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Response of bread wheat crop to tillage systems and chemical herbicides in areas with moderate rainfall .

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I. 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 (Faronia , Najia , 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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II. 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).

III. 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 , Adana , 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% .

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IV. Result and discussion

1- Table (1) indicates that there are significant differences between the used tillage systems in the studied wheat crop traits, as conservation agriculture outperformed traditional agriculture in plant height by 5.33 cm. This may be due to the fact that the amount of water retained in the soil as well as the regular spacing between plants were better, which was reflected in the plant height. These results are consistent with the results of Aljuburi and Anter, (2021). Conservation agriculture also outperformed traditional agriculture in the number of grains per spike by 0.78, while traditional agriculture outperformed conservation agriculture in 1000-grain weight by 1.67 g. No significant differences were found between the two systems in the remaining vegetative and production traits of the plant. This may be due to the fact that supplementary irrigation reduced the differences between the two systems. These results are consistent with the results of Abdulla , (2024). As for weed characteristics, the number of narrow-leaved and broad-leaved weeds decreased in conservation agriculture compared to traditional agriculture by 4.34 and 14.22 for narrow-leaved and broad-leaved weeds, respectively. This may be due to the fact that the pesticide reduced the number of narrow-leaved and broad-leaved weeds. The two systems did not differ in their effect on the dry weight of narrow-leaved weeds, while the dry weight of broad-leaved weeds decreased in conservation agriculture by 16.77 g compared to traditional agriculture. These results are consistent with the results of Al-Hanoush (2021) and Alrijabo (2022) .

2- Table 2 indicates the presence of significant differences between the studied varieties in their effect on the studied traits of wheat crop, as the Pharaonic variety outperformed the Najia and Aba N varieties in plant height by 27.50 and 46.33 cm, respectively, while the Najia variety outperformed the Aba variety by 18.83 cm, and the reason may be due to the genetic factor. These results are consistent with the results of Jalli,(2021) The Najia variety outperformed the Pharaonic and Aba varieties in the number of shoots and the number of spikes by (16.73 and 24.33) and (19.66 and 24.16), respectively, and the reason may be due to the failure of some seeds to germinate, and the two varieties did not differ from each other. The varieties did not differ from each other in spike length and 1000-grain weight. The Pharaonic and Najia varieties outperformed the Aba variety in the number of seeds per spike by (9.0 and 8.50) respectively, as for the amount of yield and biological yield, the Pharaonic variety outperformed theEbaa variety by an amount of (13.17) (241.34 kg/dunum), and the Najia variety did not differ from the other two varieties in the amount of yield. As for the weed characteristics, the Pharaonic and Najia varieties outperformed the Ebaa variety in the number of narrow-leaved weeds by an amount of (2.33 and 1.66) respectively, while the lowest dry weight in the plants of the Ebaa variety (34.33 g), followed by the Pharaonic variety (38.33 g). The three varieties did not differ in the number of broad-leaved weeds, while the dry weight of broad-leaved weeds decreased in the Pharaonic variety (49.0 g), and the other two varieties did not differ from each other in the dry weight of broad-leaved weeds. These results are consistent with the results of Minhas, (2023).

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3- The interaction between tillage type and cultivars had a significant effect on the studied wheat crop traits, as the Pharaonic cultivar significantly outperformed the other treatments in plant height when using conservative and traditional cultivation systems (97.33 cm, 80.67 cm), while the lowest plant height was in the Aba cultivar with both tillage systems. As for the number of tillers, the Najia cultivar outperformed with conservative cultivation, recording 346.67, which outperformed the Pharaonic cultivar with traditional cultivation and the Aba cultivar with conservative cultivation by (27.67 and 31.34). The number of spikes did not differ for the Najia cultivar whether in conservative or traditional cultivation (335.0 and 335.67), nor did the Aba cultivar differ whether in conservative or traditional cultivation (335.0 and 309.0). This may be due to genetic variation between the cultivars These results are consistent with the results of Al-Jabir and Abdulla (2025) and Al-Kaby et al (2025) . No significant differences were found between treatments in spike length. In terms of the number of grains per spike, the Pharaonic variety with conservative cultivation (44.67) outperformed the rest of the treatments, while the Aba variety did not differ between the two systems in the number of grains per spike (35.0 and 33.33). As for the 1000-grain weight, the Pharaonic and Najia varieties with conventional cultivation outperformed the Aba variety with conservative cultivation (32.33 g). The Najia variety with conventional cultivation outperformed the rest of the treatments (353.67 kg/dunum), while the rest of the treatments did not differ from each other These results are consistent with the results of El-Sadek et al (2020) and Hussain (2023) and Jalli (2021) . As for the weed characteristics, it was found that the lowest number of narrow-leaved weeds was in the three cultivars with conservative cultivation, while the highest number of narrow-leaved weeds was found in the Aba cultivar with traditional cultivation. This may be due to the lack of weed control in traditional cultivation. The number of narrow-leaved weeds was reflected in their dry weight, as the highest dry weight of narrow-leaved weeds was found in the three cultivars with traditional cultivation These results are consistent with the results of Jawad et al (2025) and Akol (2021) . No significant differences appeared among all treatments in the trait of the number of broad-leaved weeds, while the highest dry weight of broad-leaved weeds was found in the Najia cultivar and the Aba cultivar with traditional cultivation, which significantly outperformed the rest of the treatments These results are consistent with the results of Shada (2025) and Woźniak and Gandía (2021) .

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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	62.44 b	325.89 a	318.78 a	7.44 a	39.56 a	34.67 a
Conservation+ limitless herbicide	67.67 a	331.33 a	322.67 a	7.44 a	40.44 a	33.00 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	343.44 a	1123.22 a	12.22 a	45.0 a	7.67 a	65.33 a
Conservation+ limitless herbicide	335.67 a	1143.56 a	7.78 b	30.78 b	6.11 a	49.56 b

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)
Faronia	89.0 a	325.50 b	315.67 b	7.67 a	43.17 a	34.17 a
Najia	62.50 b	342.33 a	335.33 a	7.33 a	42.67 a	34.17 a
Ebaa	43.67 c	318.0 b	311.17 b	7.33 a	34.17 b	33.16 a

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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
Faronia	344.67 a	1201.17 a	9.0 b	38.33 b	6.67 a	49.0 b
Najia	342.50 ab	1239.17 a	9.67 b	41.0 a	7.50 a	59.67 a
Ebaa	331.50 b	959.83 b	11.33 a	34.33 c	6.50 a	63.67 a

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	Faronia	80.67 b	319.0 c	308.0 b	7.67 a	41.67 b	35.0 a
	Najia	62.33 c	338.0 ab	335.0 a	7.33 a	42.0 b	35.0 a
	Ebaa	44.33 d	320.67 bc	313.33 b	7.33 a	35.0 c	34.0 ab
Conservation+ limitless herbicide	Faronia	97.33 a	332.0 abc	323.33 ab	7.67 a	44.67 a	33.33 ab
	Najia	62.67 c	346.67 a	335.67 a	7.33 a	43.33 ab	33.33 ab
	Ebaa	43.0 d	315.33 c	309.0 b	7.33 a	33.33 c	32.33 b

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	Faronia	345.33 ab	1171.33 b	10. c	44.33 a	7.67 a	57.33 b
	Najia	353.67 a	1227.33 ab	12.33 b	46.0 a	8.67 a	68.0 a
	Ebaa	331.33 b	971.0 c	14.33 a	44.67 a	6.67 a	70.67 a
Conservation+ limitless herbicide	Faronia	344.0 ab	1231.0 ab	8.0 d	32.33 c	5.67 a	40.67 c
	Najia	331.33 b	1251.0 a	7.0 d	36.0 b	6.33 a	51.33 b
	Ebaa	331.67 b	948.67 c	8.33 d	24.0 d	6.33 a	56.67 b