The use of Trifloralin Herbicide, cultivation distances and cultivation method to control the weeds accompanying the local barley crop (Hordeum vulgare L.)

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Abstract

The research was conducted in the fields of the Agricultural Technical College / Mosul to combat the weed associated with the barley crop for the winter season 2019/2020 to as a method of integrated control management. The research included three factors: The first factor is the two levels Trifloralin Herbicide (the concentration of 1248 cm³ active substance / e and the comparison treatment) and the second factor is the cultivation distances at two levels (15, 30) cm. As for the third factor, cultivation methods are also at two levels (orthogonal cultivation, conventional cultivation). The experiment was applied according to the system of global experiments in split–split block by designing the complete random sectors with three replicates. The most important results are summarized as follows: The three factors: Trifloralin herbicide and the narrow distance (15) cm between the row and cultivation achieved a significant decrease in the number of narrow-leaf weeds / m², number of tillers for narrow-leaved weeds / m², dry weight of the narrow-leaf weeds and the number of broad-leaved weeds, while no significant effect appeared between the two cultivation methods on the dry weight of the broad-leaved weed. The interference between the herbicide and the distance (15) cm, and the interference between the herbicide and orthogonal cultivation, and the interference between the distance (15) cm and orthogonal cultivation, as well as the triple interference between the herbicide and the distance (15) cm orthogonal cultivation, achieved a significant decrease in all studied characteristics.

Keyword: Trifloralin herbicide, cultivation distances, cultivation methods.

1. Introduction

Barley is considered an important crop in many countries of the world, and it is one of the crops grown for the production of grains with the aim of using them in the work of news, as concentrated feed, or in industry. It is also considered one of the important fodder crops in the production of green fodder [1]. One of the reasons for the low cereal productivity per unit area is the prevalence of weeds in agricultural lands that drain soil moisture, as it causes the decrease in yields and in varying proportions limited to (30 – 50)% according to the prevailing density and quality of the weeds, according to the environmental location and the amount of weed seed storage in the soil [2]. In the rainy areas, chemical and agricultural methods are an important means of control. The Trifloralin herbicide is a widely used herbicides for the control of weeds that grow with field crops. The reason for this is due to the resistance of some weeds to herbicides added after germination , mentioned that Trifloralin herbicide decomposes and volatilizes when present on the soil surface, and for it to be effective it must be mixed with the soil [3,4]. When studying the chemical and agricultural methods in controlling the weed in the wheat crop, added that the distance (20) cm between the lines caused a significant decrease in the number of weeds / m² compared to the two distances (30 and 40) cm.

2. Materials and methods

The research was carried out in the fields of the Agricultural Technical College / Mosul for the agricultural season (2019 - 2020) to combat the weed accompanying the barley crop by chemical and agricultural methods. The research included the following factors: - The first factor: Trifloralin herbicide at a concentration of 1248 cm³ active substance / hectare in addition to the comparison treatment. The second factor: planting distances (15 and 30) cm between the lines. The third factor: the
method of cultivation (cross-sectional and regular cultivation). The aim of the experiment is to find out the efficacy of trifloralin in both distances and the two methods in controlling the weed. At the last of the season, the following characteristics were studied: The number of narrow-leaved weeds /m², Number of tillers for narrow-leaved weeds / m², Dry weight of narrow-leaved weeds (g / m²), Number of broad-leaved weeds / m², and Dry weight of the broad-leaved weeds (g / m²). The data was analyzed according to the split- split block experiments system and by designing the complete random random sectors (RCBD), and the data was analyzed using the computer according to the (SAS program) The Duncan multiple-use test was used to compare the averages.

3. Results and Discussion

Table 1. indicates that the treatment of the herbicide achieved a significant decrease in the number of narrow-leaves weeds compared to the comparison treatment, the percentage of decline was 64.30%. This may be due to the fact that the Trifloralin herbicide killed the weeds whose seeds are close to the surface of the soil, and that the barley seeds were at a greater depth, so they were not affected by the pest [4]. The same table indicates that the cultivation lines achieved decrease in the number of narrow-leaves weeds compared to the wide distance, and the percentage of decline was 41.75%, and the reason for this may be that the narrow distance of crop plants makes them compete with the weed plants for the ingredients of life this finding was consistent with his findings [1]. The data show that orthogonal cultivation achieved a significant decrease in the number of weeds compared to regular cultivation and this may be due to the regular distribution of the barley crop per unit area, which makes barley plants the competition for the weed plants and this result coincided with what it reached [2]. Between the herbicide and the cultivation distances, the distance of 15 cm between plants with the treatment of herbicide achieved a significant decrease in the number of narrow leafed actions compared, to the rest of the treatment. The results of the interference between the herbicide and the cultivation method show that the treatment of the herbicide significantly outperformed the comparison treatment in both methods, and that the lowest number of weeds achieved the number of orthogonal cultivation within the herbicide treatment which did not differ significantly from the usual method within the same treatment. As for the results of the interference between the distance and the method of cultivation, orthogonal cultivation with the 15cm. distance of the treatment of the herbicide achieved a significant decrease in this capacity compared to the rest of the treatment.

Table 1. Effect of trifloralin herbicide, cultivation distances, method of cultivation and their interference with the number of narrow-leaves weeds / m²

| Herbicide | Cultivation distances | Cultivation method | Herbicide x distances | Effect of herbicide | Effect of distances |
|-----------|----------------------|-------------------|-----------------------|-------------------|-------------------|
| Control   | 15 cm                | 8.33 c            | 6.66 d                | 7.50 b            |                   |
|           | 30 cm                | 12.66 a           | 9.66 b                | 11.16 a           |                   |
| Herbicide | 15 cm                | 1.66 f            | 2.00 f                | 1.83 d            |                   |
|           | 30 cm                | 5.33 e            | 4.33 e                | 4.83 c            |                   |
| Herbicide x cultivation method | Control | 10.5 a | 8.16 b | 9.33 a |                   |
|           | Herbicide            | 3.50 c            | 3.16 c                | 3.33 b            |                   |
| Distances x Cultivation method | 15 cm | 5.00 b | 4.33 c | 4.66 b |                   |
|           | 30 cm                | 9.00 a            | 7.00 b                | 8.00 a            |                   |
| Effect of cultivation method |                   | 7.00 a | 5.66 b |                   |                   |

The values followed by the same letter do not differ significantly at the 0.05 probability level for each factor and for each interference.

The data in table 2. indicates a significant decrease in the number of tillers in the unit area when treating a trifloralin herbicide compared to the comparison treatment and the percentage of the decrease reached 81%, which is a very good percentage, and the reason for this is due to the trifloralin herbicide that has a direct impact on the buds the mystical areas are located at the base of the plant, which leads to reduced activity of those buds that turn into tillers [5]. The data in the same
The data show that the number of tilleres per unit area decreased significantly at the narrow distance compared to the wide distance, and the reason for this may be that the opportunity to obtain growth factors at the narrow distance is less than it is in the wide distance [6]. And the data show that orthogonal cultivation achieved a significant decrease in the number of tilleres per unit area compared to regular cultivation, and perhaps the reason for that is due to the distribution of plants in the unit area when orthogonal cultivation makes the crop plants compete with weed plants on the elements of life [2]. As for the interference between the herbicide and the cultivation distances, the data show that the distance of 15 cm between plants when treating the herbicide achieved a significant decrease in the number of abortions per unit area compared to the rest of the treatments. As for the interference between the herbicide and the cultivation method, the data show that the number of abortions per unit area decreased significantly when treatment with the herbicide and the two methods of cultivation compared to the comparison treatment. As for the overlap between the cultivation distances and the method of cultivation, orthogonal cultivation at a distance of 15 cm achieved a significant decrease in the number of traps per unit area compared to the rest of the transactions, as for the triple interference between the factors, showed that the two methods of cultivation at the distance of 15 cm with the treatment of the herbicide achieved a significant decrease in the number of tilleres per unit area compared to the rest of the transactions.

| Herbicide   | cultivation distances | Cultivation method | Herbicide x cultivation method | Effect of herbicide | Effect of distances |
|-------------|-----------------------|--------------------|-------------------------------|---------------------|---------------------|
| Control     | 15 cm                 | 37.33 c            | 29.66 d                       | 33.50 b             |                     |
|             | 30 cm                 | 46.33 a            | 40.66 b                       | 43.50 a             |                     |
| Herbicide   | 15 cm                 | 4.33 g             | 5.33 g                        | 4.83 d              |                     |
|             | 30 cm                 | 11.33 e            | 8.33 f                        | 9.83 c              |                     |
| Herbicide x cultivation method | Control | 41.83 a | 35.16 b | 38.50 a |
| Herbicide x cultivation method | Herbicide | 7.83 c | 6.83 c | 7.33 b |
| Distances x Cultivation method | 15 cm | 20.83 c | 17.50 d | 19.16 b |
|             | 30 cm                 | 28.83 a            | 24.50 b                       | 26.66 a             |

The values followed by the same letter do not differ significantly at the 0.05 probability level for each factor and for each interference.

The data presented in table 3, shows that there is a significant decrease in the dry weight of the narrow-leaves weed when treating the herbicide compared to the comparison treatment, as the percentage of decline was 81.6%, which is a very good percentage, and the reason for the decrease may be due to the few of the number of weed plants and the few of tilleres in the treatment of herbicide compared to the comparison treatment. We note that there is a significant decrease in the dry weight of the narrow-leaves weed at the narrow distance compared to the wide distance, and this may be due to the nature of the growth of the weed in the both distances. The data in the same table indicate that orthogonal cultivation achieved a significant decrease in this characteristic compared to regular cultivation, as the rate of decline was 24%, and the reason for this may be related to the link of this characteristic to the number of weed and number of tilleres [2]. Data on the interference between the herbicide and the cultivation distances show that the distance of 15 cm between plants to treat the herbicide achieved a significant decrease in the dry weight of the narrow-leaves weed compared to the rest of the treatments. As for the interference between the herbicide and the cultivation method, the orthogonal and regular cultivation of the herbicide treatment achieved a significant decrease in this capacity compared to the rest of the treatments. As for the interference between the distances and the method of cultivation, the data indicate that the orthogonal cultivation at the distance of 15 cm achieved a significant decrease in the dry weight of the narrow-leaves weed compared to the rest of the treatments. As for the overlap between the cultivation distances and the method of cultivation, orthogonal cultivation at a distance of 15 cm achieved a significant decrease in the number of traps per unit area compared to the rest of the transactions.
Table 3. Effect of triloralin herbicide, cultivation distances, method of cultivation and their interference with the dry weight of narrowleaves (g/m²)

| Herbicide  | cultivation distances | Cultivation method | Effect of herbicide | Effect of distances |
|------------|-----------------------|--------------------|---------------------|--------------------|
|            | 15 cm                 | 30 cm              |                     |                    |
| Control    | 11.33 c               | 16.66 a            | 9.16 b              |                    |
| 15 cm      | 7.00 d                | 14.00 b            | 15.33 a             |                    |
| Herbicide  | 3.33 e                | 2.33 e             | 2.83 c              |                    |
| Herbicide x cultivation method | Control | 14.00 a | 10.50 b | 12.25 a |
| Distances x Cultivation method | 15 cm | 6.50 c | 4.33 d | 5.41 b |
| 30 cm      | 10.00 a               | 8.16 b             | 9.08 a              |                    |

The values followed by the same letter do not differ significantly at the 0.05 probability level for each factor and for each interference.

The results show in table 4. that the Trifloralin herbicide achieved a significant decrease in the number of broad-leaved weeds compared with the comparison treatment, as the rate of decline was 56.7%, which is a good percentage, and the reason for this may be due to the wide variation in the depth of the presence of weed seeds, their roots and the size of their seeds. The seeds buried in depths more than the depth of the presence of the herbicide have the ability to escape from the effectiveness of the herbicide compared to those found close to the surface of the soil and this result is identical to what was reached [8]. While we note that the percentage of moral decline it reached 16.4% at the distance of 15 cm between the cultivation lines compared to the distance is 30 cm, the reason may be due to either allelopathy, as the roots of the crop plants secrete inhibitory materials for some weed seeds in addition to the narrow distance that makes the crop the competitor for the ingredients of life. The percentage of significant decrease in the orthogonal cultivation method was 13.5% compared to the usual cultivation method, and the reason for this may be due to the regular distribution of crop plants per unit area, which weakens the growth of weed plants, and this result coincided with what it reached [8]. The interference between the herbicide and the cultivation distances shows that the two distances when treating the herbicide achieved a significant decrease in the number of broad-leaved weeds compared with the comparison treatment. As for the interference between the herbicide and the cultivation method, we notice that the two cultivation methods achieved a significant decrease in the number of broad-leaved weeds with the herbicide treatment compared with the comparison treatment. As for the interference between the distance and the method of cultivation, the orthogonal cultivation at the distance of 15 cm between the cultivation lines achieved a significant decrease in the number of broad-leaved weeds compared to the rest of the transactions. As for the triple interference between the factors, the two methods at the two distances with the herbicide treatment achieved a significant decrease in the number of broad-leaved weeds compared to the rest of the transactions.

Table 4: Effect of triloralin herbicide, cultivation distances, method of cultivation and their interference with the number of broad-leaves weeds / m²

| Herbicide  | cultivation distances | Cultivation method | Herbicide x distances | Herbicide effect | Distances effect |
|------------|-----------------------|--------------------|-----------------------|------------------|-----------------|
|            | 15 cm                 | 30 cm              | 15.00 a               | 13.66 a          |                 |
| Control    | 12.66 c               | 17.33 a            | 10.33 d              | 11.50 b          |                 |
| 15 cm      | 6.66 e                | 7.33 e             | 4.40 g               | 5.50 c           |                 |
| Herbicide  | 6.00 c                | 5.83 c             | 5.91 b               |                  |                 |
| Herbicide x cultivation method | Control | 7.33 e | 5.66 e | 6.50 c | 5.50 c | 5.91 b |
Table 5. shows the significant decrease in the dry weight of the broad-leaved weeds in the herbicide treatment compared to the comparison treatment, as the rate of decline reached 73%, which is a very good percentage and this result was consistent with its findings [4]. The data in table (5) showed that the narrow distance (15 cm) between the crop plants achieved a significant decrease in the dry weight of the broad-leaved weed compared to the wide distance (30 cm), and this may be due to the increased competitiveness of the barley crop at the narrow distance of 15 cm compared with the wide distance is 30 cm [9]. The data in the same table indicate that the different cultivation methods did not have any significant effect on this trait. The interference between the herbicide and the cultivation distances indicated that the two distances with the herbicide treatment achieved a significant decrease in the dry weight of the broad-leaved weeds compared to the rest of the treatments.

As for the interaction between the herbicide and the cultivation method, the results show that the two cultivation methods within the herbicide treatment achieved a significant decrease in the dry weight of the broad-leaved weed compared to the two cultivation methods in the comparison treatment. The data of the intervention between the distance and the method of cultivation indicate that orthogonal cultivation within the distance of 15 cm between the crop cultivation lines achieved a significant decrease in the dry weight of the broad-leaved weeds compared to the rest of the treatments. As for the triple interference between the factors, the results show that perpendicular cultivation of the normal cultivation distances and cultivation at the distance at a distance of 15 cm with the herbicide treatment achieved a significant decrease in the dry weight of the broad-leaved weeds compared to the rest of the treatments.

| Distances x Cultivation method | 15 cm | 30 cm |
|-------------------------------|-------|-------|
| 9.66 b 7.34 c 8.50 b          | 11.33 a 10.83 a 11.08 a |

The values followed by the same letter do not differ significantly at the 0.05 probability level for each factor and for each interference.

Table 5: Effect of Trifloralin herbicide, cultivation distances, method of cultivation and their interference with the dry weight characteristic of broad-leaved weed (g/m²)

| Herbicide | cultivation distances | Cultivation method | Herbicide x distances | Effect of herbicide | Effect of distances |
|-----------|-----------------------|--------------------|-----------------------|--------------------|--------------------|
| Control   | 15 cm                 | 20.33 c            | 16.66 d               | 18.50 b            |
|           | 30 cm                 | 29.33 a            | 25.33 b               | 27.33 a            |
| Herbicide | 15 cm                 | 7.33 e             | 3.99 g                | 5.66 c             |
|           | 30 cm                 | 7.34 e             | 5.66 f                | 6.50 c             |
| Herbicide x cultivation method | Control | 22.83 a | 23.00 a | 22.91 a |
|           | Herbicide             | 6.50 b             | 5.66 b                | 6.08 b             |
| Distances x Cultivation method | 15 cm | 13.83 c | 10.33 d | 12.08 b |
|           | 30 cm                 | 16.33 b            | 17.50 b               | 16.91 a            |
| Effect of Cultivation method   | 15.08 a | 13.91 a |                      |                    |

The values followed by the same letter do not differ significantly at the 0.05 probability level for each factor and for each interference.

References

[1] Hussam F. Najeeb 2013. Effect Irrigation the Magnetic of Some Growth of the Barley Hordeum vulgare L. Al-Qadisiyah Journal,Agri.Sci. Vol.(3) No.1:48 - 53
[2] Heather , E.M; A. Navabi; B.I. Erick; T. Onavan and D.M. Spancer 2007. The weed competitive of Canada western spring cultivars grown organic management . Crop sci..47:1167-1176.
[3] Ashrafi , Zoheir.Y. ; Sedigheh sadeghi and Hamid R. Mashhadi  2009. Study of Integrate Methods Chemical and Cultural Control of Weeds to Wheat (Triticum aestivum L.). Journal of Agric. Sci. 1(2): 113-119.
[4] Chauhan, B.; S. G. S. Gill and C. Preston 2007. Timing and dose of metolachlor affect rigid ryegrass (Lolium rigidum L.) control in wheat. Weed Tech. 21 : 225 – 229.

[5] Cudney, D. W.; S. B. Orloff and D. A. Demason 1993. Effect of thiazopyr and trifluralin on dodder (Cuscuta indecora L.) in alfalfa (Medicago sativa L.). Weed Technol. 7 (4 ) 660-864.

[6] Shrestha, A. and M. Fidelibus 2005. Grapevine row orientation affects light environment, growth, and development of black nightshade (Solanum nigrum L.). Weed Sci. 53 : 802 – 812.

[7] Shehab Mohamad Hamid, Salim Thanon Younis and Mahmood Ahmed Mohammad. (2020). Effect of Substitution of Vicia Sativa Raw and Treated Seeds as A substitute for Soybean Meal on Productive Performance of Broiler Chickens. Al-Qadisiyah Journal For Agriculture Sciences, 10(2), 408-414.

[8] Al-Rashdi, Hisham Abdel Rahman 2013. Evaluation of the performance of the modified Caspardo seed for working under the cultivation system without tillage and comparison with conventional cultivation in the cultivation of soft wheat (Triticum aestivum L.), Master Thesis College of Agriculture - University of Mosul.

[9] Kazem, Muhammad Hathal and Raisan Karim Shati 2004. The effect of some weed herbicides on the yield and components of the leguminous product. Iraqi Agricultural Science Journal 35 (1): 125 - 128.