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EFFECT OF SORGHUM RATOON PLANTS ON ACCOMPANIED WEEDS OF CROP

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ABSTRACT

A field experiment was conducted at the experimental field, Department of Field Crop -College of Agriculture - University of Baghdad, to compare effect of planting seed and ratoon of sorghum on accompanied weeds of Crop. A randomized complete block design (RCBD) arranged according to split- split-plot was used with three replicates, including plant populations D1 (200000 plant.ha^{-1}), D2 (100000 plant.ha^{-1}), D3 (66000 plant.ha^{-1}) as Main-Plots whereas sub - Plots included weed control weedy and weed free where sub – sub plots included planting pattern (seed, ratoon). The high plant populations D1 achieved a reduction in the density of the weeds after 30 and 60 days of planting and dry weights of the weeds, and superior in yield (t .ha^{-1})while the low plant populations D3 was higher in head weight, weight of 1000 grains and number of grains.head^{-1}. Ratoon plants was superior in all characters under study compared to seed plants, Ratoon plants was also superior with absence of weeds or its presence with low plant populations D3 in the characteristics of growth, yield and yield components in this research .

KEYWORDS: plant population, weeds, sorghum ratoon, planting pattern.

INTRODUCTION

The different soil layers contain large numbers of the weed seeds, most of which are dormant. Tillage is one of the most important soil service operations. It is suitable for the seeds of the crop to be grown, as well as elimination of the shoot system of the weed plants, however, the soil rotation causes the hibernation of dormant weed to break down and expose them to sunlight, allowing them to grow, and their growth poses a significant risk to the planted crop. It is estimated that losses in fields of field crops due to the spread of weed by 45 to 95% of the quantity of the economic yield[1]. The critical period competition of the crop by the weed is the first 30 days of age of crop the harvest due to the growth of the weed faster and stronger than the growth of the crop. The non-stirring of the surface layer of the soil, the planting without tillage, reduces the soil service operations [5, 30] and ensures that the seeds of the weed in the soil do not grow during the critical period of the crop, reducing the number and density of the weed in the field [3]. The growth of the crop increases if the crop is planted, (Raton) will be growing faster and larger competitor to the weed, Doggett[13] said that it is a practice to stimulate the tillering in the Sorghum plants by cutting the old stems after the harvest and the rest of the plant is called a ratoon. Ramirez and Socorro[27] reported that the minimum use of tillage and the use of herbicides was less expensive, while[12] noted that the main problem with sorghum was its sensitivity to the narrow leaf herbicides, so should be use mechanical method to weed control but it is increase of production cost, so Ratoon planting can be considered more economical and environmentally friendly [5,8,11]. In this study we compared the effect of planting Sorghum seed and Sorghum Ratoon in the associated weeds of crop.

MATERIALES & METHODS

A field experiment was carried out in the field of experiments of the Department of Field Crops in the College of Agriculture-University of Baghdad in the spring and autumn seasons of 2017. The experiment was applied with the design of the Randomized Completely Block design (RCBD) in the arrangement of split-split plot and three replicates. The plant densities represented the Main plots, The distance between the lines was 50 cm and the distance between the plants within line 10, 20 and 30 cm resulted in plant densities (D1 200000 and D2 100000 and D3 66000 plants.ha^{-1}) respectively. The weed control treatment (the presence and absence of bushes) represented sub- plots, while the pattern of agriculture with ratoon and the normal planting of seeds for Sorghum as sub-sub plots. seeds of Enkath cultivar were planting in both spring and autumn seasons, The experimental soil was prepared from tillage, smoothing and leveling, and was then divided into experimental units with dimensions of 3 x 2.5 m to give six lines, the distance between which is 50 cm. 3-4 seeds were planted in drill and then reduce into one plant in two stages, the first after the emergence and the second after ten days. Urea fertilizer (46% N) added in tow payment at first irrigation, Forty days after the completion of the field emergence in spring planting, and in autumn planting on August 9, it was added to the quantity and dates of the spring addition itself, while the autumnal ratoon was added at the first irrigation after harvest directly at the boot stage and at 40 kg nitrogen.ha^{-1}, Phosphate fertilizer was mixed with experimental soil before planting and at 100 kg P.h^{-1} in the form of Super Phosphate 45% P_2O_5 one payment. The soil of the experiment was irrigated immediately after planting, in a calm manner, to ensure that the seeds remained in the drill in the agricultural lines. *Sesamia critica* was treated with diazinone (10% effective ingredient) by 6 $kg.h^{-1}$ by but it in grown apical of plant twice for the first stage in the 4-5 leaves, and the second after 15 days from the first. The soil of the experiment was irrigated until the growth season was completed as needed; Plants were cut at a height of 7-10 cm to protect new bud and better growth [16], and for the following season, the performance of ratoon plants with seed Plants are grown with a normal planting of seeds for each planting season.

Characters under study

Species and densities of the weed (m^{-2}): The weed species were diagnosed and calculated in the 30 and 60 days of planting by diagnosing and calculating the number of weed per square meter of experimental unit.

Dry weight of the weed (gm^{-2}): The weed was cut at a surface level of soil 1 m^{-2}, taken randomly and placed in perforated bags and then placed in the oven at 70°C until the weight stability[4].

Head weight (gm): measured to the main stem by cutting the head for each treatment from the neck area and calculating its weight.

Weight of 1000 grain (g): calculated 500 grain of each experimental unit taken from the middle lines and then multiply the output weight x 2 to find the weight of 1000 grain.

Number of grains.head^{-1}: Was calculated as the mean of the mean of the five plant seeds taken randomly from the middle lines and then estimated by weight of 1000 grain per treatment and proportionate procedure, the number of grains was extracted in each head.

Grain yield ($t.ha^{-1}$): Was obtained from the harvest of plants 1 m^2 and extracted from the multiplication of the average yield of plants 1 m^2 ×10000 m^2.

The analysis of the characteristics of the studied characteristics was conducted statistically according to the method of analysis of variance and the comparison between the mean was evaluated according to the least significant difference (LSD) and the probability level (0.05) [39].

RESULTS & DISCUSSION

Species and density of the weed (m^2):

Spread in the weedy treatment that weeds Wild safflower, Prickly lettuce, Johnson grass, Syrian Bind Weed, Hairy - node bear grass Nutgrass, Wild beets, Smeller Bind Weed, Button weed and Purslane which following to different families and as shown in Table (1). The percentage of Broad-leaf weed was 70%, and the percentage of Narrow-leaf weed was 30%. The percentage of annual weeds was 50% and the percentage of perennial weeds was 50%.

TABLE 1: species of weeds spread in the experiment site

N.	English name	scientific name	family name	life cycle
1	Wild safflower	*Carthamus oxyacanthus* L.	Compositae	annual
2	Prickly lettuce	*Lactuca scariola* L.	Compositae	annual
3	Johnson grass	*Sorghum halepense* L.	Poaceae	perennial
4	Syrian Bind Weed	*Convolvulus scammonia* L.	Convolvulacea	perennial
5	Hairy - node bear grass	*Dichanthium annulatum* L.	Poaceae	perennial
6	Nutgrass	*Cyperus rotundus* L.	Cyperaceae	perennial
7	Wild beets	*Beta vulgaris* L.	Chenopodiacea	annual
8	Smeller Bind Weed	*Convolvulus arvensis* L.	Convolvulacea	perennial
9	Button weed	*Malva rotundifolia* L.	Malvaceae	annual
10	Purslane	*Portulaca oleracea* L.	Portulacea	annual

The weed density after 30 days of planting, the results of Table (2) indicate significant differences between the different treatments. The plant density recorded a significant effect in the accompanying weed, the density of plant D3 achieved lowest weed plants density 28.67 $plants.m^{-2}$, and significantly different from the plant densities D1 and D2, which recorded 35.17 and 41.67 plants. m^{-2} respectively , which may be attributed to the fact that the crop plants grown naturally and without competition between the same crop plants compared to other densities, the ratoon plants achieved lowest number of weed plants amounted to 10.44 $plants.m^{-2}$ compared to seed plants which recorded 59.89 plants. m^{-2} , this may be due to the effect of the allelopathic secretions of sorghum ratoon and no tillage of soil on the associated weed compared to the seed plants [6,14,17,25] the ratoon plants are more numerous than the tillering and are superior by rapid re-growth of their lateral and axillary branches[22,28]. Binary and triple interaction achieved a significant effect on the density of weed plants, the density of plant D3 in the weedy treatment achieved lowest weed plants density which amounted to 57.33 $plants.m^{-2}$ this was significantly different from D1 and D2 densities, which recorded a density of weeds of 70.33 and 83.33 $plants.m^{-2}$ respectively. As well in the plant densities D1 and D2, the ratoon plants achieved lowest density of the weed plants, which reached 8.67 plants m^{-2}, while the seed plant in plant density D3 recorded highest density of weed at 74.67 plants. m^{-2}, It is worth noting that the ratoon plants in plant densities D1, D2 and D3 reduced the density of weed plants compared with seed plants under the same plant densities, which may be attributed to the decomposition of the residues of the post-cut ratoon plants, ratoon plants and their roots are secretion allelopathic compounds affected on the growth of other plants (18) and the non-germination of the weed plant seeds because no tillage of soil [3]. The results indicate that there is a significant effect of plant densities, weed treatment and planting patterns, the ratoon plants in plant densities D1 and D2 affected on the weeds it achieved less density of weed 17.33 $plants.m^{-2}$ and significantly different from the other treatments, while seed plants with plant density D2 recorded highest density of weed at 149.33 plants. m^{-2} the effect of ratoon plants on the density of weed in the weedy treatment is observed under the same plant densities compared to the seed plants.

TABLE 2: Effect of different treatments in the density of weeds (plant. m^{-2}) after 30 days of planting

Plant Densities (plant h^{-1})	Weeds treatment	Planting pattern		Interaction means of
		Seeds	Ratoon	Plant Densities × Weeds treatment
D1	weedy	123.33	17.33	70.33
	weedfree	0.00	0.00	0.00
D2	weedy	149.33	17.33	83.33
	weedfree	0.00	0.00	0.00
D3	weedy	86.67	28.00	57.33
	weedfree	0.00	0.00	0.00
L.S.D 0.05	Densities × Weeds treatment× Planting pattern			Densities × Weeds treatment
		5.410		4.338
Interaction between Plant Densities × Planting pattern				
		Seeds	Ratoon	Plant Densiseties mean
	D1	61.67	8.67	35.17
	D2	74.67	8.67	41.67
	D3	43.33	14.00	28.67
Planting pattern mean		59.89	10.44	
L.S.D 0.05	Plant Densities × Planting pattern		Planting pattern	Plant Densities
		4.091	2.182	3.844
Interaction between Weeds treatment × Planting pattern				
		Seeds	Ratoon	Weed treatments mean
	weedy	119.78	20.89	70.33
	Weedfree	0.00	0.00	0.00
L.S.D 0.05	Weeds treatment × Planting pattern			Weed treatments
		3.174		2.695

As for the density of the weeds after 60 days of planting, the results of Table (3) indicate significant differences between the different treatments; the plant densities had a significant effect in the accompanying weeds, the plants density D1 showed lowest density of weed at 38.67 plants. m^{-2}, and significantly different from the plant densities D2 and D3, which recorded 46.67 and 50.00 plants. m^{-2}, respectively which may be attributed to the fact that increasing the plant density of crop plants may lead to reduction of the sun's rays which reached to weeds and then decrease the process of photosynthesis and the occurrence of disturbances in the biological processes within the plant and then the plant death. The weedy treatment recorded highest density of weeds at 90.22 plants.m^{-2} compared with the weed free treatment.

Ratoon plants achieved lowest weed density reaching 19.56 plant.m^{-2} compared with the seed plants, which recorded 70.67 plants. m^{-2}, this may be due to the fact that ratoon plants excreted some allelophatic compounds in more quantities than seed plants, Enhellig *et al.* [15] noted that sorgoleone is one of the allelopathic compounds produced by the sorghum plants in the environment, inhibiting the release of oxygen in the photosynthesis . When it is released from the roots of the sorghum, it oxidizes to quinone and becomes a growth inhibitor.

TABLE 3: Effect of different treatments in the density of weeds (plant. m^{-2}) after 60 days of planting

Plant Densities (plant.h^{-1})	Weeds treatment	Planting pattern		Interaction means of Plant Densities
		Seeds	Ratoon	× Weeds treatment
D1	weedy	133.33	21.33	77.33
	weedfree	0.00	0.00	0.00
D2	weedy	150.67	36.00	93.33
	weedfree	0.00	0.00	0.00
D3	weedy	140.00	60.00	100.00
	weedfree	0.00	0.00	0.00
L.S.D 0.05	Densities × Weeds treatment× Planting pattern			Densities × Weeds treatment
	6.833			4.223
	Interaction between Plant Densities × Planting pattern			
		Seeds	Ratoon	Plant Densities mean
	D1	66.67	10.67	38.67
	D2	75.33	18.00	46.67
	D3	70.00	30.00	50.00
	Planting pattern mean	70.67	19.56	
L.S.D 0.05	Plant Densities × Planting pattern		Planting pattern	Plant Densities
	5.049		3.389	3.917
	Interaction between Weeds treatment × Planting pattern			
		Seeds	Ratoon	Weed treatments mean
	weedy	141.33	39.11	90.22
	weed free	0.00	0.00	0.00
L.S.D 0.05	Weeds treatment × Planting pattern			Weed treatments
	3.880			2.432

Binary and triple interaction showed a significant effect in this characteristic, the plants density D1 in the weedy treatment achieved lowest weed density amounted to 77.33 plants. m^{-2} and significantly different from the densities D2 and D3 for the same treatment 93.33 and 10.00 plants.m^{-2} respectively, effect of plant density is observed in reducing the number of weeds in weedy treatment, also the ratoon plants in density D1 showed less density of weed plants 10.67 plants.m^{-2} and significantly different from the other treatments, while the seed plants in plant density D2 recorded highest density of weeds amounted to 75.33 plants. m^{-2} .

The effect of ratoon plants and high plant density was apparent, which contributed to reducing the density of weed plants, it is noted that the ratoon plants also superior in weedy treatment by achieving least density of weeds amounted to 39.11 plant.m^{-2} and a significant difference from seed plants in the same treatment, which recorded 141.33 plants. m^{-2} .

Dry weight of weeds (g.m $^{-2}$):

Table (4) indicates the significant effect of different treatments on the dry weight of weeds, high density D1 achieved lowest dry weight of weeds at 27.97 g.m^{-2}, significantly different from the D2 and D3 densities, which recorded a higher dry weight of weeds 47.93 and 61.66 g.m^{-2} respectively, this may be attributed to the fact that increasing the plant density of the crop leads to the formation of canopy that reduces the sun's rays which reached to weeds , affecting in photosynthesis and its products, including growth and thus reducing the amount of dry matter accumulated in the weed plants. Ratoon plants achieved lowest dry weight weeds at 17.11 g.m^{-2}, significantly different from the seed plants that recorded higher dry weight of 74.60 g.m^{-2}, as the existing ratoon plants in the soil, which has a larger root and has the ability to excrete some allelopathic compounds are in larger quantities compared to seed plants, which is consistent with the decrease the density of weeds after 30 and 60 days of planting (Table 2, 3) contributed to the reduction of the dry weight of the weeds. There is a significant effect of binary and triple interaction in the dry weight of the weeds (Table 4), the plant density D1 in weedy treatment achieved lowest dry weight of weeds amounted to 55.93 g.m^{-2}, and significantly different from that achieved by the plants densities D2 and D3 with the same treatment, which recorded 95.87 and 123.31 g.m^{-2} respectively, as the high plant density affected and significantly in weedy treatment.

In the high plant density D1, the ratoon plants achieved lowest dry weight of weeds at 11.98 g.m^{-2}, significantly different from other treatments, while the seed plants with plant density D3 recorded the highest dry weight of weeds was 104.81 g.m^{-2}, generally observed that ratoon plants in plant densities D1, D2 and D3 reduced the dry weight of weeds and significantly higher than that recorded by seed plants, which may be attributed to achieved ratoon plants lowest weed density (Table 2, 3). The effect of plant density, weed treatment and planting pattern was significant in dry weight of weeds, ratoon plants in high plant density D1 with the presence of weeds achieved lowest dry weight of weeds amounted to 23.96 g.m^{-2}, and significantly different from the other treatments , while the seed plants in the same plant density recorded 87.91 g.m^{-2}, as well as with the plant density D3 highest dry weight of weeds was 209.00 g.m^{-2}, it is noted that the ratoon plants in different densities in weedy treatment achieved lowest dry weight of weeds compared to the seed plants with the effect of the same plant densities, which indicates the effect of the ratoon plants in achieving this low weight of weeds as well as achieve less dense weed plants (Table 2, 3).

TABLE 4: Effect of different treatments on the dry weight of weeds (g m^{-2})

Plant Densities (plant.h^{-1})	Weeds treatment	Planting pattern		Planting pattern Interaction means of Plant Densities × Weeds treatment
		Seeds	Ratoon	
D1	weedy	87.91	23.96	55.93
	weedfree	0.00	0.00	0.00
D2	weedy	150.06	41.68	95.87
	weedfree	0.00	0.00	0.00
D3	weedy	209.61	37.01	123.31
	weedfree	0.00	0.00	0.00
L.S.D 0.05	Densities × Weeds treatment× Planting pattern			Densities × Weeds treatment
	4.945			3.131
	Interaction between Plant Densities × Planting pattern			
		Seeds	Ratoon	Plant Densities mean
	D1	43.95	11.98	27.97
	D2	75.03	20.84	47.93
	D3	104.81	18.51	61.66
	Planting pattern mean	74.60	17.11	
L.S.D 0.05	Plant Densities × Planting pattern		Planting pattern	Plant Densities
	3.623		2.422	2.828
	Interaction between Weeds treatment × Planting pattern			
		Seeds	Ratoon	Weed treatments mean
	weedy	149.19	34.22	91.71
	weed free	0.00	0.00	0.00
L.S.D 0.05	Weeds treatment × Planting pattern			Weed treatments
	2.844			2.422

Head weight (g):

The results of Table (5) show the significant effect of different treatments on head weight (g), The lowest plant density D3 achieved highest head weight of 78.15 g with a significant difference from D1 and D2, which recorded 53.17 and 33.88 g respectively, the increase in plant density has reduced the head weight, which may be attributed to the competition between crop plants in the high density of nutrients and moisture and other necessary growth requirements, the head weight increased in the absence of weeds with the highest weight of 63.24 g, while the presence of weeds was 46.89g which is due to the competition between the weeds and the crop of the necessary growth requirements such as water, mineral elements and others. Ratoon plants achieved highest head weight 77.42 g and a significant difference from the seed plants, which recorded 32.77 g. This may be attributed to the fact that the ratoon plants significantly reduced the density of weeds and their dry weights (Table 2, 3 and 4).

The results of Table (5) indicate a significant effect of binary and triple interactions, the plants of low density D3 in the absence of weeds achieved highest head weight of head 88.76 g, while the plants of high density D1 recorded with presence of weeds less head weight of 25.10 g, noting the low weight of head of the impact of the weeds and increased plant density. In the low plant density D3, the ratton plants achieved highest head weight at 111.33 g while the seed plants in the high plant density D1 recorded the lowest head weight of 21.36 g, the ratoon plants have achieved the highest head weight within the same plant densities compared to the seed plants, in the absence of weeds, ratoon plants achieved highest head weight of 87.72 g. However, while the seed plants recorded a less head weight with presence of weeds and its absence were 26.66, 38.77 g respectively.

Table (5) indicates that there is a significant effect of plant densities, weed treatment and plant pattern in this character, ratoon plants in the low plant density D3 in the absence of weeds, achieved highest head weight of 124.74 g, seed plants were recorded in the high density D1 with weeds less head weight of 17.09g, the superiority of ratoon plants by the effect of plant density and the presence of weeds may be attributed to their superiority in reducing the density and dry weights of weeds plants (Table 2, 3, 4).

TABLE 5: Effect of different treatments on head weight (g)

Plant Densities (plant.h^{-1})	Weeds treatment	Planting pattern		Planting pattern Interaction means of
		Seeds	Ratoon	Plant Densities × Weeds treatment
D1	weedy	17.09	33.12	25.10
	weedfree	25.63	59.69	42.66
D2	weedy	25.86	70.21	48.04
	weedfree	37.90	78.73	58.31
D3	weedy	37.05	98.02	67.53
	weedfree	52.78	124.74	88.76
L.S.D 0.05	Densities × Weeds treatment× Planting pattern			Densities × Weeds treatment
	4.549			3.149
	Interaction between Plant Densities × Planting pattern			
		Seeds	Ratoon	Plant Densities mean
	D1	21.36	46.40	33.88
	D2	31.88	74.47	53.17
	D3	44.91	111.38	78.15
Planting pattern mean		32.72	77.42	
L.S.D 0.05	Plant Densities × Planting pattern		Planting pattern	Plant Densities
	2.929		2.120	1.941
	Interaction between Weeds treatment × Planting pattern			
		Seeds	Ratoon	Weed treatments mean
	weedy	26.66	67.12	46.89
	weedfree	38.77	87.72	63.24
L.S.D 0.05	Weeds treatment × Planting pattern			Weed treatments
	2.939			2.413

Weight of 1000 grain (g):

Table (6) indicates that there is a significant effect of different treatments on the weight of 1000 grain (g), low plants density D3 achieved highest weight 35.32 g with a significant difference from the D1 and D2 plant densities, which recorded a lower weight of 31.99 and 30.13 g respectively , the increase in plant density is accompanied by a decrease in the number of leaves of the plant, this is reflected negatively due to the reduction of the products of the carbonation process required to fill the grain, thus reducing the weight of the grain[7], increased plant density leads to competition between the roots on the mineral nutrients and thus reduces the weight of the grain, this is consistent with what other researchers have found[1,9,20].

In the absence of weeds, achieved highest grain weight 33.64g and a significant difference from the recorded weedy treatment by 31.33g, the obvious effect of the competition of weeds on grain weight is observed as a result of the competition between weeds and crops, which is reflected in grain weight. The increase in the weight of 1000 grain in weed control treatments was result of increased efficiency of the process of photosynthesis and then increase the accumulation of dry matter in the grain, increasing the weight on the revers, the low weight of 1000 grain in weedy treatment of the result of the high density of the weeds and has made the accumulation of nutrients a few. In addition, improving the efficiency of the source in the supply of carbonate products during the period of grain filling leads to increased grain weight for the period from flowering to physiological maturity[21]. Ratoon plants achieved highest weight of 1000 grain was 42.44 g while the seed plants recorded a weight of 22.52 g. The superiority of the ratoon plants was due to the less density of the weeds and dry weights and the highest weight of the head (Table 2, 3, 4, 5). Note from the results of Table (6) no significant effect of binary and tripl interaction between treatments , except the interaction between plant density and planting pattern, In the low density plant D3, the ratoon plants achieved highest grain weight of 46.59 g, the lowest weight recorded by the seed plants in the high plant density D1 was 20.97g, it should be noted that the increase in plant density reduced the weight of grains of both ratoon plants and seed plants, although the ratoon plants were superior in this character.

TABLE 6 : Effect of different treatments on weight of 1000 grain (g)

Plant Densities (plant.h^{-1})	Weeds treatment	Planting pattern		Planting pattern Interaction means of Plant Densities × Weeds treatment
		Seeds	Ratoon	
D1	weedy	19.37	38.06	28.72
	weedfree	22.57	40.53	31.55
D2	weedy	21.06	41.60	31.33
	weedfree	24.04	41.27	32.65
D3	weedy	22.30	45.58	33.94
	weedfree	25.80	47.61	36.70
L.S.D 0.05	Densities × Weeds treatment× Planting pattern			Densities × Weeds treatment
	N.S			N.S
	Interaction between Plant Densities × Planting pattern			
		Seeds	Ratoon	Plant Densities mean
	D1	20.97	39.30	30.13
	D2	22.55	41.43	31.99
	D3	24.05	46.59	35.32
	Planting pattern mean	22.52	42.44	
L.S.D 0.05	Plant Densities × Planting pattern		Planting pattern	Plant Densities
	1.608		1.221	0.883
	Interaction between Weeds treatment × Planting pattern			
		Seeds	Ratoon	Weed treatments mean
	weedy	20.91	41.75	31.33
	weed free	24.14	43.14	33.64
L.S.D 0.05	Weeds treatment × Planting pattern			Weed treatments
	N.S			1.539

TABLE 7: Effect of different treatments on number of grain head^{-1}

Plant Densities (plant.h^{-1})	Weeds treatment	Planting pattern		Planting pattern Interaction means of Plant Densiseties × Weeds treatment
		Seeds	Ratoon	
D1	weedy	881.40	868.8	875.10
	weedfree	1134.40	1471.40	1302.9
D2	weedy	1227.20	1687.90	1457.60
	weedfree	1575.70	1907.90	1741.80
D3	weedy	1663.90	2151.10	1907.50
	weedfree	2044.90	2620.80	2332.90
L.S.D 0.05	Densities × Weeds treatment× Planting pattern			Densities × Weeds treatment
	39.73			22.42
	Interaction between Plant Densities × Planting pattern			
		Seeds	Ratoon	Plant Densities mean
	D1	1007.90	1170.10	1089.0
	D2	1401.40	1797.90	1599.70
	D3	1854.40	2386.00	2120.20
	Planting pattern mean	1421.30	1784.70	
L.S.D 0.05	Plant Densities × Planting pattern		Planting pattern	Plant Densities
	25.83		20.50	9.66
	Interaction between Weeds treatment × Planting pattern			
		Seeds	Ratoon	Weed treatments mean
	weedy	1257.50	1569.30	1413.40
	weedfree	1585.00	2000.10	1792.50
L.S.D 0.05	Weeds treatment × Planting pattern			Weed treatments
	25.10			17.98

Number of grain. head^{-1} :

Table (7) indicates that there is a significant effect of different treatments on the number of grain.head^{-1}, the lowest plant density D3, achieved highest number of grain. head^{-1} reaching 2120.20 grain Plant densities D2 and D1 showed a lower number of grain. head^{-1} 1599.70 and 1089.00 respectively. The number of grains decreased by increasing the plant density Molina *et al.* [23] pointed to a decrease in the number of grain. head^{-1} by increasing the plant density, this may be due to the availability of better growth equipment in the wide distance, which led to an increase in the number of grain.head^{-1} this is agreed with [1,19] .

The crop plants in the absence of weeds achieved highest number of grain.head^{-1} reaching 1792.50 grain.head^{-1}, this number decreased with the presence of weeds to 1413.40 grain.head^{-1}, which is due to the effect of weeds on crop plants and compete with the necessary growth requirements, thus reducing the number of grain. head^{-1}. Ratoon plants achieved highest number of grain. head^{-1}

amounted to 1784.70 grain and a significant difference from the recorded seed plants and the number of 1421.30 grain. head^{-1}, which may be attributed to its superiority in head weight (g) (Table 5) as well as its reduction in weed density and its dry weights (Table 2, 3, 4).

Notes from Table (7), a significant effect of binary and triple interaction in the number of grain. head^{-1}, plants with low density D3 in the absence of weeds achieved highest number of grain. head^{-1} at 2332.90 grain, while high plant density D1 with presence of weeds recorded 875.10 grain. head^{-1}, as the number of grains decreased by the presence of the weeds and the increase in plant density. In the low plant density D3, ratoon plants achieved highest number of grains at 2386.00. head^{-1}, while seed plants in high plant density D1 recorded lowest number of 1007.90 grain.head^{-1}, as the number of seeds in seed plants compared to the ratoon plants decreased by the effect of the same plant density.

In the absence of weeds, the ratoon plants achieved highest number of grains of 2000.10. head^{-1} and a significant difference from the seed plants and the same treatment 1585.00 grain.head^{-1}, as the number of grain.head^{-1} decreased, with the presence of weeds , and it is noticeable that the superiority of the ratoon plants the number of grains in the presence and absence weeds compared to the seeds plants.

The results of Table (7) indicate that there is a significant effect of the interaction between plant densities, weed treatment and planting pattern, in the absence of weeds in the low plant density D3, ratoon plants achieved highest number of grains of 2620.80 head^{-1}, and ratoon plants with the presence of weeds in the high plant density D1 recorded lowest number of grain reached 868.80 grain. head^{-1}, the reverse effect of plant densities and competition of weeds is observed in the number of grains.

Total grain yield (t .ha^{-1}).

The results of Table (8) indicate that there is a significant effect of the different treatments on the grain yield, high plants density D1achieved highest grain yield of 4.405 t.ha^{-1} with a significant difference from D2 and D3, which recorded a lower yield of 3.766 and 3.391 t.ha^{-1} respectively, the increase in the yield because of increase in the number of plants in the unit area, as the increase in the number of plants in the high density of the reduction of qualities of the weight (weight head and the weight of 1000 tablets), this is agreed with a number of researchers [2,19,32] who pointed out the grain yield increased by increase plant density. The grain yield increased by the absence of weeds, reaching 4.354 t.ha^{-1} compared to the presence of the weeds by 3.355 t.ha^{-1}, the absence of weeds from the early stages of crop growth led to the opportunity for the crop to optimize the consumption of the main growth requirements, which led to increased rates of carbon representation and reflected the accumulation of dry matter in grains.

TABLE 8: Effect of different treatments on yield (t .ha^{-1})

Plant Densities (plant.h^{-1})	Weeds treatment	Planting pattern		Planting pattern Interaction means of Plant Densities × Weeds treatment
		Seeds	Ratoon	
D1	weedy	2.644	4.682	3.663
	weedfree	4.170	6.126	5.148
D2	weedy	2.178	4.564	3.371
	weedfree	2.781	5.543	4.162
D3	weedy	1.999	4.064	3.031
	weedfree	2.888	4.615	3.751
L.S.D 0.05	Densities × Weeds treatment× Planting pattern			Densities × Weeds treatment
	N.S			0.2140
	Interaction between	Plant Densities × Planting pattern		
		Seeds	Ratoon	Plant Densities mean
	D1	3.407	5.404	4.405
	D2	2.479	5.053	3.766
	D3	2.443	4.340	3.391
	Planting pattern mean	2.777	4.932	
L.S.D 0.05	Plant Densities × Planting pattern		Planting pattern	Plant Densities
	0.2615		0.1710	0.2103
	Interaction between	Weeds treatment × Planting pattern		
		Seeds	Ratoon	Weed treatments mean
	weedy	2.274	4.437	3.355
	weedfree	3.280	5.428	4.354
L.S.D 0.05	Weeds treatment × Planting pattern			Weed treatments
	N.S			0.1033

The ratoon plants were significantly superior in yielding the highest yield mean of 4,932 t.ha^{-1}, seed plants gave the lowest mean yield of 2.777 t.ha^{-1}, this is due to the weight of 1000 grain and the head weight , which contributed to the increase in grain yield in the second harvest [31], as well as the reduction of the number of weeds and their dry weights by the ratoon plants (Table 2, 3, 4). The results of Table (8) show that there is a significant effect of binary interactions just between plant densities and weed treatments, plant densities and planting pattern, the high plant density D1 in the absence of weeds achieved highest yield 5.148 t.ha^{-1}, while decreased in the low density of plants and the presence of weeds amounted to 3.031 t.ha^{-1}, the increase in plant density led to an increase yield , while the presence of weeds caused a reduction in the yield because of the competition for weeds on the requirements of growth such as water and primary nutrients as well as other effects such as blocking light or the excretion of allelopathic compounds that contribute in inhibiting the growth of the crop, which is later reflected in the grain yield.

In the high plant density D1, the ratoon plants achieved highest grain yield 5.404 $t.ha^{-1}$, while the yield of the seed plants decreased by 2.443 $t.ha^{-1}$. It is noted that the ratoon plants were superior to seed plants with the effect of different plant densities. We conclude from this research superiority of ratoon plants in the characteristic under study compared to seed plants, as it proved its ability to compete with the weed plants and give it a better yield compare with of seed plants, increasing the plant density to a certain extent reduces the density of weeds and increases the grain yield in the unit area.

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