may be owing to effect of integration between genotypes competition strength with mechanical and chemical methods in controlling weeds. Meaning that the role of genotypes on suppressing weed growth is limited and the positive effect of integration comes from mechanical and chemical treatments mainly.

Table 8: Effect of the interaction between soybean genotypes and weed control treatments on dry weight of weeds (g/m^2) and seed yield (ton/fed) in combined analysis.

Treatments		Combined analysis			
Genotypes	Weed control treatments	Brad-leaved weeds (g/m^2)	Grassy weeds (g/m^2)	Total weeds (g/m^2)	Seed yield (ton/fed)
Giza 111	Prometryne+ fluzifop-p-butyl	24.5^{DF}	41.3^{CD}	71.6^{DE}	1.80^{AB}
	Pendimethalin+ fluzifop-p-butyl	30.6^{CD}	40.8^{CD}	78.3^{E}	1.78^{C}
	Prometryne+ hand hoeing	20.4^{DE}	36.2^{DE}	57.2^{F}	1.90^{A}
	Pendimethalin+ hand hoeing	21.3^{DE}	38.7^{E}	61.4^{DE}	1.85^{B}
	Hand hoeing (2)	36.2^{CD}	41.1^{CD}	81.7^{CD}	1.72^{BC}
	Control (unweeded)	417.5^{B}	119.3^{B}	584.6^{B}	0.96^{E}
Toano	Prometryne+ fluzifop-p-butyl	36.6^{D}	53.1^{CD}	92.0^{CD}	1.52^{BC}
	Pendimethalin+ fluzifop-p-butyl	41.0^{CB}	58.8^{C}	72.6^{DE}	1.52^{BC}
	Prometryne+ hand hoeing	29.0^{E}	44.2^{CD}	83.6^{DE}	1.62^{AB}
	Pendimethalin+ hand hoeing	35.9^{CD}	49.1^{D}	83.6^{D}	1.61^{AB}
	Hand hoeing (2)	52.8^{C}	52.1^{CD}	100.5^{C}	1.44^{D}
	Control (unweeded)	577.5^{A}	163.9^{A}	693.6^{A}	0.92^{F}

- Effect of interactions among plant densities; genotypes and weed control treatments.

The effect of interaction among plant densities, genotypes and weed control treatments were significant on total weeds and seed yield/fed at 5% level, (Table 9). The maximum weed control percentage was obtained from the mediate integration between plant density (144000 plants/fed) with Giza 111 genotype and prometryne/hand hoeing treatment. Such potent interacted treatment reduced soybean total weeds by 94.0% as compared to the lowest plant density (120000 plant/fed) with Toano genotype and control (unweeded) treatment. While, the best seed yield (1.84 ton/fed) was obtained from interaction between medium plant density (144000 plant/fed) with Giza 111 genotype and prometryne plus one hand hoeing treatment. This is may be attributed to the major role of either herbicides or mechanical methods and the role of cultural practices represent by 26.9 % plant density and genotypes by 27.3% under combined analysis.

Table 9: Effect of interaction among plant densities, genotypes and weed control treatments on dry weight of weeds (g/m^2) and seed yield of soybean (ton/fed) under combined analysis.

Treatments			Combined analysis	
P. densities	Genotypes	Weed control treatments	Total weeds (g/m^2)	Seed yield (ton/fed)
168000	Giza 111	Prometryne+ fluzifop-p-butyl	53.2 ^{GH}	1.48 ^{BC}
		Pendimethalin+fluzifop-p-butyl	57.8 ^{GH}	1.45 ^{BC}
		Prometryne+ hand hoeing	33.5 ^{J}	1.54 ^{AB}
		Pendimethalin+ hand hoeing	42.4 ^{HI}	1.52 ^{AB}
		Hand hoeing (2)	58.1 ^{H}	1.38 ^{D}
		Control (unweeded)	597.1 ^{B}	0.88 ^{E}
	Toano	Prometryne+ fluzifop-p-butyl	58.3 ^{H}	1.45 ^{BC}
		Pendimethalin+ fluzifop-p-butyl	62.1 ^{FG}	1.43 ^{BC}
		Prometryne+ hand hoeing	38.6 ^{J}	1.50 ^{C}
		Pendimethalin+ hand hoeing	46.8 ^{I}	1.48 ^{BC}
		Hand hoeing (2)	63.4 ^{FG}	1.34 ^{CD}
		Control (unweeded)	609.0 ^{AB}	0.85 ^{E}
144000	Giza 111	Prometryne+ fluzifop-p-butyl	78.9 ^{F}	1.76 ^{AB}
		Pendimethalin+ fluzifop-p-butyl	83.9 ^{DE}	1.73 ^{AB}
		Prometryne+ hand hoeing	64.5 ^{G}	1.84 ^{A}
		Pendimethalin+ hand hoeing	71.6 ^{EF}	1.81 ^{AB}
		Hand hoeing (2)	89.1 ^{E}	1.71 ^{A}
		Control (unweeded)	638.9 ^{AB}	0.99 ^{E}
	Toano	Prometryne+ fluzifop-p-butyl	83.1 ^{DE}	1.60 ^{B}
		Pendimethalin+ fluzifop-p-butyl	84.4 ^{DE}	1.59 ^{BC}
		Prometryne+ hand hoeing	62.4 ^{FG}	1.72 ^{AB}
		Pendimethalin+ hand hoeing	74.9 ^{EF}	1.69 ^{AB}
		Hand hoeing (2)	94.3 ^{CD}	1.54 ^{BC}
		Control (unweeded)	642.5 ^{AB}	0.910.70 ^{CD}
120000	Giza 111	Prometryne+ fluzifop-p-butyl	108.0 ^{BC}	1.62 ^{AB}
		Pendimethalin+ fluzifop-p-butyl	114.4 ^{BC}	1.62 ^{AB}
		Prometryne+ hand hoeing	96.2 ^{D}	1.75 ^{AB}
		Pendimethalin+ hand hoeing	100.2 ^{C}	1.75 ^{AB}
		Hand hoeing (2)	120.6 ^{BC}	1.55 ^{BC}
		Control (unweeded)	647.3	0.83 ^{CD}
	Toano	Prometryne+ fluzifop-p-butyl	111.4 ^{BC}	1.60 ^{AB}
		Pendimethalin+ fluzifop-p-butyl	115.3 ^{BC}	1.60 ^{AB}
		Prometryne+ hand hoeing	96.7 ^{D}	1.63 ^{A}
		Pendimethalin+ hand hoeing	101.5 ^{BC}	1.68 ^{AB}
		Hand hoeing (2)	123.6 ^{BC}	1.53 ^{BC}
		Control (unweeded)	675.3 ^{A}	0.81 ^{ED}

- Correlation between all studied characters and soybean seed yield:

Data presented in Table 10 indicated that correlation between dry weight of grasses, broad-leaved species and soybean seed yield was statistically significant and negative at 5% level, and very strong with grassy weeds (-0.43) than with broad-leaved weeds (0.73). This means that grassy weeds were more aggressive in their competition to soybean than broad-leaved weeds. Correlation between dry weight of total annual weeds and seed yield recorded the highest value, where vit negatively affected soybean seed yield by (- 0.78) at 5% level, under combined analysis.

Also, correlation analysis revealed that the yield increases due to type of weed competition were positively contributed to the increases in plant height, seed yield/plant and weight of 100 seeds. The correlation between total weeds and soybean seed yield, plant height, seed yield/plant and weight of 100 seeds were highly statistically significant. Hence, weed control play a major role in increasing soybean productivity per unit urea, if applied at the suitable time, rate and stage of weed growth.

Table 10: Correlation coefficient between all studied characters and soybean seed yield under combined analysis.

Studied characters	Grassy weeds (g/m^2)	Total weeds (g/m^2)	Plant height (cm)	Seed yield/ plant (g)	Weight of 100 seeds (g)	Seed yield (ton/fed)
Broad-leaved	0.25	0.94**	- 0.64**	- 0.82**	0.78**	- 0.73**
Grassy weeds		0.56**	- 0.02	- 0.35	- 0.77	- 0.43*
Total weeds			- 0.55**	- 0.88**	0.76**	- 0.78**
Plant height				0.79**	0.81**	0.11
Seed yield/plant					0.89**	0.54**
W. of 100 seed					-	0.46**

- Effect of weed control treatments on oil and protein contents:

- On oil % and oil yield (kg/fed):

Data denoted that weed control treatments had a significant effect on oil and protein content in soybean seeds (Table 11). The influence of such treatments on oil yield had the same trend of that of seed yield/fed. The control treatment recorded the lowest oil yield (186.24 and 173.88 kg/fed. Giza111 and Toano genotypes,respectively,). Oil yield losses from weed competition reached to 267.90 and 206.82 kg oil/fed (59.0 and 54.3%) as compared to oil estimated from applying prometryne plus one hand hoeing (454.14 and 380.70 kg/fed) in Giza111 and Toano genotypes, respectively, under combined analysis. However, elimination of weeds increased oil yield to different extents according to the effectiveness of the used weed control program.

Generally, data indicated that the highest increase in oil yield was achieved from the herbicides plus one hand hoeing, followed by hand hoeing twice as compared to control treatment. The slight differences in oil % and the significant difference in oil yield/fed among different weed control treatments must be attributed to the variation in the effectiveness of the applied weed control treatments. The highest oil% and yield were produced by herbicides plus one hand hoeing, followed by hand hoeing twice. Meanwhile, the lowest oil yieldwere obtained from the control treatment. Such superiority of these treatments in increasing oil yield was mainly due to higher seed yield, whereas, the lowest oil yield was due to reduction in seed yield reflecting the dominant weed growth. Similar results were obtained by Abdel – Hamid and El – Metwally (2008).

- **On protein content:**

Regarding percentage of protein content in soybean seeds, data showed that all treatments increased protein content when compared with the control treatment (Table 11). The higher values 744.80, 717.80, 680.40, 665.72 and 636.40 kg/fed in Giza 111 genotype, and 628.56, 616.63, 566.96, 563.92 and 528.48 kg/fed in Toano genotype were obtained by prometryne/ hand hoeing, pendimethalin/hand hoeing, prometryne/ fluzifop-p-butyl, pendimethalin/fluzifop-p-butyl and hand hoeing twice, under combined analysis, respectively. This may be due to effective control of weeds. In contrast, the lowest value (342.72 and 315.56 kg/fed) in Giza 111 and Toano genotypes, respectively were observed with control treatment. Similar results were obtained by Abdel – Hamid and El – Metwally (2008).

Table 11: Effect of weed control treatments on protein and oil content of soybean genotypes under combined analysis.

Weed control treatments (L/fed)	Giza 111				Toano			
	Protein %	Protein (kg/fed)	Oil% of seeds	Oil yield (kg/fed)	Protein %	Protein (kg/fed)	Oil% of seeds	Oil yield (kg/fed)
Prometryne+ fluzifop-p-butyl	37.8	680.40^{AB}	22.8	410.41^{AB}	37.3	566.96^{B}	21.8	331.36^{B}
Pendimethalin+ fluzifop-p-butyl	37.4	665.72^{B}	22.5	400.52^{AB}	37.1	563.93^{BC}	21.6	328.32^{BC}
Prometryne+ hand hoeing	39.2	744.80^{A}	23.9	454.14^{A}	38.8	628.56^{A}	23.5	380.70^{A}
Pendimethalin+ hand hoeing	38.8	717.80^{AB}	23.0	425.53^{AB}	38.3	616.63^{AB}	23.5	378.35^{AB}
Hand hoeing (2)	37.0	636.40^{C}	21.6	371.57^{B}	36.7	528.48^{C}	20.1	289.44^{C}
Control (unweeded)	35.7	342.72^{D}	19.4	186.24^{C}	34.3	315.56^{D}	18.9	173.88^{D}

REFERENCES

Abdel – Hamid, M.T. and I. M. El – Metwally (2008). Growth, nodulation, yield of soybean and associated weeds as affected by weed management. Planta Daninha, 26 (4): 855 – 863.

A.O.A.C. (1980). Official Methods of Analysis of the Association of Official Analytical Chemists. 14th Edition, Published by Association of Official Analytical Chemists. Washington, D. C., U.S.A.

A.O.A.C. (1990). Official Methods of Analysis of the Association of Official Analytical Chemists. 15th Edition, Published by Association of Official Analytical Chemists, Arlington, Virginia, U.S.A.

Bahan, V.M.; H. Singh and R.A. Maurya (1972). Studies on the chemical of weeds in soybean. Indian. J. weed Sci., 17: 4-16.

Ekram, A.M. and A. S. E. Mohamed (2008). Integrated effect of varieties, plant density and weed control treatments on chemical composition and yield of soybean grown in newly reclaimed soil. Cited from (http: / WWW. Fayoum. Edu. Eg / English / agriculture / Journal Z. aspk).

El- Gizawy, N. Kh. B.; A.M. Fadlallah, A.M.A. Hassanein and I.E. Soliman (2012). Estimation of the critical period for weed control in soybean (*Glycine max* L.) as influenced by plant density. J. Plant Production, Mansoura Univ., 3 (9): 2375-2394.

Eweida, M.H.T.; A.I. El-Agamy; A.M. Hagras and E.A. El-Gharib (1980). Effect of hoeing numbers and some herbicides on yield, yield components and some chemical contents of soybean seeds. Fac. Agric. Res. Bulletin, Ain Shames Univ. (1296): 16.

Fayed, M.T.; Olfat H. El-Bagoury and H.T. Al-Marsafy (1983). The effectiveness of numerous herbicides in soybean. Egyptian Society of Crop. Science Proc. of the 1st Conf. Agron. (2): 289-678.

Galal, A.H. (2004). Effect of weed control treatments and hill spacing on soybean and associated weeds. Acta Agronomica Hungarica, 52 (1): 81-93.

Gomez, K.A. and A.A. Gomez (1984). Statistical Procedures for Agricultural Research. John Wiely and Sons. Inc, New York.

Guriqbal, S. (2005). Effect of chemical and mechanical methods on weed management, growth and grain yield of soybean (*Glycine max,* L.). Indian J. Weed Sci. 37 (112): 131-132.

Gurnah, A.M. (1978). The effect of plant population, spacing and weeding on yields of soybean. Proc. East African, Weed Sci. Conf., 6: 85-89.

Hassanein, E. E.; M. H. Fayed; N. F. Dawla and S. E. El – Sehly (2002). Effect of some weed control treatments on soybean and associated weeds. Egypt. J. Agric. Res., 78(5): 1979 – 1997.

Jadhav, K.T.; D.N. Arthamwar; N.B. Rathod; M.M. Giram and A.K. Shaikh (2003). Effect of different herbicidal combinations on weed management in soybean (*Glycine max* L.), J. Soils and Crops 13 (1): 182-184.

Kurchania, S.P.; G.S. Rathi; C.S. Bhalla and R. Mathew (2001). Bio-efficacy of post-emergence herbicides for weed control in soybean (*Glycine max* L.). Indian J. Weed Sci., 33 (1/2): 34-37.

Moursi, M.A.; T.Y. Rizk; M.T. Fayed and A. Roshdy (1980). Yield and yield components of soybean as effected by chemical weed control. Annual of Agric. Sci., Moshtohor, 14: 21-31.

Pandya, N.; G.S. Chouhan and V. Nepalia (2006). Production potential and energy budgeting of soybean (*Glycine amx* L.) varieties as influenced by weed-management practices under different crop geometries. Indian J. Agro., 51 (3): 209-212.

Raei, Y.; K.G. Golezani; A. Javanshr; H. Aliari and A. Mohammadi (2008). Effect of plant density on soybean and sorghum. J. of Sci. and Tech. of Agric. and Natural Resources., 12: 45 (A), 33-45.

Reddy, K. N.; R. M. Zablotowicz; M. A. Locke and C. H. Koger (2003). Cover crop, tillage and herbicides effects on weeds, soil properties, microbial populations and soybean yield. Weed Science, 51 (6): 987 – 994.

Regnault, Y. (1986). Weed control in soybeans. Inform. Tech., (94): 166-169.

Rizk, T.Y.; F.I. El-Bastawesy; M.T. Mostafa and A.A. Hassan (1985). Effect of some herbicides and plant density on weed species in soybean fields. Proc. 6th Arab Pesticide Conf. Tanta Univ. Vol. (III): 231-248.

Sarah, T. L. Loyd and B. German (2002). Pre-emergence flumioxazin and pendinethalin and post-emergence hebicides systems for soybean (*Glycine max* L.). Weed Technology, 16 (3); 502 – 511.

Saudy, H. S. and I. M. El – Metwally (2009). Weed management under different patterns of sunflower – soybean intercropping. J. of Central European Agric., 10 (1): 41 – 52.

Sikkema, P.H.; J. D. Vyn and N. Soltani (2008). Control of common cocklebur (*Xanthium strumarium* L.) with pre- and post-emergence herbicides in soybean. Canadian J. of plant Science, 88 (6): 1127 – 1131.

Silva, A.C.; L.R. Ferreira; A.A. Silvada; A.F. Belo and C.S. Sediyama (2005). Morphologic characters of soybean and brachiaria intercropped under reduced rates of fluazifop-p-butyl. Ciencia-Rural. 35 (2): 277-283.

Singh, J.N.; K. Kirti Kumar and M.L. Pandito (1973). Herbicidal control of weeds in peas. Indian J. of w. Sci., 5 (1): 42-47.

Singh, V.P.; J.S. Mishra; Anil-Dixit; P.K. Singh and N.T. Yaduraju (2003). Integrated management of tiger grass (*Saccharum spontaneum* L.). Indian J. W. Sci., 35 (314): 246-250.

Topps, J.H. and R.L. Wain (1957). Investigation of fungi toxicity of 3-and 5-alkyl salicylinilide and para-chloroaniline. Ann. Appli. Biol., 45 (3): 506-511.

Tripathi, R.D.; P. Srivastava; M.S. Nsra and S.C. Pandey (1971). Protein control in some varieties of leymes. The Allah Abad Farmer, 16: 291-296.

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تأثير القدرة التنافسية لبعض أصناف فـول الصويا والكثافات النباتيـة ومعاملات مكافحة الحشائش على فول الصويا والحشائش المصاحبة له

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أجريت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بـسخا- كفرالـشيخ خـلال موسمي الزراعة ٢٠١٣، ٢٠١٤. بهدف تقييم كفاءة أصناف فـول الـصويا ، الكثافـات النباتيـة ومعاملات مكافحة الحشائش على محصول فول الصويا والحشائش المصاحبة له وذلك باسـتخدام تصميم تجارب القطع المنشقة مرتين فى أربعة مكررات. اشتملت القطع الرئيـسية علـى ثـلاث كثافات نباتية (١٦٨٠٠٠، ١٤٤٠٠٠ و ١٢٠٠٠٠ نبات/ فدان) والقطع الشقية الأولى على صـنفين من فول الصويا (جيزة ١١١ وToano) والقطع الشقية الثانية على سـتة معـاملات لمكافحـة الحشائش (بروميترين/عزيق، بنديمثالين/عزيق، بروميترين/فلوزيفوب-ب-بيوتايـل، بنـديمثالين/ فلوزيفوب-ب- بيوتايل، عزيق مرتين والكنترول).

أشارت النتائج إلى أن الكثافة النباتية العالية خفضت معنوياً الـوزن الجـاف للحـشائش الحولية عريضة وضيقة الأوراق والحشائش الكلية حيث أدت زيادة الكثافة النباتية مـن ١٢٠٠٠٠ نبات/ فدان إلى ١٦٨٠٠٠ نبات/ فدان إلى خفض الوزن الجاف للحشائش الحولية عريضة وضيقة الأوراق والحشائش الكلية بنسبة ٢٦,٤ و ٢٦,٩% على التوالي. كان الصنف جيـزة ١١١ أكثـر منافسة للحشائش مقارنة بالصنف Toano والذي أنقص الوزن الجاف للحشائش الحولية عريضة وضيقة الأوراق والحشائش الكلية بنسبة ٢٨,٧، ٢٤,٧ و٢٧,٣% على التوالي وأحدث زيادة فـى المحصول بنسبة ٦,٦٧%.

خفضت جميع معاملات مكافحة الحشائش الوزن الجاف للحـشائش عريـضة وضـيقة الأوراق والحشائش الكلية مقارنة بمعاملة الكنترول. وقد قدرت الخسارة في المحصول تحت معاملة الكنترول بمقدار ٣٩,٦٦% مقارنة بمعاملة بروميترين/ عزيق مرة واحدة والتـى كانـت أفـضل المعاملات مقارنة بالمعاملات الأخرى. ارتبط محصول البذور (طن/ف) ارتباطا موجبا بمكونـات المحصول وارتباطا سالبا بالحشائش.

- ولذا توصى هذه الدراسة بمكافحة الحشائش فى محصول فول الصويا باسخدام برنامج المكافحة المتكاملة للحشائش حيث قللت الكثافة النباتية الحشائش بنسبة ٢٦,٩% والأصناف بنـسبة ٢٧,٣% ومعاملة المبيد مع العزيق بمقدار ٨٩,٨% بينما أحدث التكامـل بـين الكثافـة النباتيـة (١٤٤٠٠٠ نبات/ فدان) والصنف جيزة ١١١ ومعاملات مكافحة الحشائش (المبيد+ العزيق)أعلـى كفاءة فى المكافحة الحشائش وصلت الى ٩٤ %.