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**Effect of the three densities of plant residues of sunflower  
*Helianthus annuus L.* and deferent spraying rates of Chevalier  
herbicide on weeds control in Wheat *Triticum aestivum L.***

**ABSTRACT**

Field study applied during the 2019-2020 season in the fields of the college of Agriculture, University of Tikrit, in order to study the combined effect of residues of plants sunflower *Helianthus annuus L.* cultivated in different plant densities with using different spraying rates of chevallier herbicide in developing efficient weeds with wheat crop *Triticum aestivum L.* as well as in the growth of the crop and yield. Field experiment was applied according to randomized complete block design RCBD in split plot. Plant densities of sunflower were but in main plots by three densities (53000, 66000 and 88000 plants. ha<sup>-1</sup>) with treatment without the cultivation of the plants. These treatments have been growing during the summer season of 2019 in order to obtain the residues of sun flower plants during the cultivation of wheat. While spraying rates applied of herbicide were four rates (without herbicide, 50% 75% 100%) of the recommended rates of chevallier herbicide spraying, (300 ml/ha<sup>-1</sup>) in the sub plots. Characters studies of wheat crop and weeds which grow with developing wheat crop were (weed control %, dry weight of weeds, wheat plants height, total number of tillers, number of spikes, number of grains spike, 1000-grain weight, grain yield). The results that have been obtained from this research are as following:

-Chevalere herbicide spraying under recommended amount (300 gm-h<sup>-1</sup>) gave the highest weeds control percentage by (91.2%) comparing with the treatment without herbicide (22.0%).

-High plant density of sunflower plant (88000 plant. ha<sup>-1</sup>) gave the highest percentage of weeds control compared to other densities (53000 and 66000 plant).

-The best weed control it was given by using a high density with spraying rate 75 % of recommended of herbicide

-Dry weight of weeds were decreased significantly by using high density of sunflower residues, as well as with increase rate spraying of herbicide while the treatment which used a high density of plants with the 75% of the rate of spraying of the herbicide has achieved clear results in reducing the number of the weeds.

- Some growth characters of wheat have been affected by the factors applied in the experiment significantly by decreasing the characters with increase the density of residues like (plant height, number of tillers total number of spikes, number of grains spike, grain yield), while others characters influenced positively with increase rates of spraying herbicide like the (the total number of tillers m<sup>-2</sup>, number of spikes m<sup>-2</sup>, 1000 grain weight and, grain yield).

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**INTRODUCTION**

The wheat crop is one of the most important field crops in the world in terms of production amount and cultivated, while this crop suffer of many problems, which leads to a decrease in the quantity and quality of the yield.

The use of herbicides to control weed plants in wheat fields in large areas of the world has increased production by more than 50%. As the world consumes about three million tons annually

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of weed herbicides in various agricultural systems to reduce the impact of weeds on productivity (Stephenson et al., 2003), however, their unscientific and excessive use has become a source of concern for the individual and society because these chemical compounds cause great damage to health, and the environment in general, and its ineffectiveness in eliminating the weeds in particular, and following one method in combating the weeds may not be efficient in most cases.

The phenomenon of allelopathy is one of the most promising alternatives that researchers have focused on in managing of weeds and improving crop growth (Chou, 1999; Hozayn et al. 2011). Studies indicate that there are several strategies through which the concept of allelopathy can be used in weeds control. (Alsadawi and Dayan, 2009), including the use of water extracts of plant species with allelopathic effects or mixing their residues in the soil to reduce the growth of the weed and then improve the growth and productivity of the crop; Shahid et al. (2007) used the extract of many crops, including sorghum alone or Integrating with weed herbicides, it was found that the addition of sorghum extract reduced the dry weight of the weeds and increased the grain yield of wheat crop.

The use of water extracts, despite its effectiveness in combating the weeds, may be a method that cannot be effectively applied to large areas, so it was thought to use the allelopathic phenomenon in a more applied and more important way through the use of crop residues after harvesting, after plowing them with the soil, as mixing or plowing the residues with the soil may stimulate the release of allelopathic compounds significantly due to the availability of moisture and appropriate conditions for the effectiveness of the decomposing microorganisms, which leads to an increase in their concentration in the early stages and then a decrease in their concentrations with the progression of time due to soil biota or washing it from the soil mound (Roth et al., 2000 ).

Some suggested the possibility of using them as environmentally friendly natural herbicides that could be used directly in the control or in developing new ones that are less harmful to the environment (Jamil, 2004). However, it is noticeable that the allelopathic ability does not rise to the high capacity of manufactured herbicides. Therefore, it was thought to use the allelopathic phenomenon with herbicides in a more applied and more important way through the use of allelopathic crop residues left after the harvest after mixing them with the soil of the field, as a significant reduction was observed in the emergence and growth of the weed plants with an increase in the yield of barley and legume plants when using sunflower residues with lower dose of the recommended herbicides (Al-Temimi, 2010 and Alsadawi et al., 2011).

In addition, adding plant residues to the soil contributes to improving its physical, chemical and biological properties as a result of an increase in organic matter (Alsadawi and Dayan, 2009). In view of the lack of studies related to the study of the effect of plant residues on the wheat crop and the importance of this crop as one of the strategic crops in Iraq and the world, this research was implemented to achieve the aim of integration between planted sunflower residues in different densities and spray rates less than recommended by the common herbicide in combating the weed accompanying wheat and the effect of this on the growth and yield of wheat crop, as it is one of the crops that follow the sunflower crop.

## **MATERIALS AND METHODS**

A field experiment was carried out during the 2019-2020 season in the experimental field of the Department of Field Crops Sciences, College of Agriculture - Tikrit University in order to study the effect of integrating sunflower plants residues planted with different densities and spray rates less than the recommended rates of the common herbicide Chevalier in controlling the weeds plants accompanying wheat crop and the effect of this on the growth and yield of wheat plants.

The experiment was carried out by planting the sunflower crop in the fall season 2019 and then by planting the wheat crop in the winter season 2019-2020. The experiment included the cultivation of the French sunflower OPERA with three plant densities within the RCBD design, in split-plot arrangement, and by three replicates. The main plots included the cultivation of sunflower plants in three densities through the planting distances between the plants, which are 15, 20 and 25 cm, in addition to a comparison treatment (without cultivation) as shown in (Table 1).

The sub plots included four rates of spraying the herbicide, which is the treatment of spraying with the recommended amount of herbicide, these rates are Chevalier (300 g commercial material / hectare, spray treatment at 75% of the recommended concentration of chevalier herbicide 225g of commercial substance/ha and spraying treatment at 50% of the recommended amount of chevalier herbicide 150gm Commercial material ha<sup>-1</sup>, in addition to the comparison treatment without the addition of a herbicide control.

**Table (1) field distribution of plants per square meter and hectare, according to the densities used in the experiment**

Plant Density (average number) plants.m <sup>-2</sup>	Distance between one line and another (cm)	distance plants (cm)	Plant Density.ha <sup>-1</sup>
D0 0	0	0	D0 0
D1 5.3	75	25	D1 53000
D2 6.6		20	D2 66000
D3 8.8		15	D3 88000

Field soil were plowing, smoothing were carried out, then the field was divided into 3 x 3 m boards, leaving a distance of 0.5 meters between the boards. The seeds planted in the main panels along the lines of distance between one line and another 75 cm in a hollow at a depth of 5 cm, and they were covered with a layer of soil. The panels were irrigated by the first planting wilderness on 10/7/2019. And after the completion of the emergence of plants reduced to one plant in hill. The panels were irrigated periodically and as needed. After the plants reached maturity, the remaining plants were harvested and left in the field until the plots were planted with wheat.

The control treatment (not planted with sunflower) was cleaned of weed residues growing in the field to avoid its effect on the subsequent crop, in addition to cleaning the rest of the treatments from weed residues. The aerial parts of the sunflower crop were cut, and after completing the cutting process for all the treatments, they were mixed well with the soil while maintaining the residues inside the plots, types of weed plants spread in the wheat field as shown in the following table.

**Table (2) Types of weeds spread in the wheat crop field**

o.	scientific name	family	botanical group
	<i>Lolium rigidum</i>	Poacea	Narrow leaves
	<i>Lolium temulentum</i>	Poacea	Narrow leaves
	<i>Eruca sativa (miller)</i>	Brassicaceae	Broad leaves
	<i>Sonchus olerances</i>	Compositae	Broad leaves
	<i>Raphanus raphanistrum</i>	Brassicaceae	Broad leaves

Sub plots were planted with an area of 3 x 3 m with four treatments for each main plot representing the concentrations of Chevalier\* herbicide, which are 300 gm. without adding herbicide. Wheat seeds Var. (Aba 99) were sown in lines with a distance between one line and another of 20 cm, at a seeding rate of 120 kg ha<sup>-1</sup>. The seeds were sown on 15/11/2019.

The herbicide spraying treatments were applied on 9/2/2020 at the tiller stage of wheat and at the stage of 3-4 leaves for the weeds. The treatments of herbicide were sprayed on the basis of 200 liters of water, then sprayed equally for each treatment by a manual sprayer under constant pressure directly

Studied traits: -

**Percentage of weeds control %:** It was calculated after 30 days of spraying the herbicide according to the equation: -

$$\% \text{ Weed control} = \frac{\text{Number of weeds in treat.} - \text{Number of weeds in control}}{\text{Number of weeds in control treat.}} \times 100$$

**Dry weight of the weeds (gm m<sup>-2</sup>): -**

The dry weight of the weed was calculated after 30 days of spraying the herbicide, as the weed was cut at the level of the soil surface and collected with perforated paper bags and then placed in the oven at 70 °C for 48 hours.

**Wheat Parameters****Germination percentage:**

The germinated seeds were calculated according the number of seeds/row in each treatment after 14 days of sowing, and the germination percentage was extracted using this equation.

$$\% \text{ germination percentage} = \frac{\text{Number of germinated seeds}}{\text{The number of seeds sown}} \times 100$$

**Plant height (cm): -**

The height of the plant was measured with a graduated ruler from the base of the plant to the base of the spike, an average of ten random plants from the harvested plants.

**Total number of tillers /(m<sup>2</sup>):**

The tillers were counted at harvest randomly from the center of each slab from an area of one square meter for each experimental unit.

**Number of spikes /m<sup>-2</sup>:**

The number of spikes of all plants harvested from an area of a quarter square meter from each experimental unit was then converted to the number of spikes m<sup>-2</sup>

**Number of grains per spike:**

Ten spikes were taken at random from each experimental unit, then plucked manually, and the total number of grains was calculated, then divided by 10 to calculate the number of grains. spike<sup>-1</sup>.

**The weight of 1000 grains (gm):**

A random sample of grains was taken for each experimental unit and 1000 grains were counted from them, where their weight was extracted.

**Grain yield (tons.ha<sup>-1</sup>):-**

The grain yield per hectare was estimated based on the experimental unit yield (9 m<sup>2</sup>) converted into hectares.

**Statistical analysis:**

After collecting the data for the traits under study, the data were analyzed statistically according to the RCBD design in the order of the split plot, and the arithmetic means of the treatments were compared using Duncan's multiple range test with a significance level of 5% (Steel & Torrie, 1980).

**RESULTS AND DISCUSSION****Percentage of weeds Control**

The results of Table (3) indicate the presence of positive and significant effects of the applied herbicide on the number of controlled weeds, as it is noted that the recommended spraying rate (H3) has achieved a control rate of 90.0% compared to the two spraying rates (H1 and H0), which gave control rates (58.3 and 22.0) % respectively. These results confirm the effectiveness of the applied herbicide in controlling the broad and fine weed of wheat. As for the effect of sunflower plant densities on weed control, the results indicated that the high density residue (D3) achieved the highest control percentage of 83.7%, significantly more than the rest of the densities. While the treatment in which there were no residual plant parts of sunflower (D0) gave the lowest control rate of 50.9% and differed significantly from the rest of the treatments that contained residues that the reason for the increase in the percentage of control by increasing the amount of residues may be due to the high concentrations of the secreted substances from the residues, which have an inhibitory role for the germination of weed seeds and the growth of its seedlings.

**Table (3) Effect of herbicide rates and plant residues of Sunflower on the control percentage of weeds**

Herbicide Treat. / Density	H3	H2	H1	H0	Mean of Density
D0	78.6 f	83.7 e	41.4 j	0.0 m	50.9 c
D1	92.3 bc	94.0 b	55.7 g	23.4 k	66.4 b
D2	97.5 a	88.8 d	44.5 i	14.9 l	61.4 b
D3	96.4 ab	97.0 a	91.7 cd	49.8 h	83.7 a
Mean of herbicide	91.2 a	90.9 a	58.3 b	22.0 c	

The same letters mean there were no differences between them

The results of the interaction effect between the rates of herbicide spraying and the plant densities of sunflower show a significant effect on the number of control weeds (Table 3). As the treatment in which the herbicide was used at a rate of spraying half the recommended amount with a high density of residues (H1D3), achieved a control rate of 91.7%, and this percentage is equivalent to or close to the percentage achieved by the treatments in which high spray rates were used. We can conclude from this that it can be Reducing the spray rate of the herbicide when plant residues with an allelopathic effect are present. The reason for this may be due to the participation of the action of the herbicide with the action of plant secretions in the process of killing weed plants.

#### The dry weight of the weeds after 30 days

The dry weight of the weeds after the control process is considered the vital indicator of the effectiveness of the herbicide in the growth of the weed plants, so the dry weight of the control weed was calculated. The results of Table (4) indicated that there was a significant reduction in dry weight of weeds at the herbicide used compared to the treatment in which the herbicide was not used. The weight decreased by (78.7, 81.4 and 84.3%), respectively, for the spraying rates (H1, H2 and H3) compared to the treatment in which the herbicide was not used. These results may be attributed to the fact that the active substance present in the herbicide has a significant effect on the structural processes of weed plants. As for the effect of the density of plant residues on the weight, it is noted that there is a significant decrease in the dry weight of the weed and directly with the increase in the amount of residues Table (4) of the means of dry weights under the influence of this factor.

**Table (4) Effect of herbicide rates and plant residues of Sunflower on the dry weight of weeds after (30) days**

Herbicide Treat. / Density	H3	H2	H1	H0	Mean of Density
D0	29.7 gh	35.3 ef	38.8 e	217.7 a	80.4 a
D1	25.8 gh	30.1 fg	35.33 ef	184.0 b	68.8 b
D2	24.7 h	28.7 gh	33.4 ef	137.7 c	56.1 c
D3	22.3 h	26.8 gh	30.9 fg	111.3 d	47.9 d
Mean of herbicide	25.6 c	30.2 bc	34.6 b	162.7 a	

The same letters mean there were no differences between them



It can be noted that the percentage of the decrease was less than its percentage in the case of using the herbicide, as the percentages of decrease for the treatment without residues (D0) were 14.4, 30.2 and 40.4%, respectively, for the residues of low, medium and high plant densities. These results explain that the substances secreted by plant residues naturally have an effect in reducing the plant metabolic processes of cells less than in chemicals. These results are consistent with many researchers including (Alsadawi and Dayan, 2009). As for the interaction treatments, it is noted that the treatments in which the herbicide and residues were not used were the highest treatments in dry weight of 217.7 gm, which differed significantly from the rest of the interaction treatments Table (4). In general, the table shows that all the interactions had a significant effect on the dry weight of the weed towards reducing it. The important thing in this field is that the interaction of spray rates of the herbicide with the residues has achieved remarkable percentages in reducing the dry weight, which helps to confirm the fact that the joint action of the study workers has achieved positive results in the direction of combating the weed.

### Height of wheat plants(cm)

The height of the wheat plants at the end of the spike formation period is the sum of the growth processes from the beginning of germination to the measurement period, and this time that the plant takes to grow can be affected by the factors and conditions that permeate the growth process. In the case of the factors of the current study, the effect of herbicide spraying rates did not have a significant effect on the height of wheat plants (Table (5)).

**Table (5) Effect of herbicide rates and plant residues of Sunflower on Height of wheat plants/cm**

Herbicide Treat. / Density	H3	H2	H1	H0	Mean of Density
D0	91.8 a	89.8 b	86.3 c	84.3 e	87.9 a
D1	85.4 d	83.4 f	82.9 g	91.4 a	85.8 a
D2	80.5 i	83.7 f	82.4 g	81.3 h	81.9 b
D3	81.2 h	80.2 i	80.5 i	83.5 f	81.3 b
Mean of hebicide	84.6 a	84.3 a	83.0 a	85.1 a	

The same letters mean there were no differences between them

While cultivation of wheat in different densities of sunflower residue led to a decrease in the height of wheat plants with an increase in the density of residues. The height of the plant decreased. By 7.5%, with a high residue density of 6.8% with a medium density. The decrease in plant height in wheat may be due to the inhibitory effect of the active substances secreted from sunflower residues, whose concentration is higher the higher the residue density.

As for the interaction between spray rates and residue density, table (6) indicates that the treatment spray rate H1 + high intensity D3 gave the lowest possible plant height of wheat (80.5 cm), while the treatment H3 + D0 gave the highest plant height (91.8 cm). poison, the reason for these results may be due to the high concentration of the herbicide that affected the elongation of cells more than in other treatments.

### Total number of tillers m<sup>-2</sup>

The results of Table (6) refer to the averages of the total number of tillers resulting from the application of the coefficients of the study factors on the wheat plants. The rates of spraying the herbicide had a significant effect on the number of tillers, for the treatment H2 which is the spraying of the herbicide in the recommended quantity on the rest of the rates of spraying and it gave a number of tillers equal to 495.9 units, while the lowest number of tillers was given by the treatment in which the herbicide did not spray ( H0 )( 367.8 tillers m<sup>-2</sup>).

**Table (6) Effect of herbicide rates and plant residues of Sunflower on total number of tillers / m<sup>2</sup>**

Herbicide Treat. / Density	H3	H2	H1	H0	Mean of Density
D0	d415.5	c426.1	j364.7	i374.3	b395.2
D1	b431.1	a504.4	d416.8	g384.1	a434.1
D2	c423.9	f393.3	g387.1	l340.7	c386.3
D3	e407.8	h379.6	k360.8	i372.0	c380.1
Mean of herbicide	a419.6	a425.9	b382.3	b367.8	

The same letters mean there were no differences between them

The reason for the increase in the number of tillers in the treatments in which the herbicide was sprayed is the decrease in the number of weeds growing with wheat, which led to a reduction in competition for all growth requirements. As for the density of residues and its effect on the total number of tillers, the low density D1 achieved the highest arithmetic average for the number of tillers (434.1) branches. compared to the rest of the densities. The reason for this may be that the concentration of excreted substances of this density was appropriate for the growth of wheat plants. As for the effect of the interaction on the number of straws, the treatment that was sprayed with the recommended amount of herbicide with a low residue density (504.4) , while the lowest number of tillers was It was achieved by the H0D2 treatment.

#### Number of spikes .m<sup>-2</sup>

The number of spikes per square meter was significantly increased in wheat plants that were sprayed with the recommended amount of herbicide (Table 7). The spraying rate H2 achieved the highest mean number of spikes/m<sup>2</sup> (418.3), which differed significantly from the average number of spikes in the treatment in which the herbicide H0 was not used, which gave (361.6) spikes/m<sup>2</sup>.

The reason may be attributed to that the herbicide reduced competition for light, water and nutrients factors. These results were in agreement with many researchers, including Said, (2006), Al-Shati, (2006) and Brzozowska et al., (2008). As for the cultivation of wheat in container soil on sunflower residues with different densities, the results showed that the number of spikes per square meter was significantly affected by these densities (Table 7).

**Table (7) Effect of herbicide rates and plant residues of Sunflower on total number of spikes. m<sup>-2</sup>**

Herbicide Treat. / Density	H3	H2	H1	H0	Mean of Density
D0	e405.9	c418.8	l355.6	k368.2	b387.1
D1	b422.8	a496.9	e404.1	i377.7	a425.4
D2	d410.9	g383.9	h380.6	n333.0	c377.1
D3	f396.9	j373.7	m353.2	K367.6	c372.9
Mean of herbicide	a409.1	a418.3	b373.4	c361.6	

The same letters mean there were no differences between them

These results indicate that the best residual density was the low density D1, which achieved the highest number of spikes. While the lowest number of ears was achieved by the high density of residues D3, the reason for that was the increase in the residues that might lead to an increase in the secretion of substances that inhibit the growth of wheat. As for the number of spikes resulting from the effect of the interaction of the study factors, the effect of these factors was significant in this number, as the results showed that the recommended spray rate with the amount of low residue (H2D1) led to giving the highest number of spikes per square meter (496.9). While the treatment

(without herbicide + medium density) gave the lowest number of spikes (333.0), perhaps the reason for this was an increase in the number of weed plants that were present with the wheat because they were not sprayed with any amount of the herbicide, and the effect of the densities of the residues had little effect in reducing the negative action for weed growth with wheat, these results were in agreement with both Einhellig and Leather (1988).

### Number of grains.spike<sup>-1</sup>

A significant differences appeared in the average number of grains/spike through their influence on the study factors and from table (8) it can be noted that the best rate of spraying the herbicide was half of the recommended quantity (H1), as this treatment gave (48.5) grains.spike<sup>-1</sup>.

**Table (8) Effect of herbicide rates and plant residues of Sunflower on total number of grains spike<sup>-1</sup>**

Herbicide Treat. / Density	H3	H2	H1	H0	Mean of Density
D0	e43.4	b49.4	c46.6	c47.4	b46.7
D1	c47.5	e43.2	b49.4	e43.5	bc45.9
D2	c47.6	de45.6	a51.5	ab50.4	a48.8
D3	f40.7	e43.6	cd46.6	cd46.4	c44.4
Mean of hebcicide	c44.8	bc45.5	a48.5	b46.9	

The same letters mean there were no differences between them

As for the best density of the residues that gave the highest average number of grains in the spike, it was the average density (48.8) grains. As for the interaction coefficients, the treatment (H1D2) outperformed the rest of the treatments (51.5) grains/spike. The effect of the study factors and their interactions on the trait of the number of grains/spike did not take a specific direction in the effect. Perhaps the reason is that this trait was governed by the genetic influence of the wheat variety more than the effect of the study factors. Therefore, no consistent or harmonious effect was observed with the spray rates, residue densities, or the interference.

### Weight of 1000 grains/gm

The characteristic of the weight of 1000 grains is one of the characteristics that express the metabolic activities that lead to the accumulation of substances that are stored in the seeds, so the environmental factors that accompany plant growth can greatly affect the fullness of the grain. In light of this, the study factors had a significant effect on this trait (Table 9), as the recommended spray rate of the herbicide achieved the highest mean of the weight of 1000 grains (33.8) g, while the lowest average of the weight of 1000 grains was given by the treatment that was not used in it. This effect of the herbicide factor may be due to the fact that the use of the herbicide reduced the number of weed, which led to allowing wheat plants to perform metabolic processes better than plants in which the weed did not fight, (Marwat.*etal.*,2007) and (Brzowska.*etal.*2008).

**Table (9) Effect of herbicide rates and plant residues of Sunflower on 1000 grains weight/gm**

Herbicide Treat. / Density	H3	H2	H1	H0	Mean of Density
D0	b33.2	b33.1	c32.1	c33.0	b32.8
D1	a34.1	ab33.9	a34.5	d31.2	a33.5
D2	c32.4	a34.2	b33.0	c32.1	b32.9
D3	b33.4	a34.0	b33.3	a34.3	a33.8
Mean of hebcicide	b33.3	a33.8	b33.3	c32.7	

The same letters mean there were no differences between them

The plant residues of sunflower affected the characteristic of 1000 grains significantly (Table 9). The addition of residues to wheat soil achieved higher mean weights of 1000 grains (33.8 and 33.5) g compared with the treatment to which no amount of sunflower residue was added (32.8).



As for the interaction of factors, the best interaction in the weight of 1000 grains was (H1D1), which gave an average of 34.5 g, while the lowest achieved average was the interaction of workers in the treatment (H0D1), which gave (31.2) gm, perhaps the reason for this is that the concentration of the active substance from the herbicide The weed is in harmony with the concentration of secreted substances from the plant density of the remains. These results are consistent with Chalabi (2003)

### Grain yield ton.ha<sup>-1</sup>

The final outcome of all metabolic activities of any plant is the plant's productivity of grains or seeds, and the source from which the metabolic materials are made and accumulated is their final destination in the grain or seed. spike and weight of 1000 grains), the use of spray rates led to a significant increase in the yield (Table 10).

The highest yield was the yield that was given by the spraying rate (H3) of the entire recommended amount. The reason for this may be to significantly reduce the number of jungles from the rest of the spraying rates, or to increase the average yield components for this rate of spraying. The best remaining plant density led to The best yield and significantly was the low density (D1), which gave 1.82 tons.ha<sup>-1</sup>. As for the interaction of herbicide spray rates with the density of residues, the best interaction was H3D1, which achieved a yield of 2.48 tons.ha<sup>-1</sup> compared with the treatment of control (H0D0) . The reason for this could be to increase the efficiency of the control at the rate of spraying with the full recommended amount and in the presence of the appropriate concentration of sunflower residual secretions.

**Table (10) Effect of herbicide rates and plant residues of Sunflower on grains yield ton /ha<sup>-1</sup>**

Herbicide Treat. / Density	H3	H2	H1	H0	Mean of Density
D0	bc1.88	e1.05	e1.12	f0.76	b1.20
D1	a2.48	b2.03	bc1.88	f0.88	a1.82
D2	bc1.83	c1.76	d1.46	g0.53	b1.39
D3	b1.97	e1.18	ef0.96	ef0.96	b1.27
Mean of herbicide	a2.04	b1.51	b1.36	c0.79	

The same letters mean there were no differences between them

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التأثير المشترك لمتبقيات زهرة الشمس *Helianthus annuus L.* و ثلاث معدلات رش من مبيد الشيفالير في كفاءة مكافحة أدغال الحنطة *L. Triticum aestivum*

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الخلاصة

طبقت دراسة حقلية خلال الموسم 2019-2020 في حقول كلية الزراعة-جامعة تكريت بهدف دراسة التأثير المشترك لمتبقيات نباتات زهرة الشمس *Helianthus annuus L.* المزروعة بكثافات نباتية مختلفة مع استخدام مبيد الشيفالير بمعدلات رش مختلفة في كفاءة مكافحة الأدغال النامية مع محصول الحنطة *L. Triticum aestivum* كذلك في نمو وحاصل المحصول المستهدف.

طبقت التجربة الحقلية وفق تصميم القطاعات العشوائية الكاملة **R.C.B.D** بنظام الألواح المنشقة **Split Plots** وضعت الكثافات النباتية لزهره الشمس في الألواح الرئيسية بواقع ثلاث كثافات هي 53000 و 66000 و 88000 نبات.ه-1 مع معاملة بدون زراعة النباتات وتم زراعة هذه الألواح خلال الموسم الصيفي لسنة 2019 بهدف الحصول على المتبقيات النباتية لزهره الشمس خلال فترة زراعة الحنطة. بينما طبقت معدلات رش مبيد الشيفالير (أربع معدلات) هي (بدون مبيد، 50%، 75%، 100%) من الكمية الموصى بها لرش المبيد وهي 300غم.ه<sup>-1</sup> في الألواح الثانوية. تم دراسة الصفات النباتية الآتية:

النسبة المئوية للمكافحة، الوزن الجاف للأدغال، ارتفاع نباتات الحنطة، عدد الأشطاء الكلية، عدد السنابل عدد الحبوب.سنبلة<sup>1</sup>، وزن 1000 حبة، حاصل الحبوب). كانت النتائج التي تم الحصول عليها من البحث كالآتي: -

- ازداد معدل ارتفاع نباتات زهرة الشمس بمقدار 37% عند زراعة النباتات بالكثافة العالية (88000 نبات) مقارنة مع الكثافة الواطئة (53000 نبات).

- انخفضت المساحة الورقية لنباتات زهرة الشمس بالكثافات العالية للزراعة بنسبة 34.9% عن المساحة الورقية للكثافة الواطئة.

- انخفض الوزن الجاف لنباتات زهرة الشمس بنسبة 40% عند زراعتها بكثافات عالية مقارنة بالوزن الجاف للكثافات الواطئة.

- تأثرت نسبة أنبات بذور الحنطة المعاملة بالمستخلصات المائية للمجموع الخضري لزهره الشمس معنوياً إذ انخفضت نسبة الانبات بنسبة 31.6%، 50%، 70% مع تراكيز المستخلص 5%، 10%، 15% على التوالي.

- استخدام مبيد الشيفالير بالكمية الموصى بها 300غم.ه<sup>-1</sup> أعطى أعلى نسبة مكافحة لأدغال الحنطة 91.2% مقارنة بالمعاملة التي لم يرش فيها المبيد 22.0%.

- الكثافة النباتية العالية من نباتات زهرة الشمس 88000 نبات.ه-1 أعطت أعلى نسبة مكافحة لأدغال مقارنة بالكثافات الأخرى 53000 و 66000 نبات.ه-1

- أفضل نسبة مكافحة لأدغال الحنطة كانت بالكثافة العالية مع معدل الرش 75% من مبيد الشيفالير.

- انخفض الوزن الجاف للأدغال بشكل معنوي مع متبقيات النباتات ذات الكثافة العالية وكذلك مع زيادة معدل رش المبيد، بينما كانت المعاملة التي استخدم فيها الكثافة العالية للنباتات المتبقية مع 75% من معدل الرش للمبيد قد حققت نتائج واضحة في تقليل عدد الأدغال.

اما صفات الحنطة النامية بظروف العوامل المطبقة في التجربة فقد تأثرت بعض الصفات معنوياً بزيادة كثافة المتبقيات بشكل سلبي مثل صفة (ارتفاع النبات، عدد الأشطاء الكلي، وزن الف حبة)، بينما تأثرت بعض الصفات معنوياً وبشكل إيجابي بزيادة معدلات رش المبيد مثل صفة عدد السنابل.م<sup>-2</sup>، عدد الحبوب بالسنبلة، حاصل الحبوب.

الكلمات  
المفتاحية:  
متبقيات ،  
زهرة  
الشمس،  
مبيد  
الشيفالير،  
محصول  
الحنطة