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Response of Bread Wheat Crop to Tillage Systems and Chemical Herbicides Under Supplemental Irrigation

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ABSTRACT

The experiment was carried out at Agricultural season 2024-2025 at midtown of Mosul city, the experiment was include two factor, tillage system (conventional tillage without herbicide) and conservation tillage with using limitless herbicide, and the second factor the varieties of soft wheat (Kallar, Adena, Ebaa). the seed were sowing at mid of December of 2024 by 100 kg / h-1, add the fertilizer according of recommendations of Agriculture Ministry (100 kg of DAP) with planting of seeds. The experiment was applied according factorial experiments using Randomize Complete Block Design with three replication. Limitless herbicide was spraying at last week of February. The conservative agriculture system with the use of pesticide was superior to the traditional agriculture system in plant height, reducing the number of narrow-leaved weeds and their dry weight, as well as the dry weight of broad-leaved weeds by 5.23 cm, 4.44, 14.22 and 15.77 g/m2, while the two systems did not differ in the rest of the studied characteristics. The Pharaonic cultivar was superior to the other two cultivars in plant height and yield by (26.5 and 45.33 cm) (2.17 and 13.17 g/m2). The best plant height for the Pharaonic cultivar with conservative agriculture and the use of pesticide was (97.33 cm). The Najia cultivar was superior with traditional agriculture in the amount of grain yield (353.67 g/m2). The aim of the research was to disseminate conservation agriculture technology system in Nineveh Governorate the research was conducted in cooperation with the World Food Program (W.F.P).

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INTRODUCTION

Triticum aestivum L. consider the first share in the group of cereal crops that are grown in the Iraq as well as the Arab word, given the importance of this plant in achieving food security for all the Arab population in addition to its role in economic development Salim et al (2025) and Al-jaddir (2023)) The cultivation of bread Wheat is spread in a wide area of arable land in the world and this plant occupies the Advanced place in world agricultural yield. The area planted with Wheat in the Arab world is estimated at approximately 30.46% of the total cultivation of other crops and a production rate of up to 48.02% of the production of these crops (Abdulrahman (2023). This percentage reaches approximately 3.07% of the world yield of this crop, which was estimated at about 749.46 million tons. Iraq contributes 12.92% of the Arab countries' yield. There are many problems facing the agriculture, especially wheat cultivation, including narrow wand broad leaves weed, that are present in high density with it Hussain (2024). In Iraq, there are more than 15 types of broadleaf weeds and 10 types of narrow leave weeds. These weeds cause losses damage of up to 50% of the yield, in addition to the deterioration of the quality of the crop. Researchers are resorting to investigating new scientific processes to increase crop yield and improve its quality, such as the use of the zero tillage system, which is one of the modern scientific methods of agriculture. This system has achieved positive results in Nineveh Governorate compared to traditional agriculture Al-Jobouri and Alabar (2021). Also keeping the remains of the crop that harvesting at last year in the ground and not disturbing the farm in this type of plowing led to obtaining important results compared to other systems. The research aims to spread of zero tillage in the rain-fed areas in northern Iraq in order to reduce the effects of climate damage that is currently affecting the world Antar and Ahmed (2020) The aim of the research was to disseminate conservation agriculture technology system in Nineveh Governorate, the research was conducted in cooperation with the World Food Program (W.F.P).

MATERIALS AND METHODS

The experiment was carried out at Agricultural season 2024-2025 at midtown of Mosul city, the experiment was include two factor, tillage system (conventional tillage without herbicide) and conservation tillage with using limitless herbicide, and the second factor the varieties of soft wheat (Kallar, Adena, Ebaa). the seed were sowing at mid of December of 2024 by 100 kg / h^{-1}, add the fertilizer according of recommendations of Agriculture Ministry (100 kg of DAP) with planting of seeds. the experiment was applied according factorial experiments using Randomize Complete Block Design with three replication. Limitless herbicide was spraying at last week of February, The rainfall was very little at this season , the field was watered an needed, the important traits which studied are plant high, No of tillage m No of Spikes / m^2 Spike length (cm), No of grain (spike), Weight of 1000 grain (g), Yield grain kg/ dounum, Biological yield kg / dounum, Number of narrow leaves weeds, Dry weight of narrow leaves weeds, Number of wide leaves weeds, Dry weight of wide leaves weeds. the data were analyzed according of factorial experiments using R.C.B.D. and using Duncan multiple range test to compare among the treatments at probability level 5%.

RESULT AND DISCUSSION

1- Table (1) indicates significant differences between the tillage systems used in some of the studied wheat crop traits. Conservation farming, which used the herbicide Limitlis, outperformed conventional farming, which did not use it, in the number of grains per spike, thousand-grain weight, and total grain yield by 5.67 g, 7.22 g, and 25.44 kg, respectively. This may be attributed to better soil water retention and more uniform plant spacing, which resulted in higher plant height. These results are consistent with those of Al-Jubouri and Antar (2021). Conventional farming also outperformed conservation farming by 1.78 cm and in biological yield (65.66 kg). No significant differences were found between the two systems in the remaining vegetative and productive traits, such as plant height and number of spikes. This may be because supplemental irrigation reduced the differences between the two systems. These results are consistent with those of Abdullah (2024). Regarding weed characteristics, the number of narrow-leaved and broad-leaved weeds decreased in conservation agriculture compared to conventional agriculture by 5.89 g and 14.55 g for narrow-leaved and broad-leaved weeds, respectively, by 3.78 g and 11.78 g for broad-leaved and narrow-leaved weeds. This may be attributed to the herbicide's reduction of both weed populations. These results are consistent with those of Al-Hanoush (2021) and Al-Rajabo (2022).

Table (1) effect of tillage system on traits of wheat and the weeds that accompany it.

Tillage system	Plant high (cm)	No of tillers	No of Spikes	Spike length (cm)	No of grain (spike)	Weight of 1000 grain (gm)
Conventional	59.22 a	341.00 a	294.67 a	7.00 b	38.78 a	42.33 a
Conservation+ limitless herbicide	60.33 a	335.11 a	292.56 a	8.78 a	33.11 b	35.11 b

Tillage system	Yield grain (kg / dounum	Biological yield kg / dounum	Number of narrow leaves weeds	Dry weight of narrow leaves weeds	Number of wide leaves weeds	Dry weight of wide leaves weeds
conventional	349.11a	1160.67b	7.89 b	30.89 b	4.78 b	56.89 b
Conservation+ limitless herbicide	323.67 b	1226.33 a	13.78 a	45.44 a	8.56 a	68.67

2-Table 2 indicates significant differences between the studied varieties in their effect on the studied characteristics of wheat. The Klar variety outperformed the Adna and Abaa varieties in plant height by 6 and 27.16 cm, respectively, while the Adna variety outperformed the Abaa variety by 21.16 cm. This may be due to genetic factors. These results are consistent with those of Gali (2021). The Adna variety also outperformed the Klar and Abaa varieties in the number of tillers and the number of spikes by 49.16 and 91.16, respectively, and 14.50 and 107.17, respectively. This may be due to

the failure of some seeds to germinate. The two varieties did not differ from each other in spike length and thousand-grain weight. The Adna and Abaa varieties were significantly inferior to the Kalar variety in spike length and number of grains per spike by 1.33 and 1.53 cm (4.67 and 5, respectively). However, in terms of thousand-seed weight, the Kalar and Abaa varieties outperformed the Abaa variety by 9 and 7.66 g. No significant differences were observed among the three varieties in yield. The Kalar variety outperformed the Adna and Abaa varieties by 235.0 kg/dunum (468.0 kg/dunum), while the Adna variety outperformed the Abaa variety by 233.0 kg/dunum. The three varieties did not differ in the number of narrow-leaved weeds. The Kalar variety did not differ from the Adna variety in the dry weight of narrow-leaved weeds, while the dry weight of narrow-leaved weeds was lower in the Abaa variety compared to the other two varieties. Adna and Abaa differed from the Kalar variety in the number of broadleaf leaves compared to Kalar by (0.33 and 0.17) in the dry weight of broadleaf weeds, while both surpassed Kalar in the dry weight of broadleaf weeds. Adna and Abaa did not differ in the dry weight of broadleaf weeds, while both surpassed Kalar in the dry weight of broadleaf weeds. These results are consistent with those of (Menhas, 2023).

Table (2) effect of types of var on traits of wheat and the weeds that accompany it.

Var	Plant high (cm)	No of tillers	No of Spikes	Spike length (cm)	No of grain (spike)	Weight of 1000 grain (gm)
Kallar	70.83 a	335.67 b	319.67 b	8.83 a	39.17 a	42.17 a
Adena	64.83 b	384.83 a	334.17 a	7.50 b	34.50 b	40.83 a
Ebaa	43.67 c	293.67 c	227.00 c	7.33 b	34.17 b	33.17 b

Var	Yield grain kg / dounum	Biological yield kg / dounum	Number of narrow leaves weeds	Dry weight of narrow leaves weeds	Number of wide leaves weeds	Dry weight of wide leaves weeds
Kallar	340.67 a	1427.83 a	10.50 a	40.17 a	7.50 a	58.17 b
Adena	337.00 a	1192.83 b	11.0 a	40.33 a	6.17 b	66.67 a
Ebaa	331.50 a	959.83 c	11.0 a	34.0 b	6.33 b	63.50

3- Table No. (3) indicates that the interaction between tillage systems and varieties has a significant effect on the studied traits, whether vegetative or productive. The Kalar variety, when using conservation tillage, surpassed the rest of the treatments in plant height (70.33 cm) compared to the rest of the treatments, followed by the Kalar and Adna varieties with traditional tillage (66.67 cm). The lowest height was found for the Abaa variety when using both types of tillage. The reason may be due to the genetic factor, and this result is consistent with what was found by Al-jader and Abdulla (2025) and Al-Kaby et al (2025). The table also indicates significant differences between the treatments in their effect on the trait of the number of tillers and the number of spikes per square meter, as the two varieties Kalar and Adna were superior with traditional tillage and the Adna variety (379.67, 379.67 and 390.0) with conservation agriculture compared to the rest of the treatments. The treatments did not differ between them in their effect on the traits of spike length and number of grains per spike, while the interaction between the treatments had an effect on the trait of a thousand grains, as the Kalar variety was superior with conservation agriculture (49.33) compared to the rest of the treatments, while the lowest weight of a thousand grains was in the Abaa variety with traditional agriculture (32.33). These results are consistent with the results of Jawad et al (2025) and Akol (2021). The interaction between the type of cultivation and the varieties also affected the yield quantity, as the Adna variety was superior with conservation cultivation and the use of the herbicide Limitless (362.0 g/m2), while the lowest yield quantity was for the Kalar and adna variety with traditional cultivation and no use of the herbicide (312.0). The Kalar variety was superior with conservation cultivation in the quantity of biological yield (1436.33 kg), while the lowest quantity of biological yield was for the Abaa variety with traditional cultivation (948.67 kg/dunum).

As for weed characteristics, the number of narrow-leaved weeds decreased for the three varieties with conservation cultivation and the use of the herbicide compared to traditional cultivation and no use of the herbicide. This was reflected in the dry weight of the narrow-leaved weeds, which behaved in the same way as the number. Likewise, the number of broadleaf weeds decreased for all three varieties with conservation agriculture and pesticide use compared to traditional agriculture and no pesticide use. Also, the dry weight of broadleaf weeds decreased in the two varieties, Kalar and Abaa, with conservation agriculture and pesticide use compared to traditional agriculture and no pesticide use. These results are consistent with the results of Shada (2025) and Woźniak and Gandía (2021).

Table (3) effect of interaction between tillage systems and types of var on traits of wheat and the weeds that accompany it.

Tillage system	Var	Plant high (cm)	No of tillers	No of Spikes	Spike length (cm)	No of grain (spike)	Weight of 1000 grain (gm)
conventional	Kallar	70.33 a	340.00 b	322.67 ab	6.67 b	36.0 a	49.33 a
	Adena	63.00 c	390.00 a	334.33 a	7.00 b	35.33 a	43.67 b
	Ebaa	44.33 d	293.00 c	227.00 c	7.33 b	35.00 a	34.00 cd
Conservation+ limitless herbicide	Kallar	66.67 b	379.67 a	334.00 a	8.00 b	33.67 ab	38.00 c
	Adena	66.67 b	379.67 a	334.00 a	8.00 b	33.67 ab	38.00 c
	Ebaa	43.00 d	294.33 b	227.00 c	7.33 b	33.33 ab	32.33 d

Tillage system	Var	Yield grain kg / dounum	Biological yield kg / dounum	Number of narrow leaves weeds	Dry weight of narrow leaves weeds	Number of wide leaves weeds	Dry weight of wide leaves weeds
conventional	Kallar	354.00 ab	1436.33 a	8.0 b	35.0 b	6.0 b	49.0 c
	Adena	362.00 a	1074.67 c	8.0 b	34.0 b	3.67 c	65.33 a
	Ebaa	331.33 bc	971.00 d	7.67 b	23.67 c	4.67 bc	56.33 b
Conservation	Kallar	312.00 c	1311.00 b	13.0 a	45.33 a	9.0 a	67.33 a
	Adena	312.00 c	1311.00 b	14.0 a	46.67 a	8.67 a	68.0 a
	Ebaa	331.67 bc	948.67 e	14.33 a	44.33 a	8.0 a	70.67 a

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