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WEEDS GROWN IN THE SUNFLOWER FIELDS (*HELIANTHUS ANNUUS* L.) AS INFLUENCED BY NO TILLAGE AND PHOSPHORUS FERTILIZATION

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Abstract

In order to investigate the effect of no tillage compared with the conventional cultivation (pre - sowing ploughing) and Phosphorus Fertilization (100,200 and 300 kg ha^{-1}) P_2O_5 on the weeds grown in the sunflower field variety Aqmar, a field trial was conducted at the experimental farm (alternative site of college of agriculture- university of Baghdad) Abu- Ghraib during the spring and fall seasons of 2015 the experiment was carried –out by using Randomized Complete Block Design (R.C.B.D) with split-split arrangement with weeds density, their dry weight and seed yield and its components. Results of statistical analysis indicated that unploughed and un weedy treatments gave the lowest averages of these characters. Results, also revealed a significant increase in the weed density, weed dry weight, seed yield and its components with the increase of phosphorus fertilizer from 100 to 300 kg ha^{-1} in both seasons. It can be concluded, that growing sunflower with out ploughing (no-tillage) drastically reduced the weed density and its distribution in the field which reduced the weed competition to the crop and consequently increased the seed yield and its components. However, increased phosphor fertilizer levels raised weeds density, their dry weight and seed yield of sunflower. This indicates that weeds deplete part of phosphorus fertilizer given to the main crop.

Key words : conservation agriculture, Weeds, oil crop, fertilizer.

Introduction

Sun flower is considered one of the main crop in the Iraq due to its different uses among them oil for the oily varieties as well as feed for animals (Cheyed, 2014) it is the fourth best oily crop in the world (Nisar *et al.,* 2011). Oil and protein percentages in seed are estimated to be 40-50%, and 23% respectively (Khan, 2012). Sunflower crop is characterized by its high adaptability within wide range of environmental conditions, therefore, it was grown widely around the world (Agele *et al.,* 2007). Iraqi environment is considered as suitable to produce sunflower, but its productivity still low. This was due to the bad application of the husbandry practices and non-using of modern systems of cultivation which assure soil conservation and increase seed yield per unit area. Among these methods zero-tillage which improved the chemicals, physical, biological characteristics of soil, more stability of productivity, an economic method to reduce production costs via lessening energy waste and saving manpower as well as saving time required for soil preparation (Singh *et al.,* 2005, Whish and Bell, 2008 and Cheyed *et al.,* 2014). Also, it increases water harvesting, organic matter and protection soil from rain and wind erosions (Lipiec *et al.,* 2006 and Lopez *et al.,* 2003). This method, also prevent the germination of weeds seeds present in the soil during the critical period of crop, hence, weeds density and number will be decreased in the field, while using conventional ploughing of soil will break the seeds dormancy which encourages their germination which might affect the crop growth and yield negatively (AL-Bely and Saody, 2011 and Hammood, 2018), especially in the first stages of crop growth due to the vigorous of weeds higher than the crop growth.

Also, nutritional element of soil determines the agricultural production Iraqi soils is characterized by its high content of calcium carbonate which make soil (PH) near the alkalinity, therefore, soil is becoming poor due to the unavailability of essential nutritional elements among them phosphor (Lipiec *et al.,* 2006). Phosphor is the second essential element next to the nitrogen which effect all growth stages of crop in terms of yield and quality (Salih, 2013). The availability of phosphor in soil improves the root system of plant, and hence increase the efficiency of absorption, transportation of nutrient and water which improve the growth characters and hence makes plants more competitive to the weeds. Many studies referred that sunflower crop responds to the increased level of P_2O_2 applied to the soil and improves crop growth and yield (Abbadi and Gerendas, 2011 and Sadozai *et al.,* 2013). The density and kind of weeds differentes the influence of applied fertilizers among them phosphors (Freymani *et al.,* 1989). In the light of above, this study was performed to investigate the response of sunflower (Aqmar oily variety) to the non or zero–tillage and phosphorous fertilizer levels and their effects on accompanied weeds and seeds yield of sunflower.

Material and Methods

A field trail was carried out at the experimental farm (alternative site of College of Agriculture–University of Baghdad) Abu-Ghraib /Iraq during the spring and fall seasons of 2015 to investigate the effect of cultivation method without ploughing (zero-tillage) compared with the conventional ploughing (pre-sowing) and phosphorus fertilization (100, 200 and 300 kg ha^{-1}) P_2O_5 on the weeds grown in the sunflower field (Aqmar oily variety). The design was Randomized Complete Block Design (R.C.B.D) with split-split arrangement with three replicates. Cultivation method occupied the main-plots and weed control treatments were in the sub-plots while phosphorus fertilizer levels were in the sub-sub plots.

A piece of land previously grown with sunflower in the spring season prepared to be used in the fall season. This land was divided in to six stripes, three of them was ploughed three time after removal of the residual plants randomly and the other stripes left without ploughing with retaining all plants residual. Each stripe was divided into experiential units with 3×4 m dimensions *i.e.* $12m^2$ in area with the same dimensions of the plots left unploughed to ensure the homogeneity of the area of experiential units. Cultivation was done by using rows 75 cm apart and 25 cm between plants. A distance of 75cm was left between the experimental units. Three to four seeds was sown in each hill, and thinning was performed once after the full emergence of seedling and formation of the first true leaves. This trial was conduced by using Strip –Block Design with two factors. The main factor was cultivation without ploughing (zero-tillage) compared with conventional ploughing and the second factor was phosphorous fertilization levels were applied once along the cultivation rows, while nitrogen fertilizer as urea (46% N) at 280 kg ha^{-1} splitted twice, the first at post field emergence after two weeks and the second application at the beginning of floral buds formation.

Studied characters

Weeds kind: weed kind were designated, classified according to their families, life cycle, leaf kind and numbers of weeds were counted.

Weed density (plant m^2): Weeds kind and counting their density were performed at 20 and 40 days from sowing in an area of $1m^2$.

Weed dry weight (gm^2): Weeds were cut randomly at the soil surface level from squared meter area ($1m^2$); Packed in bags with openings for ventilation and the placed in the oven at 7^0c until the stability of weight (Al-Chalabi, 1988).

100-seed weight (gm): One hundred seed were counted from each experimental unit in the middle rows and weight.

No. of seed per head: were counted as an average of five plants taken randomly from the middle rows, and the estimated depending upon the 500 seeds head was calculated.

Seed yield (tone ha^1): it was estimated from the harvesting of five plants by multiple the averages of plant seed with the plant density.

Statistical analysis

ANOVA analysis was performed according to the analysis of variance (ANOVA) and comparing between the averages according to the least significant differences (L.S.D) at the probability level (0.05%) (Stell and Torrie, 1980).

Results and Discussion

Effect of different treatments on accompanied weeds to the sunflower crop:

Weeds Type

It is clear from the data in Tables 1 and 2 that the weedy treatments were full of wild sunflower (*Carthanus oxacanthus* L.), Wild beet (*Beta vulgaris* L.), Mallow (*Malva* rotundifolial L.) and as (annual weeds) and nut grass (*Cyperus rotundus* L.). gohnson grass (*Sorghum halepense* L.), field bind weed (*Convolvulus arvensis* L.), as (Perennial weeds). The percentage of broadleaved and narrow-leaved weeds were 64.33 and 35.66%, respectively. The percentages of annul weeds and perennial weeds were 55.25 and 44.75% in the first season, respectively. In the second season the percentages were almost similar to the percentages in the first season *i.e.* 67.75 and 32.25%, for broad and narrow leaves weed, respectively. The perennial weeds gave slight increase when compared with the first season by 48.50%, while annual weeds gave 51.50%.

Table 1: Weeds kind present at experiment site, their English, Scientific names, families and life cycle.

Scientific names	Families	English names	No.
Carthamus oxyacanthus L.	Compositae	Wild safflower	1
Lactuca scariola L.	Compositae	Prickly lettuce	2
Beta vulgaris L.	Chenopodiacea	Wild beets	3
Malva rotundifolia L.	Malvaceae	Button weed	4
Portulaca oleracea L.	Portulacea	Purslane	5
Convolvulus arvensis L.	Convolvulacea	Smeller Bind Weed	6
Convolvulus scammonia L.	Convolvulacea	Syrian Bind Weed	7
Cyperus rotundus L.	Cyperaceae	Nutgrass	8
Sorghum halepense L.	Poaceae	Johnson grass	9
Dichanthium annulatum L.	Poaceae	Hairy - node bear grass	10

Weeds Density (plant m^2)

Results in table 3 referred to the significant differences between different treatment as influenced by cultivation system (ploughed and zero-tillage). Treatment of zero-tillage gave the minimum number of weeds in m^2 (16.39 and 14.88 plant m^2) in both season, respectively compared with 61.61 and 82.98 plant m^2 for both season, respectively. This may be attributed that ploughed treatment encouraged weeds seeds to germinate and grow good seed bed for germination of weed seed (AL-Bely and Sadoy, 2011). Also the less amount of weeds in the ploughed treatment, may be due to the allellopathic effect of plants residual of sunflower where this crop is considered with high content of allellopathic compounds compared with other crops (Macias *et al.,* 1999). It is clear from table 3 that phosphorous fertilizer treatment significantly in creased of weed density in the sunflower field in both seasons where density increased from 35.42 and 47.56 plant m^{-2} at the l00kg ha^{-1} $p_2 0_5$ to reach the highest average (42.50) and (51.35) plant m^{-2} at the 300 kg ha^{-1}. This may be due that phosphor among the essential elements after nitrogen and its presence in suitable quantities reduce the competition between plants on nutrients, and hence the density of plants increase in the unit area. This result in agreement with the findings of (Freymani *et al.,* 1989), in their experiment about the effect of N.P.K on weeds biology where phosphors increased the weeds density especially broad-leaves weeds compared with no application of N.P.K. It was clear from table 3 that weed density reached 78.00 and 97.86 plant m^{-2} in the weedy treatment with significant difference of un-weedy treatment where no weed plants present in both seasons. The interaction between cultivation system and phosphors fertilization was significant in only spring season with no significant interaction in fall season (Table 3). Zero-tillage treatments recorded the lowest weed density (12.33 plant m^{-2}) at the lowest level (100 kg ha^{-1}) of phosphors while the ploughed treatment at (200 and 300 kg ha^{-1}) gave the highest average of weed density (64.00 and 62.33 plant ha^{1}), respectively with no significant difference in the spring season (Table 3).

The reason of increased weeds density in the ploughed treatment at higher phosphorus level may be due to

Table 2: Weeds life cycle of grown weeds and their classification based on leaf-shape and their present percentages in both season of 2015.

Percentages of weeds fall	Percentages of weeds spring	leaf-shape class	Percentages of weeds fall	Percentages of weeds spring	Life cycle class	English names	No.
%67.75	%64.33	Broad leaves	%51.50	%55.25	Annual weeds	Wild safflower	1
						Prickly lettuce	2
						Wild beets	3
						Button weed	4
						Purslane	5
%32.25	%35.66	Narrow leaves	%48.50	%44.75	Perennial weeds	Smeller Bind Weed	6
						Syrian Bind Weed	7
						Nutgrass	8
						Johnson grass	9
						Hairy-node bear grass	10

suitable conditions for weed seed germination and growth with the absence or reduced plant residual of sunflower (allylopathy) in the ploughed treatment with the high utilization of fertilizer due to soil excitation and spread of fertilizer between cultivation rows. Results table 3 also referred to significant interaction between cultivation system and weed treatment in both seasons, non-weedy treatments of ploughed and up on ploughed.

Treatments showed full absence of weeds (0.00 plant ha^{-1}) in both seasons. However, weedy and ploughed treatments gave the highest average of plant density 123.22 and 165.97 plant ha^{-1} in both seasons, respectively. For interaction between weedy treatment and phosphorus fertilizer, there was significant effect, only in fall season.

All phosphorus fertilizer levels showed full absence of weeds plants (0.00 plant m^{-2}) without significant difference between them, while weedy treatment at 300kg ha^{-1} P_2O_5 gave the highest weed density 102.70 plant m^{-2} in the fall season (Table 4). The absence of weeds in the non – weedy treatments was an expected result due to the hand –weeding and sunflower plant has large vegetative system and broad leaves which enable the plant to strongly compete with weeds especially ate the late stages of plant growth. For triple interaction, there was no significant effect in both season (Table 3).

Weed Dry Weight (gm^{-2})

Results showed significant effect of all factors and their interaction in both season for this character except the interaction between cultivation system and phosphorus fertilizer and triple interaction only in spring season where no significant effect present (Table 4).

Zero-tillage treatment recorded the lowest weed dry weight (13.5 and 13.40 gm^{-2}) in both seasons, respectively, compared with the highest average (47.25 and 64.00 gm^{-2}.) In both season for the ploughed treatments. This may be due to the fact that ploughing practice encouraged weeds seeds germination and growth vigorously compared with the zero-tillage treatments where it lacks the good seed bed for weed seeds germination (AL-Bely and Saody, 2011). The reason of declining weeds weight in the Zero-tillage practice was due to the declined number of weed in this treatment (Table 3). It is clear from table 4 that the phosphors fertilization treatment significantly increased the dry weight of accompanied weeds to the sunflower crop in both seasons where the dry weight increased from 26.13 to 35.49 gm^{-2} at 100 kg ha^{-1} P_2O_5 to reach the highest weight 34.50 and 44.08 gm^{-2} at 300 kg ha^{-1}. This may be due that phosphor is one of the essential elements and it availability reduces the competition between plants. Hence, plants growth and their weights will be increased. This result was in agreement with the weeds density which was reflected in the dry weight of weeds as illustrated in Table 3. It is, also clear from Table 4. Zero –tillage treatments at 100 kg h^{-1} of P_2O_3 showed the lowest average of weeds dry weight 10.59 plant m^3 compared with 72.19 plant m^2 at 300 $kgha^{-1}$ of P_2O_5 Table 4. The increase of weed dry weight in the ploughed treatments at higher level of phosphorous fertilizer may be due to the suitable conditions for weed germination and weeds growth with the absence of reduction of the residual effect of sunflower (allylopathy) in the ploughed treatment which increased the benefit of fertilizer between rows which, in turn, increased weed density Table 4 and increased their dry weight.

For the interaction, it was observed from table 4 that the interaction between both cultivation systems for ploughed and non-ploughed treatments in the abscence of weds, there was no weight of weeds. This was expected as these treatment were free of weeds due to the hand weeding compared with weedy and ploughed treatments which gave the highest average of weeds dry weight 94.51 and 129.81 gm^{-2} in both seasons. The interaction between all levels of phosphorous fertilizers and non-weedy treatments gave the lowest weed dry weight (0.00 gm m^{-2}) while the weed treatment at the highest level of p_20_5 gave the highest average 69.01 and 88.16 gm^{-2} in both seasons, respectively. The triple interaction between all phosphorous levels of ploughed and unploughed in the absence of weed gave the lowest dry weight of weeds (0.00 gm^{-2}) in the fall season only. However, this interaction of ploughed treatment at the highest level of phosphorous fertilizer (300 kg ha^{-1}) gave the highest average of weed weight (144.39 gm^{-2}) of weed treatments in the fall season (Table 4).

Number of seeds per head

Results of table 5 showed significant effect of cultivation systems in the fall seasons and phosphorous fertilizer levels and weeds treatment in both seasons. interaction between cultivation systems and fertilizer levels was significant in the fall season while for other interactions there was no significant effect on this character. It is clear from these results that zero- tillage treatment gave the highest average of seed head (755.8 seed) only in the fall season compared with the lowest average 665.6 seed $head^{-1}$ for the ploughed treatment increased this character in both seasons to 707.2 and 685.5 seed head, respectively at l00 kg with no significant differences at 200 kgh^{-1} in the fall season to increase again gradually to reach the peak (760.0 and 732. 9 seed) at 300kg h^{-1}. This may be due to the role of phosphor in

Table 3: Effect of different treatments on weeds density (plant m^{-2}) in spring and full season.

Cultivation system(C)	Weeds treatments (W)	Spring season phosphorous fertilizer (kg h^{-1}) (P)			C × W	Spring season phosphorous fertilizer (kg h^{-1}) (P)			C × W
		100	200	300		100	200	300	
Ploughed	weedy	117.00	124.67	128.0	123.22	164.67	163.37	169.87	165.97
	non-weedy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zero- tillage	weedy	24.67	31.67	42.00	32.78	25.57	28.17	35.53	29.76
	non-weedy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LSD 0.05		N.S*			2.82	N.S			1.92
Mean (p)		35.42	39.08	42.50		47.56	47.88	51.35	
LSD 0.05		2.11				2.93			
C		C × P			Mean (C)	C × P			Mean (C)
ploughed		58.50	62.33	64.00	61.61	82.33	81.68	84.93	82.98
Zero- tillage		12.33	15.83	21.00	16.39	12.78	14.08	17.77	14.88
LSD 0.05		2.93			3.14	N.S			2.43
W		W × P			Mean (W)	W × P			Mean (W)
weedy		70.83	78.17	85.00	78.00	95.12	95.77	102.70	97.86
non-weedy		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LSD 0.05		N.S			2.46	3.47			1.17

N.S: Nan Significant.

Table 4: Effect of different treatments on weed dry weight (gm^{-2}) in spring and full season.

Cultivation system(C)	Weeds treatments (W)	Spring season phosphorous fertilizer (kg h^{-1}) (P)			C × W	Spring season phosphorous fertilizer (kg h^{-1}) (P)			C × W
		100	200	300		100	200	300	
Ploughed	weedy	84.93	95.45	103.14	94.51	120.78	124.25	144.39	129.81
	non-weedy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zero- tillage	weedy	19.58	24.45	34.87	26.30	21.17	27.28	31.93	26.79
	non-weedy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LSD 0.05		N.S*			3.90	3.75			1.59
Mean (p)		26.13	29.98	34.50		35.49	37.88	44.08	
LSD 0.05		1.95				2.20			
C		C × P			Mean (C)	C × P			Mean (C)
Ploughed		42.46	47.72	51.57	47.25	60.39	62.13	72.19	64.90
Zero- tillage		9.79	12.23	17.44	13.15	10.59	13.64	15.97	13.40
LSD 0.05		N.S			4.74	2.70			2.01
W		W × P			Mean (w)	W × P			Mean (w)
weedy		52.26	59.95	69.01	60.40	70.98	75.77	88.16	78.30
non-weedy		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LSD 0.05		3.27			2.99	3.62			1.01

improving crop growth which consequently increased yield components and seed yield among these components number of seed $head^{-1}$.

This results were in agreement with the findings of (Amanullah and Khan, 2010 and Sadozai *et al.,* 2013), who found that increased level of phosphorus fertilizers increased number of seed $head^{-1}$. It is also clear from table 5 that the absence of weeds treatments in both season was significantly superior which gave the highest average of seed head 717. and 699.5 in both seasons, respectively. This result was due to the absence of weeds competition with the main crop on water, space and nutrients which allow the crop to grow naturally and giving highest number of seeds as more nutrient were available.

Table 5: Effect of different treatments on Number of seeds per head in spring and full season.

Cultivation system(C)	Weeds treatments (W)	Spring season phosphorous fertilizer (kg h^{-1}) (P)			C × W	Spring season phosphorous fertilizer (kg h^{-1}) (P)			C × W
		100	200	300		100	200	300	
Ploughed	weedy	698.0	731.3	741.5	723.6	639.8	650.3	676.1	655.4
	non-weedy	711.2	753.2	779.8	748.1	677.4	659.4	690.3	675.7
Zero- tillage	weedy	686.1	712.4	733.1	710.5	711.2	741.5	779.8	744.2
	non-weedy	713.5	748.0	785.5	749.0	725.7	771.5	804.9	767.4
LSD 0.05		N.S			N.S	N.S			N.S
Mean (p)		702.2	736.2	760.0		685.5	702.7	732.9	
LSD 0.05		19.40				17.87			
C		C × P			Mean (C)	C × P			Mean (C)
Ploughed		704.6	742.2	760.6	735.8	658.6	654.9	683.2	665.6
Zero- tillage		699.8	730.2	759.3	729.8	718.5	756.5	792.3	755.8
LSD 0.05		N.S			N.S	27.1			32.1
W		W × P			Mean (w)	W × P			Mean (w)
weedy		692.0	721.9	737.3	717.1	675.5	695.9	727.9	699.8
non-weedy		712.4	750.6	782.6	748.5	701.5	715.5	747.6	721.5
LSD 0.05		N.S			10.60	N.S			4.9

Table 6: Effect of different treatments on 100-seeds weight (gm^2) in spring and full season.

Weeds system(C)	Spring season treatments (W)	Spring season phosphorous fertilizer (kg h^{-1}) (P)			C × W	phosphorous fertilizer (kg h^{-1}) (P)			C × W
		100	200	300		100	200	300	
Ploughed	weedy	7.35	7.41	7.48	7.42	7.65	6.98	7.15	7.26
	non-weedy	7.45	7.48	7.62	7.51	7.19	7.65	7.53	7.46
Zero- tillage	weedy	7.31	7.41	7.50	7.41	7.45	7.48	7.62	7.51
	non-weedy	7.46	7.58	7.66	7.57	7.46	7.59	7.99	7.68
LSD 0.05		N.S			N.S	0.22			N.S
Mean (p)		7.39	7.47	7.56		7.44	7.42	7.57	
LSD 0.05		0.05				0.12			
C		C × P			Mean (C)	C × P			Mean (C)
Ploughed		7.40	7.45	7.55	7.46	7.42	7.32	7.34	7.36
Zero- tillage		7.39	7.50	7.58	7.49	7.45	7.53	7.80	7.60
LSD 0.05		N.S			N.S	0.14			0.07
W		W × P			Mean (w)	W × P			Mean (w)
weedy		7.33	7.41	7.49	7.41	7.55	7.23	7.38	7.39
non-weedy		7.46	7.53	7.34	7.54	7.33	7.62	7.76	7.57
LSD 0.05		N.S			0.04	0.17			0.12

100-seeds weight (gm^2)

It appears from table 6 that zero-tillage treatments were significantly superior in the fall season by giving the highest average of 100 seeds weight 7.75 gm. It was clear for these tables that the highest level of fertilizer 300 kg ha^{-1} was significantly superior in both seasons and gave the highest value 7.56 and 7.57 gm. The lowest level of phosphorus fertilizer 100 kg ha 1 gave the lowest average (7.39 gm) in the spring season. However, the level of 200 kg ha^{-1} gave 7.44gm in the fall season with no significant differences between 100 and 200 kg ha^{-1}. The reason of increased 100 seed weight was due to the availability of enough nutrients of phosphor during the plant growth stages. This was in agreement with the findings of (Arif *et al.*, 2003) who achieved an increased of 100 seeds weight after the application of phosphor. It

Table 7: Effect of different treatments on Seeds Yield (gm plant^{-1}) in spring and full season.

Cultivation system(C)	Weeds treatments (W)	Spring season phosphorous fertilizer (kg h^{-1}) (P)			C × W	Spring season phosphorous fertilizer (kg h^{-1}) (P)			C × W
		100	200	300		100	200	300	
Ploughed	weedy	51.29	54.22	55.49	53.67	48.90	45.41	48.30	47.54
	non-weedy	52.95	56.30	59.40	56.22	48.70	50.45	52.00	50.38
Zero- tillage	weedy	50.18	52.81	55.01	52.67	52.95	55.43	59.40	55.93
	non-weedy	53.25	56.70	60.17	56.71	54.13	58.57	64.31	59.01
LSD 0.05		N.S			1.19	N.S			N.S
Mean (p)		51.92	55.01	57.52		51.17	52.47	56.00	
LSD 0.05		1.39				1.98			
C		C × P			Mean (C)	C × P			Mean (C)
Ploughed		52.12	55.26	57.44	54.94	48.80	47.93	50.15	48.96
Zero- tillage		51.72	54.76	57.59	54.69	53.54	57.00	61.86	57.47
LSD 0.05		N.S			N.S	1.64			2.07
W		W × P			Mean (w)	W × P			Mean (w)
weedy		50.74	53.51	55.25	53.17	50.92	50.42	53.85	51.73
non-weedy		53.10	56.50	59.78	56.46	51.42	54.51	58.16	54.69
LSD 0.05		N.S	0.69	1.35	0.99				

was also clear from table 9, 10 that the absence of weeds treatments was significantly superior and gave the highest value of 100 seeds weight (7.54 and 7.57gm) in both seasons, compared with the weedy treatments which gave the lowest average 7.41 and 7.39 gm.

The interaction between zero-tillage fertilized with the 300 kgha^{-1} phosphors gave the highest average 7.80 gm. in fall season with the significant differences with other interaction with ploughed treatments fertilized with all phosphors levels (100, 200 and 300 kg h^{-1}) gave the lowest average 7.42, 7.32 and 7.34, respectively with no significant differences between them. The interaction between the absence of weeds treatment with the 300 kgha^{-1} phosphors level achieved the highest level 7.76 gm in the fall season while the weedy treatment fertilized with 200 kgha^{-1} gave the lowest average 7.23 gm with no significant differences between this treatment and 100 and 200 kgha^{-1}. Other interaction appeared no significant effect on this character.

Seeds Yield (gm plant^{-1})

Zero-tillage treatments showed significant superiority in the seed yield in the fall season by giving the highest average 57.47 gm plant^{-1} compared with 48.96 gm plant^{-1} of ploughed treatments. This was due to the increased number of seed head^{-1} Table 5. Also, it was clear Table 7, that increased phosphorus fertilizer level, significantly increased the seed yield in both seasons from 51.95 and 51.17 gm plant^{-1} at 300 kgha^{-1}. This may be due that phosphor is amongst the essential elements and it's enough availability improves plant growth seed yield components tables 5, 6 which in turn increased seed yield. This results were in agreement with the other studies showed the sunflower crop responded to increased levels of added phosphors (P_2O_5) to the soil improved growth characters and seed yield sunflower (Abbadi and Gerendas, 2011 and Sadozai *et al.,* 2013). It was clear from these tables that un-weedy treatments gave the highest seeds yield in both seasons 56.46 and 54.69 gm Plant^{-1}, respectively, compared with the weedy treatments which gave the lowest averages 53.17 and 51.71 gm plant^{-1} in both seasons, respectively.

For interaction between cultivation system and phosphorus fertilizer, there was significant effect on seed yield only in the fall season where un ploughed treatments at 300 kgha^{-1} gave the highest average 61.86 gm plant^{-1} compared with 47.93 gm plant^{-1} in ploughed treatments at 200 kgha1 with no significant difference with the interaction of ploughed treatments at 100 kg ha^{-1} level (Table 7).

It also clears from table 7 that the interaction between unploughed and ploughed treatments with the presence of weed with no significant differences between their combinations when the combination between un weedy treatments and 300 kg ha^{-1} gave the highest average 58.16 gm plant.

The lowest average 50.42 gm plant^{-1} was for weedy treatment at the 200 kgha^{-1} level with no differences with weedy and un-weedy treatments at the 100 kgha^{-1}. For other interaction there was no significant effect on this character (Table 7).

It can be concluded from this study that the cultivation of sunflower without ploughing (zero-tillage) significantly reduced the weeds density and their presence in the field which in turn reduced the weed competition to the main crop which increased the seed yield and its components. However, increased phosphorous levels increased Weeds density, their dry weights and the seed yield. This suggests that weeds depletes part of the phosphorus fertilizer applied to the main crop.

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