



ASSESSMENT OF IMPACT OF ZERO TILLAGE AND SOME NUTRIENT RATES ON A WHEAT YIELD OF IBA 95 VARIETY

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Abstract

The research aims is to evaluate the effect of the zero tillage system and compare it with traditional farming by using 4 rates of urea fertilizer 46% (zero, 30, 40, 50 kg / d and 3 rates of superphosphate fertilizer 20% (zero, 30, 40 kg / d.) on some vegetative growth and yield properties for wheat Iba-95 variety. The seeds were cultivated at rate 40 kg / dunum, by using RCBD design with 3 replicates. The results of the zero tillage revealed its superiority over traditional agriculture in all Iba-95 variety traits at a level 0.05, but did not differ significantly from the traditional cultivation at a level probability 0.01 in studied traits; Plant height 81.3cm, Number of tillers 7 /plant, Spike length 11.5 cm, Number of spikes 302/m², Number of grains 51/spike, Weight of a thousand grains 43.2 g and total grains yield 3,680 tons / hectare, as in table (3), while values of traditional agriculture were; Plant height 81.2cm, Number of tillers 6/ plant, spike length 11.4 cm, Number of spikes 301/m², Number of grains 50/spike, Weight of 1000 grain 42.1 g and total grains yield 3,520 t / h. The urea fertilizer showed its superiority at a rate of 50 kg / d in all of characters as in table (4); Plant height 92.3cm, Number of tillers 9 /plant, Spike length

11.9 cm , Number of spikes 307/m², Number of grains 57/spike , Weight of 1000 grain 46,4 g and total grains yield 4,160 tons / h. The superphosphate fertilizer revealed its superiority at a rate 40 kg/h in all properties as in table (5) ; Plant height 88.6cm, Number of tillers 8 /plant , length of spike 11.6 cm Number of spikes 304 / m² , Number of grains 55/ spike, Weight of 1000 grain 45.2 gm and total grains yield 4,060 t / h. The interaction between the zero tillage system and both levels of fertilizer (Nitrogen 50, Phosphate 40 kg / d) showed significant superiority in probability level 0,05 and not differs in probability level 0,01 in all traits as in table (6) , where the total grain yield with both fertilizers (Nitrogen 50, Phosphate 40 kg / d) reached 4,269 and 4,165 ton/h respectively. Conclusion that the interaction of zero tillage with both N 50 kg/d, P 40 kg/d fertilizers were better than the interaction between traditional farming with both 2 kinds of fertilizer in all traits of plant . Therefore, it is preferable to cultivation Wheat-Iba 95 by zero tillage system due to its ecological, economical importance in achieving of sustainable agriculture.

Key words: Wheat Iba (95 V), Zero tillage, yield traits, N,P fertilization, Iraq.

Problem View

Due to of growth population in current increased the challenges in the world, including food security because of environmental crisis as global warming ,water lack and soil deterioration by salinity and desertification , where countries suffer from the shortage of food, as in some developing countries including Iraq , these challenges are require the attention of researchers to read off from these challenges by follows new agricultural techniques to maintain production factors from deterioration and devising

high varieties productivity and positively adaptation with sustainable of production factors as; soils , crop management process , where the Wheat is considered a strategic crop and forms first degree in supply the Iraqi population by food energy. Therefore, came forward attention for this research for compare zero tillage with traditional farming by using a highly wheat varieties in production such as Iba-95 with the provision of fit nutrient needs , as N,P fertilizers to increase the yield in area unit due the deterioration the soil which was the main problem in agriculture of Iraq for its less fertility and high salinity by follows traditional farming.

Introduction

The wheat (*Triticum aestivum*) is the cereal winter annual crop belongs to *Poaceae* family, The total cultivated land of wheat for 2016 in Iraq was 3,697,200 dunum, the production was 3,052,900 ton by a rate of 826 kg/dunum [1]. Wheat cultivation was widespread in the globally in terms of its importance that its consume comes in first grade and representative the essential pillar for food security in the world, Iraq suffers from shortage of food,[2], Iraq consumptive 4-5million ton/yearly where fill the shortage by import [3,4] expected the gap between the wheat production and the imported will increase in 2020 to reach more than 5 million ton. Therefore, requires for developing Wheat yield by applying new techniques for raising its production in low cost as zero tillage, that is considers the ecological agriculture with utilizing a new cultivar as Iba-95 wheat variety, also by expanding the agricultural areas. In a study, on wheat of Semeto variety In Erbil city for the impact of two systems of plowing with and without tillage on two speeds of drill equipment under the semi-arid region,

found Semeto variety without tillage was Superior to with tillage[5].In research, about the effect of four levels of nitrogen and three levels of irrigation (50%, 75%, and 100% of field capacity) in use Semeto as a new variety by comparative with Durum wheat shown the result, that nitrogen fertilizer with 50% irrigation water caused to increase the yield [6].In the study, mentioned that the grain yield increased by irrigation when field capacity at 50% for varieties; Sham 6 , Bekal and Iba 99 in following proportions; 68.14,61.91 and 72.24% respectively by comparative with control (without irrigation) in depending on rainfall with zero tillage [7]. In other study mentioned that the yield of Wheat grain increased from 2.61ton/ha as the control in depending on rainfall to 4.61ton/ha when added 68mm as supplemental irrigation with zero tillage [8]. in a study in Haryana of India has where compared the economics of wheat yield with zero tillage and conventional methods for assessing the contribution of zero tillage technique and inputs to the increased production due to zero tillage. The net income has been found higher in zero tillage method, due to the lower cost of production by a compared with the conventional method. The study has observed this technique has the potential to provide additional income to farmers and help in the conservation of natural resources. due to changes in input costs. Despite several economic and environmental advantages, In addition to being an eco-friendly technique [9]. It was observed from various studies that introduction of technology has enhanced land productivity significantly [10]. The study has revealed that it is possible to save machine labour and irrigation water under zero tillage than under conventional method. Due to resource saving, net return has been significantly higher in zero tillage technology [11]. This technology is an important alternative to save scarce resources and enhance the net farm

income. that the production of wheat was higher in zero tillage than in conventional tillage method by adopting this technology, farmers could save scarce resources and reduce the cultivation cost. The availability of zero-till seed drill needs to be accorded more attention to foster the adoption of zero tillage technology in wheat production [12].

Notice: Dunum = 50x50 m = ¼ hectare

Methodology

This study was carried out in the agricultural season 2016/2017 of Alhay district which distance 45 km from Wasit governorate of Iraq .The total area of Wasit Governorate 20744 km². It is located specifically in the eastern part of central Iraq, where soil texture was clay as in table (2).To evaluate the impact of two agricultural systems ; zero tillage and traditional farming on vegetative and productivity properties of Wheat variety Iba-95. Cultivated the variety in 15/11/2016 by seed rates 240 g /plot by average 40 kg/dunum ,planted in rows their distance 15 cm , area of plot 15m² , was fertilized the soil by 2 types; urea 46% in 4 rates as nitrogen fertilizer (zero, 30 ,40 and 50 kg / dunum ,applied in two stages first at planting and the second at tiller stage , with three levels of superphosphate 20% fertilizer (zero, 30 and 40 kg / dunum applied in planting stage.The Iba-95 variety of Wheat was planted by using the complete randomized block design (CRBD) with three replications by area plot 3x5 m². applied all crop management on the plots after planting. The samples were taken by area 1 m² using a wooden square by dimensions 1x1 m² from the middle of each plots ,data recorded for each experimental units for study a following traits ; plant height cm,number of tillers, spike length cm, number of seeds / spike, number of spikes / m²,weight of 1000 seed and total of grain yield ton/h. The data were

analyzed statistically according to (CRBD) design and compared the mathematical means due to Duncan test on probability levels 5% and 1% .

Results and discussion

This research was conducted in the Technical Institute of Wasit governorate / Hay district in Iraq . Chosen of the Wheat crop in this study comes. Wheat considers strategic crop and first in consumption in globally level and in Iraq due to its richest in nutrient energy ;70 % carbohydrates, 11-14% protein, 2-3 % oil, 1,7 % mineral,10.7 % fiber and supply energy .Where the application of sustainable environmental agriculture has become a strategic option to protect the ecosystem from deterioration and sustainability of life organisms . The agricultural process of zero tillage includes by placing seeds on the surface of the soil in a depth 7 cm according for crop type by using of special seeds drill without plowing. It is importance to increase the agricultural production by 15-25% by their compared with traditional agriculture, provide 30% of the time , 40% of employment , 60% of fuel consumption , 40- 50 % of a water use ,reduce the rates of seed and facilitate the a way of cultivation then to maintain irrigation water consumption to the level 50% , reduce soil erosion, helps on the recycling of plant waste in the land, activates the role of microorganisms in the analysis of organic compounds and rehabilitation it for non-organic compounds to achieve the case of adsorption and absorption through the roots, helps to reduce the spread of weeds and contribute to the follow a long time of crop rotation. Zero tillage is an agriculture without plowing or minimum a tillage or a system in which crops are planted pre-prepared soil by doing a narrow incision in sufficient depth and width to properly lay and cover seeds. The conservation agriculture aims to reduce soil service operations and thus

reduce production costs. This study focus on effect of two agricultural systems; first zero tillage by comparative with traditional farming by applying Iba-95 of wheat variety with supplying the plant nutrient requirements by 4 rates of urea 64% and 3 rates of superphosphate 20% fertilizers. It is necessary to improve the yield of Wheat and to innovate modern methods to increase the productivity of the unit of the area.. Hence, comes the attention of this research by applying of zero tillage , which is one of the sustainable environmental farming techniques aiming to achieve sustainable food production in dry and semi dry areas, give great flexibility in the agricultural process through the optimal utilization of resources and the preservation of soil moisture by covering the remnants of the previous crop, which increases fertility after its decomposition. In current the sustainable ecological agriculture has been come one of the essentials in the sustainable productivity to achieve a food security particularly in Wheat crop because it was the main crop in production and occupy of wide lands in a world and Iraq, that the selection of zero tillage for wheat Iba-95 variety with the variance rates of phosphorous and nitrogen fertilizer and their comparative with traditional farming, where the study region characterize by follows climate elements as in table (1);annual average temperature range between 9 °C in winter , 45 °C in summer by average 26.064 °C, humidity average 39.540% and total annual rainfall 134.5 mm, classify by hot climate , high moisture loses and less rainfall is semi-arid region [13].Table (2) revealed the soil analysis in study region that the texture was clay [14] . The aim of research how to activation the relationship between environmental factor that represented by farming method and genetic factor by use the Iba-95 variety with supplying its nutrient needs and

their reflection on vegetative growth & yield characters. Table (3) shows the variance between zero tillage and traditional farming ,that the zero tillage showed an increase than traditional farming at level 0.05 but did not differs significantly at level 0.01 in all vegetative and yield traits from the traditional agriculture were; Plant height 81.3cm Number of tillers 7 /plant ,Spike length 11.5 cm , Number of spikes 302 / m², Number of grains 51 /spike ,Weight of 1000 grains 43,2 g and the total grain yield 3,680 ton / hectare, while values of traditional agriculture were ; Plant height 81.2cm, Number of tillers 6 /plant ,spike length 11.4cm ,Number of spikes 301/ m²,Number of grains 50/spike,Weight of 1000 grain 42.1 g and the total of grains yield 3,520 t/h .Table (4) revealed the superior of nitrogen fertilizer at rate of 50 kg/d in all traits as following ; Plant height 92.3cm, Number of tillers 9/plant, length of spike 11.9cm, Number of spikes 307/ m², Number of grains 57/spike, Weight of 1000 grains 46.4 g and the total of grain yield 4,160 t / h. Table (5) revealed the superior of phosphate fertilizer at rate 40 kg/d in all traits ; Plant height 88.6cm, Number of tillers 8 / plant , length of spike 11.6 cm Number of spikes 304 / m², Number of grains 55/spike, Weight of 1000 grains 45.2 gm and the total of grains yield 4,060 ton / h. Table(6) revealed the interaction between the zero tillage system and both rates of fertilizer (Nitrogen 50, Phosphate 40 kg / d) reached 4,269 ton/ h and 4,165 ton/ h respectively showed significant superiority in probability level 0,05 and not differs in probability level 0,01 in all traits.Conclusion that both kinds of N,P fertilizers were better than the interaction between traditional farming and both kinds of fertilizer in all traits of plant , these results are consistent with [15,16,17] . So evaluates the zero tillage system was better than traditional farming due to improving of all traits of plant in

addition of its; ecological, economical importance in achievement of sustainable agricultural development.

Table(1):Average monthly value of climate elements of wasit governorate station 2016-2017.

Month	Temp. c	Humidity %	Rainfall mm
Jan.	11.77	7.5	31
Feb.	14	63	17.5
Mar.	18	65.64	21
Apr.	25	45.35	12
May	32	31	1
June	44	24	-
July	45	25	-
Aug.	38	25	-
Sep.	31	26	1
Octob.	31	39	7
Nov.	14	55	20
Dece.	9	68	24
Annual average	26.064	39.540	134.5

Table(2) soil analysis in study region explain Physical and chemical characters

Properties	Value
Orgnic mater	0.9
E.C dsm	2 mm
Cation Exchange capacity Meq.100g soil	39
available N ppm	6.5
Available p ppm	10.5
Soluble K ppm	200
Caco3 g. kg	31
Soil texture	Value
Sand	%21
Clay	%52
Silt	%27
Texture class	Clay

Table(3)shows the effect of cultivation system on vegetative &yield properties with out fertilizer in plant

cultivation system	Plant length cm	Spike length cm	Tillers number/plant	spikes number//m ²	Seeds number/spike	Weigh of 1000 seed gm	Yield ton/h
Zero tillage	81,3a	11,4a	7a	302a	51 a	43,2a	3,680a

Traditional cultivation	81,2a	11,4a	6b	301b	50 b	42,1b	3,520a
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Means preceded by similar do not differ among than the level of probability of 0.01

Table(4)shows the effect of urea fertilizer rates on vegetative &yield properties

Urea rate kg/d	Plant length cm	Spike length cm	Tillers number/plant	spikes number//m ²	Seeds number/s pike	Weigh of 1000 seed gm	Yield ton/h
Zero	81,3c	11,4b	7bc	302C	51d	43C	3,680b_c
30	90,1bc	11,6b	8b	305Bc	54c	45,8b	3,800b
40	92,3a	11,8a	9a	306B	56b	46,1a	3.760b
50	92,3a	11,9a	9a	307a	57a	46,4a	4,160a

Table(5)shows the effect of superphosphate fertilizer rates on vegetative &yield properties

Superphosphate kg/d	Plant length cm	Spike length cm	Tillers number/plant	spikes number//m ²	Seeds number/spike	Weigh of 1000 seed gm	Yield ton/h
Zero	81,3b	11,4a	7b	302b	51bc	43,2b	3,680b
30	82,3b	11,4a	8a	303b	53b	45,1a	3,840b
40	88,6a	11,6a	8a	304a	55a	45,2a	4,060a

Table(6) shows the effect of interaction between agriculture system and the rates of N,P fertilizers
on vegetative &yield of plant

System of cultivation	Fertilizers rate	Plant length cm	spike length cm	Tillers number/plant	spikes number//m ²	Seeds number/spike	Weigh of 1000 seed gm	Yield ton/h
Zero tillage	N zero	81,3c	11,4b	7b	302b	51b	43,2B	3,680b
	N 30	90,2b	11,6b	8b	305a	55a	45,1A	3,760b
	N 40	92,3a	11.8b	9a	306a	56a	46,1A	4,000a
	N 50	92,3a	12,9a	9a	307a	56a	46,4A	4,269a
	P zero	81,3b	11,4b	7b	302b	51b	43,2B	3,680b
	P 30	82,3b	11,4b	8b	303b	53b	45,1A	3,840b
	P 40	88,6a	12,6b	8a	304a	55a	45,2A	4,165a
Traditional cultivation	N zero	81,2b	11,4b	8b	301b	50b	42,2B	3,760b
	N 30	90,1b	11,5b	9a	304b	54b	45,7A	4,160a
	N 40	92,3a	11,8b	9a	306a	56a	46,1A	4,163a

	N 50	92,3a	11,8a	9a	306a	56a	46,5A	4,164a
	P zero	81,3b	11,4b	7b	302b	51b	43,2b	3,525b
	P 30	82,3b	11,4b	8a	303b	53b	45,1a	3,800a
	P 40	88,6a	12,6a	8a	304a	55a	45,2a	4,840a

Conclusions and Recommendations

The zero tillage system is consider sustainable development farming gave a positive results where increased the Iba-95 wheat variety yield in area unit in the study region due to improving the vegetative growth characteristics which reflected in yield. So advice to applied zero tillage for the follows reasons; It is important to increase the yield 15-25%. Provide 30% of the time . Provide 40% of employment . Provide 60% of fuel consumption .Provide 40-50 % of water use . Reduce the rates of seed and facilitate the way of cultivation. Reduce soil erosion. .Helps on the recycling of plant residues in the land .Activating the role of microorganisms in the analysis of organic compounds and rehabilitation to non-organic compounds to achieve the case of adsorption and absorption through the roots .Helps to reduce the spread of weeds . Without pollution and contribute to the follow a long time of crop rotation further is economical farming .

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