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EFFECT OF WHEAT CULTIVARS, SEEDING RATES AND WEED CONTROL TREATMENT ON THE ASSOCIATED WEEDS

BY

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ABSTRACT

Two field experiments were carried out at the Experimental Farm of Sakha Research Station, Kafr El-Sheikh during 1994/95 and 1995/96 winter seasons to study the effect of wheat cultivars (Sakha 8, Sakha 61 and Giza 163), seeding rates (40, 55 and 70 Kg/fed.) and some weed control treatments on the associated weeds.

The seasonal effects were significant on most of the studied characters for weed growth during the three sampling dates, 60, 90 and 120 days after sowing. Concerning the effect of wheat cultivars, Sakha 8 cultivar significantly decreased fresh weight, dry weight and leaf area index (LAI) of broad leaved, grassy and total annual weeds as compared to Sakha 61 or Giza 163 cultivars during three sampling dates (60, 90 and 120 days after sowing). Increasing seeding rate significantly decreased fresh weight, dry weight and LAI of broad leaved, grassy and total weeds. Arelon at the rate of 1.25 L/fed.or hand weeding (twice), significantly reduced fresh weight, dry weight and LAI of grassy, broad leaved and total annual weeds at the three dates of sampling.

INTRODUCTION

Wheat (*Triticum aestivum*) is the most important cereal crop in Egypt and the world. In spite of the recent increases of wheat area and national average yield, the local production is still not able to meet the growing needs of wheat.

Weeds can cause up to 10% crop losses in Agriculturally developed countries, while in the developing world this figure could be two or more times higher. Several weed problems caused by intensive monocropping or repeated use of a particular herbicide are very difficult to resolve using a single control method. Valenti and Wicks (1992) reported that winter wheat cultivars suppressed density and growth of weeds (barnyard grass and green foxtail) significantly than eagle winter wheat before and after wheat harvest. Yongqing

et al., (1995) studied weed growth in stubble of 25 wheat lines and cultivars. They obtained significant differences between some lines and cultivars in number of weeds and weed fresh and dry weights measured on two dates during growth period. Alam *et al.*, (1994) concluded that a higher seeding rate of wheat significantly decreased weeds dry weight / m2. Tanji *et al.*, (1997) found that increasing wheat seeding rates from 60 to 180 Kg/ha reduced rigid ryegrass and cowcockle plant component weight when wheat emerged with either weeds. Hooda Agrawi (1995) stated that the post emergence application of isoproturon (1 Kg/ha) significantly reduced the weed population and weed dry matter production of *Phalaris spp.* compared with the weedy control. Rajender and Hooda (1996) found that weed density and dry matter accumulation by weeds were significantly reduced with all the herbicidal treatments (isoproturon 0.7 kg a.i./ha).

This work was designed to study the effects of wheat cultivars, seeding rate and some weed control treatments on weeds.

MATERIALS AND METHODS

The present study was carried out at the Experimental Farm of Sakha Research Station Kafr El-Sheikh, Egypt during two successive seasons 1994/95 and 1995/96. The investigation aimed to study the effects of wheat cultivars, seeding rate and some weed control treatments on weeds.

The mechanical and chemical analysis of the experimental field according to Black *et al.*, (1965), indicated that soil texture was clayey with pH 8.3 and 8.2, organic matter 2.04 and 1.91% while the available N was 19.57 and 19.03 ppm for the first and second season, respectively.

Three seeding rates (40, 55 and 70 kg/fed.) were used for wheat throughout the two seasons. The seeds of wheat cultivars (Sakha 8, Sakha 61 and Giza 163) were broad casted by hand.

Arelon 50% [3-(4-isopropylphenyl)-1, 1-dimethylurea)], at the rate of 1.25 L/fed. and hand weeding (twice at 30 and 45 days from sowing) were used as weed control treatments in addition to the untreated weedy check plots. The herbicidal treatment was applied at 3-4 leaf stage of wheat using knapsack sprayer.

A split-plot in factorial design with four replications was used. The main plots were randomly assigned to three wheat cultivars. Seeding rates and weed control treatments were allocated in the sub-plots. The sub-plot size was 15.75 m^2 (3.5 in width and 4.5m in length). All agronomic practices of growing wheat as recommended for the region were followed.

The associated weeds were pulled by hand from two random quadrates of 0.5 x 0.5 m. Weeds were classified, counted, and the following traits were recorded at three sampling dates (60, 90 and 120 days from sowing):

1- Fresh weight (g) of grassy weeds per square meter.
2- Fresh weight (g) of broad leaved weeds per square meter.
3- Fresh weight (g) of total annual weeds per square meter.
4- Dry weight (g) of grassy weeds per square meter.
5- Dry weight (g) of broad leaved weeds per square meter.
6- Dry weight (g) of total annual weeds per square meter where the weeds were dried to a constant weight in a forced air oven at 70C and the dry weight was recorded.
7- *Leaf area index (LAI) of grassy weeds.
8- *Leaf area index (LAI) of broad leaved weeds.
9- *Leaf area index (LAI) of total annual weeds.

Data of the two experiments were subjected to proper analysis of variance according to Snedecor and Cochran (1971). The combined analysis was conducted for the data of the two experiments according to Gomez and Gomez (1983). Duncans multiple range test was used for comparison between means. Means followed by the same alphabetical letters are not statistically different at the 5% level of significance.

RESULTS AND DISCUSSION

The major weed species associated with wheat crop during the two growing seasons were: *Phalaris minor*, *Phalaris canariensis*, *Medicago polymorpha*, *Rumex dentatus* L. *Anagallis arvensis*. *Ammi sp.* and *Melilotus indica* L.

Fresh weight, dry weight per square meter and leaf area index were used as reliable indicators for weed distribution in wheat plots.

1. Effect of seasons:

The effect of seasons on weed characters presented in Table (1) showed that the seasonal effects were clear with weed distribution and growth measurements. Dry weight in the second sample of total weeds showed insignificant seasonal effect. The mean values of fresh and dry weight of broad leaved weeds in the three samples in addition to leaf area index (LAI) in the first and second samples of the broad leaved weeds were significantly higher in the first season. Also, fresh weight of total weeds in the three samples and dry weight of total weeds in the third sample gave significantly higher values in the first season. On the other hand, the other traits had significantly higher mean values in the second one.

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*At 60 and 90 days after sowing

Table (1): The average values of seasonal effect on some growth measurments of weeds in 1994/95 and 1995/96 seasons

Seasons	Measurments									
	Fresh weight per m2 (g)			Dry weight per m2 (g)			Leaf Area Index		
	Grasses	Broad leaved	Total weeds	Grasses	Broad leaved	Total weeds	Grasses	Broad leaved	Total weeds
60 days after sowing									
1994/95	7.61 b	26.45 a	34.06 a	0.64 b	1.34 a	1.98 b	0.01 b	0.036 a	0.047 b
1995/96	17.68 a	12.42 b	30.07 b	2.12 a	0.83 b	2.83 a	0.035 a	0.013 b	0.048 a
90 days after sowing									
1994/95	313.22 b	367.72 a	680.94 a	50.79 b	36.82 a	87.61 a	0.458 b	0.532 a	0.990 a
1995/96	408.96 a	190.70 b	599.66 b	66.92 a	21.25 b	88.17 a	0.565 a	0.342 b	0.907 b
120 days after sowing									
1994/95	479.73 b	632.84 a	1012.67 a	66.90 b	47.58 a	134.38 a	.	.	.
1995/96	596.29 a	275.08 b	871.37 b	103.76 a	24.71 b	128.47 b	.	.	.

2. Varietal effects:

Data presented in Table (2) showed the effect of three wheat cultivars on, fresh weight, dry weight and LAI of weeds at 60, 90 and 120 days after sowing as combined data over the two seasons. The results clearly indicated that all studied characters were significantly affected by wheat cultivars in all samples. It is obvious from Table (2) that fresh and dry weight/m^2 of grassy, broad leaved and total weed values were significantly decreased by Sakha 8 wheat cultivar if compared to Sakha 61 and Giza 163. This trend was true at the three different stages of wheat growth. Giza 163 cultivar had the heaviest fresh weights of weeds. The high effectiveness of Sakha 8 in decreasing weed fresh weight values may be attributed to the low population of weeds occurred with this cultivar that reflects the high competitive ability with the associated weeds. The same trend was obtained by Valenti and Wicks (1992).

Data in Table (2) indicated that leaf area index for grassy, broad leaved and total weeds at 60 and 90 days after sowing were significantly affected by cultivars. Sakha 8 cv. showed an efficient role in the suppression of L.A.I. for weeds durinthe first and second samples while Giza 163 was the least efficient variety in this connection. The varietal potention in weed biomass and leaf area depression my be correlated with ground cover and plant height of the cultivar in the early stage of development as reported by Niemann (1990).

The effect of the interaction between wheat cultivar and seasons is shown in Table (2). Significant effect of interaction between cultivar and season was detected from fresh weight of grasses/m^2 in the first and third samples, fresh weight of total weeds in the first sample, dry weight and LAI of both grasses and broad leaved weeds in the first sample, dry weight of grassy weeds, LAI for broad leaved and total weeds in the second sample. These results indicate that the performance of these cultivars differed from season to season. On the other hand, insignificant effect of interaction between cultivar and season was detected in the rest measurements reflecting the constant behavior of these measurements from season to another.

3. Effect of seeding rate:

Data in Table (3) showed the effect of three seeding rates on fresh weight, dry weight and leaf area index of weeds at 60, 90 and 120 days after sowing as combined data of the two seasons.

As shown in Table (3), increasing wheat seeding rate markedly reduced fresh and dry weight of grassy, broad leaved and total annual weeds. The declined fresh and dry weight of weeds associated with raising seeding rate could be related to the reduced weed population and the increased depletion of water by wheat plants under dense crop populations. In addition, the higher crop density may intercept more light and increase the crop ability to compete for soil nutrients. Similar results were reported by Tahoon (1994), Zaher (1996) and Tanji *et al.*, (1997).

Table (2): Average values of some traits of grasses, broad leaf and total annual weeds as affected by wheat cultivars

(Combined data of the seasons)

Sampling date	Wheat cultivar	Fresh weight g / m2			Dry weight g / m2			Leaf Area Index		
		Grasses	Broad leaved	Total annual	Grasses	Broad leaved	Total annual	Grasses	Broad leaved	Total annual
60 DAS	Sakha 8	8.46 c	16.30 c	23.76 c	0.79 c	0.73 c	1.70 c	0.015 c	0.014 c	0.029 c
	Sakha 61	13.66 b	19.45 b	33.11 b	1.42 b	1.07 b	2.49 b	0.023 b	0.021 b	0.044 b
	Giza 163	15.61 a	23.68 a	39.29 a	1.75 a	1.25 a	3.00 a	0.020 a	0.039 a	0.059 a
	F test (CV.S*)	S	NS	S	S	S	S	S	S	S
90 DAS	Sakha 8	266.08 c	204.98 c	471.06 c	42.95 c	22.11 c	66.06 c	0.361 c	0.328 c	0.709 c
	Sakha 61	380.24 b	281.29 b	661.53 b	58.04 b	29.41 b	87.45 b	0.517 b	0.457 b	0.974 b
	Giza 163	456.93 a	351.36 a	808.28 b	75.57 a	35.58 a	111.15 a	0.636 a	0.526 a	1.162 a
	F test (CV.S*)	NS	NS	NS	S	NS	NS	NS	S	S
120 DAS	Sakha 8	391.41 c	314.05 b	705.46 c	74.38 c	28.45 c	102.83 c	-	-	-
	Sakha 61	556.31 b	425.74 a	982.05 b	96.11 b	37.76 b	132.87 b	-	-	-
	Giza 163	666.32 a	472.24 a	1138.56 a	116.38 a	42.22	158.58 a	-	-	-
	F test (CV.S*)	S	NS	NS	NS	NS	NS			

CV = Cultivar
S = Significant

S* = Seasons
NS = Not significant

Table (3): Average values of some traits of grasses, broad leaf and total annual weeds as affected by wheat seeding rate

(Combined data of the seasons)

Sampling date	Seeding rate (kg/fed)	Fresh weight g / m2			Dry weight g / m2			Leaf Area Index		
		Grasses	Broad leaved	Total annual	Grasses	Broad leaved	Total annual	Grasses	Broad leaved	Total annual
60 DAS	40	17.33 a	26.08 a	43.41 a	1.90 a	1.28 a	3.18 a	0.032 a	0.032 a	0.064 a
	55	11.34 b	17.87 b	29.21 b	1.26 b	0.99 b	2.25 b	0.022 b	0.024 b	0.046 b
	70	9.08 c	14.48 c	23.56 c	0.98 c	0.80 c	1.78 c	0.014 c	0.019 c	0.033 c
	F test (SR.S*)	S	NS	NS	S	S	S	S	S	NS
90 DAS	40	441.93 a	338.35 a	780.28 a	72.08 a	35.03 a	107.11 a	0.629 a	0.517 a	1.146 a
	55	381.31 b	282.50 b	633.81 b	57.68 b	29.21 b	86.89 b	0.502 b	0.442 b	0.944 b
	70	290.01 c	216.78 c	506.79 c	46.80 c	22.85 c	69.65 c	0.404 c	0.351 c	0.755 c
	F test (SR.S*)	S	NS	NS	S	NS	S	NS	NS	S
120 DAS	40	668.35 a	473.59 a	1142.94 a	116.64 a	41.92 a	158.46 a	-	-	-
	55	556.21 b	413.94 b	970.15 b	94.06 b	36.73 b	130.79 b	-	-	-
	70	388.48 c	324.50 c	712.98 c	75.26 c	130.79 b	106.02 c	-	-	-
	F test (SR.S*)	S	NS	S	S	NS	S			

SR = Seeding rate
S = Significant

S* = Seasons
NS = Not significant

In respect of weeds, Table (3) showed the mean values of LAI of grassy, broad leaved and total annual weeds as affected by seeding rate of wheat. It is observed that increasing seeding rate significantly decreased LAI of weeds. This was clear at both sampling dates. The lower leaf area of weeds under the highest seeding rate could be attributed to the taller plants and larger leaf area in addition to the larger number of culms for the crop. Blackshaw (1993), Ferrero *et al.*, (1994) and Anten and Werger (1996) mentioned similar explanation.

The results for the effect of interaction between seeding rates and seasons are shown in Table (3). Data revealed that the effect of the interaction was statistically significant for fresh weight of grassy weeds in the three samples. Also it was significant for fresh weight of total annual weeds at the third sample, dry weight of grasses in the second sample, dry weight of grassy, broad leaved and total weeds at the first sample, dry weight of total weight of annual weeds at second and third samples, LAI for grassy and broad leaved weeds during the first sample and for LAI for total annuals in the third sample. This indicates that the effect of seeding rate on the previous characters was inconstant from season to another. However, this effect was constant for the rest measurements which showed a non significant response to seeding rate x season interaction.

4. Effects of weed control treatments:

The mean values of fresh and dry weights and leaf area index for grassy, broad leaved and total weeds at 60, 90 and 120 days from sowing in the combined analysis of the two seasons are presented in Table (4). The effects of weed control treatments were statistically significant on all measurements at the three sampling dates. Both chemical and mechanical methods resulted in minimizing values of weed characters under study.

Data given in Table (4) indicated considerable effects of weed control treatments on fresh and dry weight of grassy, broad leaved and total weeds. The effects of weed control treatments were significant during the three samples. The application of Arelon or hand weeding (twice) significantly reduced the fresh and dry weight of grassy, broad leaved and total weeds during the three stages of growth. The effectiveness of controlling all weeds fresh and dry weights was higher at early growth stage than at later. Arelon significantly exceeded hand weeding twice in reducing fresh and dry weights of weeds. These results showed the lower efficiency of hand weeding in controlling grassy weeds. Additionally, Arelon can reduce the coming flushes of weeds because its effect through the soil after application on weeds that will emerge as mentioned by Thomson ((1983). Moreover, Yadav *et al.*, (1995) indicated that pre-emergence spraying of isoproturon (Arelon 50%) effectively controlled small canary grass (*Phalaris minor*) and other 6 annual broad leaved weeds in wheat. Similar results were obtained by Zaher (1996). Under weedy check treatments, it could be detecTable that grassy, broad leaved and total weeds decreased at (90 and 120 DAS) compared to (60 DAS). This may be due to the mortality of individual weed plants resulting from the severe competition under weedy check plots. These

Table (4): Average values of some traits of grasses, broad leaf and total annual weeds as affected by some weed control treatments (Combined data of the seasons)

Sampling date	Treatments	Fresh weight g / m2			Dry weight g / m2			Leaf Area index		
		Grasses	Broad leaved	Total annual	Grasses	Broad leaved	Total annual	Grasses	Broad leaved	Total annual
60 DAS	Arelon	0.63 b	0.98 b	1.61 b	0.05 b	0.08 b	0.11 b	0.0010 b	0.0013 b	0.0023 b
	Hand weeding	0.98 b	0.35 b	1.30 b	0.08 b	0.02 b	0.10 b	0.0018 b	0.0008 b	0.0021 b
	Weedy check	36.17 a	57.10 a	93.27 a	4.00 a	2.98 a	6.98 a	0.0654 a	0.0724 a	0.1378 a
	F test (WCT.6*)	S	S	S	S	S	S	S	S	NS
90 DAS	Arelon	57.76 c	53.98 b	111.72 c	8.19 c	5.18 b	13.34 c	0.087 c	0.067 c	0.154 c
	Hand weeding	99.71 b	50.27 b	149.98 b	13.66 b	4.61 b	18.27 b	0.166 b	0.052 b	0.218 b
	Weedy check	928.78 a	733.40 a	1659.18 a	154.72 a	77.34 a	232.06 a	1.293 a	1.182 a	2.475 a
	F test (WCT.6*)	S	S	NS	S	S	S	S	S	S
120 DAS	Arelon	134.48 c	112.67 b	247.06 c	21.97 c	10.10 b	32.07 c	-	-	-
	Hand weeding	283.34 b	104.41 b	387.75 b	10.10 b	9.28 b	48.13 b	-	-	-
	Weedy check	1226.23 a	995.04 a	2221.27 a	32.07 c	48.13 b	314.07 a	-	-	-
	F test (WCT.6*)	S	S	NS	S	S	S			

WCT = Weed control treatment 6* = Seasons

S = Significant NS = Not significant

results are in agreement with those obtained by Varshney and Singh (1990), Balyan *et al.*, (1994) and Hooda and Agarwal (1995).

As the data in Table (4) revealed, leaf area index of grassy, broad leaved and total weeds were significantly affected by weed control treatments at 60 and 90 sampling dates in the combined analysis over two seasons. Arelon and hand weeding twice greatly decreased the LAI of grassy, broad leaved and total weeds during the first and second growth stages as compared to the weedy check plots. In the early stages, insignificant differences between the chemical and manual weed control in the reduction of the three measurements. However, at the second growth stage, Arelon treatment significantly exceeded hand weeding in depressing LAI of grassy, broad leaved and total weeds. The excellent efficacy of Arelon on LAI of weeds may be related to its highly exhausting effect on plant metabolism in weeds. Dhawan (1995) found that Hill activity levels in treated weeds (*Phalaris minor* and *Avena ludovicina* fell to zero over 7 days. Moreover, ion ifflux was increased in both weeds by isoproturon treatment.

Results in Table (4) indicate that interaction of weed control treatments and seasons had significant effects on all measurements under study, except fresh weight of total weeds in the second and third samples. This finding revealed that the effects of weed control treatments were not constant over seasons. This may be due to the inconstant distribution of weeds from season to another.

5. Effect of the interaction between wheat cultivars and seeding rates:

Data in Table (5) for combined analysis showed that the lowest value for all the studied measurements were obtained from 70 kg/fed. with Sakha trol However, the highest values were detected from 40 kg/fed. with Giza 163. The shown in Table (5) the interaction between wheat cultivars and seeding r significantly affected LAI of grassy, broad leaved and total annual weeds a fresh days after sowing. The highest seeding rate resulted in the least leaf area in s of values. This may be accompanied with the larger leaf area index, till number/m^2 and other measures, which enabled the crop competitiveness against s weeds.

In the respect of fresh weight of grassy weeds/m^2 at 120 days after sowing, Table (5) indicated that this measurement considerably declined by increasing seeding rates of wheat. This trend was obtained under the three tested cultivars. On the other hand, Sakha 8 cultivar caused the highest suppression in fresh weights of grassy weeds at 120 DAS compared to other two cultivars under all seeding rates. However, the lowest weight of grassy weeds was recorded by Sakha 8 cultivar sown by 70 Kg seeds/fed. These results may explain the higher crop competitive ability under dense sowing and more competitor cultivars. Concerning the cultivars x seeding rates x seasons' interaction, Table (5) shows that this interaction had significant effects on all presented measurements. This

Table (5): The average values of dry weight leaf area index and fresh weight (FWT) of weeds as affected by (wheat cultivars x seeding rates) interaction. (Combined data of 1994/95 and 1995/96 seasons).

Wheat cultivar	Sakha 8			Sakha 61			Giza 163			'F' test
Seeding rate (kg/fed.)	40	55	70	40	55	70	40	55	70	(CV. x SR.) x S*
60 days after sowing										
Dry weight of grassy weeds (g/ m^2	1.40 cd	0.90 f	0.62 g	1.86 b	1.34 c	1.06 f	2.43 a	1.55 c	1.28 c	S
Leaf area index of grassy weeds	0.023 d	0.013 f	0.009 g	0.033 b	0.023 d	0.014 f	0.041 a	0.028 c	0.020 e	S
Leaf area index of broad leaved weeds	0.019 e	0.013 fg	0.011 g	0.030 d	0.018 efg	0.015 efg	0.046 a	0.039 b	0.031 c	S
Leaf area index of total annuals	0.042 d	0.026 e	0.020 f	0.063 b	0.041 d	0.029 e	0.087 a	0.067 b	0.051 c	S
120 days after sowing										
FWT of grassy weeds (g)/m^2	545.79 c	456.75 d	171.69 e	686.58 b	538.88 c	443.46 d	775.67 a	673.00	550.29 c	S

CV = Cultivars SR = Seeding rate

S* = Seasons S = Significant difference NS = Not significant difference

means that the effect of cultivars x seeding rates interaction was not constant from season to another for thestraits.

6- Effect of the interaction between wheat cultivars and weed control treatments:

The cultivars and weed control treatments interaction over the two seasons had significant effects on fresh weight of weeds at the three samples (Table 6). The results indicated that under three cultivars used, both Arelon and hand weeding significantly reduced all studied measurements of weeds comparing to the untreated plots during all sampling dates.

Concerning weed fresh weights, it is clear that both Arelon 50% and hand weeding significantly reduced fresh weights of grassy, broad leaved and total weeds as compared to the unweeded check. The same trend was obtained under the three wheat cultivars (Sakha 8, Sakha 61 and Giza 163) during three sampling dates. On the other side, under the untreated plots, fresh weights of grassy, broad leaved and total weeds differed significantly among the three wheat cultivars. Sakha 8 with Aleron treatment obtained the lower values for fresh weight of grasses, in three sample stages, total fresh weight in two growth stages of wheat (90 and 120 DAS). On the other hand, Giza 163 with weedy check obtained the highest values. The superiority of Sakha 8 cultivar against fresh weight of weeds might be attributed to its higher ability in extracting water from soil due to its figure growth and larger LAI. The effect of interaction between cultivars, weed control treatments and season was not significant on fresh weight of broad leaved weeds in the first and second samples. This indicated that the effect of this interaction was constant on these measurements from season to another. However for the rest measurements, the effect of this interaction was significant revealing the inconstant effect from season to season.

Table (6) showed the average values of dry weight and LAI of grassy, broad leaved and total annual weeds as affected by the interaction between wheat cultivars and weed control treatments. The combined analysis showed that all measurements studied were significantly affected by weed control treatments under the three tested wheat cultivars. Arelon and hand weeding twice during three samples obtained the lowest values for all measurements.

Sakha 8, Sakha 61 and Giza 163, with both Arelon 50% and hand weeding twice greatly reduced dry weight of grassy, broad leaved and total weeds as compared to the untreated plots. The reduction in weed dry weights was significant during the three growth stages. On the other hand, under weedy check plots of the three tested cultivars, Sakha 8 considerably reduced dry weights of grassy, broad leaved and total weeds than both Giza 163 and Sakha 61.

Table (6):The average values of weeds as affected by interaction effect between (wheat cultivars and weed control. (Combined data of 1994/95 and 1995/96).

Wheat cultivar	Sakha 8			Sakha 61			Giza 163			F. test
Weed control treatment	Arelon	Weeding	Weedy Check	Arelon	weeding	Weedy check	Arelon	weeding	Weedy check	(CV. x WCT) x S*
60 days after sowing										
Fresh wt. of grasses (g)/m²	0.54 d	0.74 d	24.14 c	0.59 d	0.93 d	39.46 b	0.7 d	1.184 d	44.90 a	S
Fresh wt. of broadleaved (g)/m²	0.90 d	0.24 d	44.77 c	0.93 d	0.33 d	57.08 b	1.11 d	0.49 d	69.45	NS
Fresh wt. of total annuals (g/m²	1.44 d	0.98 d	68.91 c	1.52 d	1.26 d	96.54 b	1.87 d	1.67 d	114.35 a	S
Fresh wt. of grasses (g)/m²	0.05 d	0. 07 d	2.80 c	0.03 d	0.09 d	4.11 b	0.07 d	0.10 d	5.09 a	S
Dry wt. of grasses (g)/m²	0.05 d	0.01 d	2.13 c	0.05 d	0.01 d	3.15 b	0.06 d	0.03 d	3.67 a	S
Dry wt. of broad leaved (g)/m²	0.10 d	0.08 d	4.93 c	0.10 d	0.10 d	7.26 b	0.13 d	0.13 d	8.73 a	S
Dry wt. of total annuals (g)/m²	0.001 d	0.001 d	0.042 c	0.001 d	0.002 d	0.068 b	0.001 d	0.002 d	0.086 a	S
Leaf area index of grasses	0.001 d	0.0002 d	0.42 c	0.0014 d	0.0005 d	0.062 b	0.0019 d	0.0009 d	0.114 a	S
Leaf area index of broad leaved	0.001 d	0.0002 d	0.42 c	0.0024 d	0.0025 d	0.130 b	0.0039 d	0.0029 d	0.200 a	S
Leaf area index of total annuals	0.002 d	0.0012 d	0.084 c							
90 days after sowing										
Fresh wt. of grasses (g)/m²	44.59 f	74.52 e	679.13 c	57.72 ef	100.59 d	922.42 b	70.97 e	124.03 d	1175.79 a	S
Fresh wt. of broad leaved (g)/m²	40.93 g	43.47 d	528.54 c	58.48 d	51.40 d	734.00 b	62.46 d	53.93 d	937.67 a	NS
Fresh wt. of total annuals (g)/m²	85.52 f	119.99 ef	1207.67 c	116.20 ef	151.95 de	1656.42 b	133.43 e	177.99 d	2113.46 a	S
Dry wt. of grasses (g)/m²	6.53 g	11.23 ef	111.08 c	8.46 g	13.13 de	152.53 b	9.58 fg	16.59 d	200.54 a	S
Dry wt. of broad leaved (g)/m²	3.97 d	4.21 d	58.17 c	5.65 d	4.63 d	77.94 b	5.83 d	4.99 d	95.91 a	S
Dry wt. of total annuals (g)/m²	10.50 f	15.46 ef	169.23 c	14.11 ef	17.76 de	230.47 b	15.41 ef	21.58 d	296.45 a	S
Leaf area index Of grasses	0.073 f	0.134 e	0.937 c	0.086 f	0.150 de	1.116 b	0.101 ef	0.183 d	1.625 a	S
Leaf area index of broad leaved	0.058 d	0.065 d	0.862 c	0.072 d	0.062 d	1.238 b	0.070 d	0.060 d	1.447 a	S
Leaf area index of total annuals	0.131 h	0.199 ef	1.799 c	0.158 gh	0.212 de	2.554 b	0.171 fg	0.243 d	3.072 a	
120 days after sowing										
Fresh wt. of grasses (g)/m²	119.96 f	215.13 e	839.15 c	134.00 ef	258.23 de	1276.67 b	149.42 f	286.67 d	1562.88 a	S
Fresh wt. of broad leaved (g)/m²	85.05 e	92.97 de	764.13 c	111.73 de	110.66 de	1054.83 b	140.95 d	109.61 de	1166.17 a	S
Fresh wt. of total annuals (g)/m2	205.01 f	308.10 e	1603.28 c	245.73 e	368.91 d	2331.50 b	290.37 e	396.28 d	2729.05 a	S
Dry wt. of grasses (g)/m²	19.98 f	33.60 e	169.55 c	22.25 f	39.37 de	223.70 b	23.68 f	43.59 d	281.81 a	NS
Dry wt. of broad leaved (g)/m²	7.42 e	8.38 de	69.55 c	9.88 de	9.68 de	93.72 b	13.03 d	9.78 de	103.87 a	S
Dry wt. of total annuals (g)/m²	27.40 f	41.98 de	239.10 c	32.13 ef	49.05 d	317.42 b	36.70 e	53.37 d	385.68 a	NS

CV = Cultivars WCT = Weed control treatment *S = Seasons S = Significant difference NS = Not significant difference

The high potential of Sakha 8 variety in weed dry weight suppression may be refereed to it high competitiveness for soil nutrients which might reduce dry weight accumulation by weeds as reported by Satorre and Snaydon (1992).

Both Arelon and hand weeding twice significantly decreased LAI at 60 and 90 days from sowing in comparison of weedy check plots. The higher efficiency of both chemical and manual weed control in leaf area index of grassy, broad leaved and total annual weeds was significant under the three cultivars. On the other hand, with the untreated check plots. Sakha 8 cultivar greatly reduced leaf area index of grassy, broad leaved and total weeds during the two samples (60 and 90 DAS) as compared to Sakha 61 and Giza 163 cultivars. These findings are confirmed by those mentioned by Dunan and Zimdahl (1991).

The interaction between wheat cultivars, weed control treatments and seasons was insignificant for dry weights of grassy and total annual weeds at 120 days of sowing. However, the effects of this interaction on other rest measurements were significant. This finding means that effect was unconstant over seasons for most of these measurements.

7. Effect of the interaction between wheat seeding rates and weed control treatments:

Data in Table (7) showed that wheat seeding rates and weed control interaction had significant effects on fresh weight of grassy, broad leaved and total weeds at the three growth stages. The lowest values for fresh weight of grassy and total annual weeds were detected from 70 kg seeds/fed. with Arelon treatment. Also, the lowest values for other measurements were obtained by 70 kg seeds/fed. and hand weeding. On the other hand, the highest values were showed from 40 kg/fed. (lowest seeding rate) with weedy check. The declined weed fresh weights under the dense seeding rate of the untreated plots may reflect the higher competitiveness ability of wheat seeded at higher densities. This is similar to the results of Harrison and Beuerlein (1989). The interaction between seeding rates, weed control treatments and seasons insignificantly affected fresh weight of total annuals at 60 days after sowing, fresh weight of broad leaved weeds at 90 days after sowing, in addition to fresh weight of broad leaved weeds at 120 days after sowing. On the other hand, with the excluding of the above-mentioned measurements, the rest characters were significantly affected by this interaction. The effect of interaction between seeding rate and weed control treatments was significant on dry weight and LAI of grassy and, broad leaved and total annual weeds at the three samples stages (Table 7). The lowest values for previous characters were detected from applied 70 kg/fed. with Arelon at the three sampling stages. On the other hand, the highest values for all measurements were obtained from 40 kg/fed. and weedy check.

Leaf area index of weeds at 60 and 90 DAS was significantly influenced by seeding rates x weed control treatments interaction. Under 40, 55 and 70 kg/fed. as seeding rates, Arelon 50% and hand weeding caused remarkable

Table (7) The average values of weeds as affected by (wheat seeding rate x weed control treatments) (Combined data of 1994/95 and 1995/96).

Seeding rate	40 kg/fed.			55 kg/fed.			70 kg/fed.			F test
Weed control treatment	Arelon	Hand weeding	Weedy check	Arelon	Hand weeding	Weedy Check	Arelon	Hand weeding	Weedy check	SR x WCT x S*
60 days after sowing										
Fresh wt. of grasses (g)/m²	0.75 d	1.17 d	50.08 a	0.78 d	0.96 d	32.37 b	0.36 d	0.82 d	26.05 c	S
Fresh wt. of broadleaved (g)/m²	1.27 d	0.45 d	67.51 a	1.13 d	0.49 d	51.99 b	0.06 d	0.13 d	42.78 c	S
Fresh wt. of total annuals (g)/m²	2.02 d	1.62 d	126.59 a	1.91 d	1.35 d	84.36 b	0.40 d	0.95 d	68.83 c	NS
Fresh wt. of total annuals (g)/m²	0.06 d	0.11 d	5.52 a	0.08 d	0.07 d	3.63 b	0.03 d	0.07 d	2.66 c	S
Dry wt. Of grasses (g)/m²	0.07 d	0.02 d	3.70 a	0.07 d	0.03 d	2.87 b	0.03 d	0.01 d	2.37 c	NS
Dry wt. Of broad leaved (g)/m²	0.13 d	0.13 d	9.22 a	0.15 d	0.10 d	6.50 b	0.06 d	0.08 d	5.23 c	NS
Dry wt. Of total annuals (g)/m²	0.0014 d	0.0020 d	0.091 a	0.0010 d	0.001 d	0.063 b	0.0005 b	0.0014 d	0.041 c	S
Leaf area index of grasses	0.0019 d	0.0008 d	0.093 a	0.0015 d	0.0007 d	0.069 b	0.0008 d	0.0003 d	0.056 c	S
Leaf area index of broad leaved	0.0033 d	0.0028 d	0.186 a	0.0025 d	0.0018 d	0.132 b	0.0013 d	0.0016 d	0.097 c	NS
Leaf area index of total annuals										
90 days after sowing										
Fresh wt. of grasses (g)/m²	77.78 e	127.52 d	1120.50 a	53.07 ef	102.23 d	898.63 b	42.42 f	69.40 e	758.21 c	S
Fresh wt. of broad leaved (g)/m²	65.18 d	38.62 d	891.25 a	50.85 d	50.55 d	746.08 b	43.84 d	41.65 d	562.88 c	NS
Fresh wt. of total annuals (g)/m²	142.96 ef	166.14 d	2011.75 a	103.92 g	152.78 de	1644.71 b	88.17 g	111.03 fg	1321.09 c	S
Dry wt. Of grasses (g)/m²	10.89 ef	16.87 d	188.49 a	7.48 f	13.83 de	131.73 b	6.19 f	10.28 ef	99.50 c	S
Dry wt. Of broad leaved (g)/m²	6.23 d	5.41 d	93.46 a	4.98 d	4.61 d	78.05 b	4.24 d	3.81 d	184.43 c	S
Dry wt. Of total annuals (g)/m²	17.12 ef	22.28 d	281.95 a	12.46 fg	18.44 de	229.78 b	10.43 g	14.09 efg	1046 c	S
Leaf area index. Of grasses	0.114 ef	0.210 d	1.560 a	0.083 f	0.150 e	1.272 b	0.063 f	0.103 f	0.945 c	NS
Leaf area index of broad leaved	0.080 d	0.069 d	1.494 a	0.064 d	0.065 d	1.198 b	0.056 d	0.053 d	0.945 c	S
Leaf area index of total annuals	0.194 e	0.283 d	2.964 a	0.147 fg	0.215 e	2.470 b	0.119 g	0.156 f	1.991 c	
120 days after sowing										
Fresh wt. of grasses (g)/m²	167.83 fg	325.67 d	1514.54 a	140.50 fg	247.67 e	1280.46 b	95.04 g	186.71 ef	883.69 c	S
Fresh wt. of broad leaved (g)/m²	133.30 d	119.08 d	1168.38 a	108.12 d	102.80 d	1030.88 b	96.30 d	91.33 d	785.88 c	NS
Fresh wt. of total annuals (g)/m2	301.13 ef	444.75 d	2682.92 a	248.62 f	350.50 de	2311.34 b	191.34 g	278.03 f	1669.57 c	S
Dry wt. Of grasses (g)/m²	26.94 f	49.10 d	273.38 a	22.96 fg	37.29 e	221.93 b	16.01 g	30.17 ef	179.56 c	S
Dry wt. Of broad leaved (g)/m²	11.71d	10.56 d	103.50 a	9.63 d	8.82 d	91.74 b	8.98 d	8.46 d	71.89 c	NS
Dry wt. Of total annuals (g)/m²	38.65 ef	59.66 d	377.08 a	32.59 f	46.11 e	313.66 b	24.99	38.63 ef	251.45 c	S

SR = Seeding rate WCT = Weed control treatment *S = Seasons S = Significant difference NS = Not significant difference

reductions in leaf area index of grassy, broad leaved and total annuals as compared with the unweeded plots. Whereas, under the weedy check plots, the lowest LAI accompanied the highest seeding rate while the lowest seeding rate gave the greatest LAI for grassy, broad leaved and total annuals. The same trend was recorded at 60 and 90 days after sowing. In general, the depressions in dry weight and LAI of weeds under the higher seeding rate of wheat may be due to maximizing of crop competition and minimizing the weed competition at the same time as mentioned by Harrison and Beuerlein (1989) and Tanji *et al.*, (1997).

The interaction of seeding rates, weed control treatments and seasons had no significant effects on dry weight of broad leaved weeds at 60 and 120 days after sowing, dry weight of total annuals at 60 days after sowing, leaf area index of total annuals at 60 days after sowing and leaf area index of broad leaved weeds at 90 days after sowing. On the other hand, the effects of the previous interaction were significant for the other measurements, revealing the inconstant effect of this interaction on these traits from season to another. The Effects of the interaction between wheat cultivars, seeding rates and weed control on all measurements were not significant and consequently the data were excluded.

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تاثير أصناف القمح ومعدلات التقاوى وبعض معاملات مكافحة الحشائش على الحشائش المصاحبة

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أجريت تجربتان حقليتان فى محطة البحوث الزراعية بسخا خلال موسمى ١٩٩٥/٩٤ ، ١٩٩٦/٩٥ بهدف دراسة فاعلية بعض طرق مكافحة الحشائش تحت ظروف الزراعة بمعدلات تقاوى مختلفة لثلاثة أصناف من القمح المنزرعة فى جمهورية مصر العربية على الحشائش المصاحبة. صممت التجربة فى قطع منشقة مرة واحدة عاملية فى أربعة مكررات حيث وزعت الأصناف (سخا ٨ ، سخا ٦١ ، جيزة ١٦٣) فى القطع الرئيسية ووزعت الكثافات (٤٠ ، ٥٥ ، ٧٠كجم/ف) × معاملات مقاومة الحشائش (أريلون ١,٢٥ لتر/ف ، نقاوة يدوية مرتين والغير معامل للمقارنة) وزعت عشوائيا فى القطع الشقية وفيما يلى أهم النتائج :-

- كان تأثير المواسم معنويا على كل الصفات المدروسة للحشائش خلال الثلاث مواعيد لأخذ العينات. سجل الموسم الثانى للدراسة قيم أعلى من الوزن الخضرى للحشائش النجيلية والوزن الجاف والمساحة الورقية وذلك خلال كل مواعيد أخذ العينات.
- سجل الصنف سخا ٨ انخفاضا معنويا فى الأوزان الخضرية والجافة وكذلك المساحة الورقية للحشائش النجيلية والعريضة والحشائش الحولية الكلية خلال ٦٠ ، ٩٠ ، ١٢٠ يوم من الزراعة.
- أدت زيادة معدل التقاوى إلى انخفاض معنوى فى الأوزان الطازجه للحشائش النجيلية والعريضة والكلية فى المتر المربع وذلك خلال ٦٠ ، ٩٠ ، ١٢٠ يوم من الزراعة.
- أدى استخدام مبيد الأريلون وكذلك النقاوة اليدوية للحشائش إلى تقليل الأوزان الطازجة للحشائش النجيلية والعريضة والكلية معنويا فى القطع المعاملة عنها فى المقارنة وذلك خلال جميع العينات المأخوذة.