

The Effect Of Tillage System In Yield And Its Components Of Bread Wheat In Salahaldin Province –North Of Iraq

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Abstract

This study carried out in order to compare the effect of the type of tillage in some crop qualities and productivity of spring bread wheat, *Triticum aestivum* L. Cham 6 var. during the 2011-2012 season in field in district of Tuz - Salahaldin province north of Iraq in total area of six hectares (24 Iraqi Donum), RCBD design was used, the field was divided into three blocks included two levels of tillage, the first level was Conventional Tillage (CT) using disc plow to plowing the soil before sowing with normal seeder , second level was Zero Tillage (ZT) planting method using new ZT seeder with press wheels to compact soil on seeding row, thus we have 6 experimental units each unit area was one hectare. Except tillage methods all other factors such as fertilizer dosage(80 kg N ha⁻¹and 120 kg P₂O₅ ha⁻¹) , weed control, supplementary irrigation , seeding rate(120 kg ha⁻¹) sowing date(27/11/2011) are the same. Plant height (cm), stem thickness (mm) , number of tillers m⁻², , number of spikes m⁻², spike length (cm) , number of grains spike⁻¹, the weight of 1000 grains, specific (test) weight kg hectoliter⁻¹, biological yield kg ha⁻¹, grain yield kg ha⁻¹ and straw yield kg ha⁻¹ traits were studied.Results showed that ZT had significance superiority in number of tillers m⁻², number of spikes m⁻², biological yield kg ha⁻¹, grain yield kg ha⁻¹ and straw yield kg ha⁻¹ . traits comparing with conventional tillage, while no significant differences between the two planting methods in the other traits.

تأثير نظام الحراثة في الحاصل ومكوناته لحنطة الخبز في محافظة صلاح الدين - شمال

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الخلاصة

نفذت هذه الدراسة بهدف مقارنة تأثير نوع الحراثة في بعض الصفات الحقلية والإنتاجية للحنطة الناعمة *Triticum aestivum* L. صنف شام 6 خلال الموسم الزراعي 2011-2012 في قضاء الطوز ضمن

محافظة صلاح الدين ، وبمساحة اجمالية قدرها 6 هكتارات ، تم استخدام تصميم RCBD ، حيث تم تقسيم الحقل الى ثلاث قطاعات شملت مستويين من الحرث ، مثل أول مستوى الحراثة التقليدية (CT) باستخدام المحراث القرصي لحراثة التربة ثم الزراعة بالبازرة التقليدية ، وكان المستوى الثاني هو للزراعة بدون حراثة (ZT) باستخدام بذارة ZT جديدة مع عجلات ضغط لرص التربة حول الحبوب المزروعة وبالتالي أصبح لدينا 6 وحدات تجريبية كل وحدة مساحتها هكتار واحد، قسمت هذه الأرض إلى نصفين متساويين، نصف تمت زراعته بالبازرة التقليدية بعد الحراثة بواسطة المحراث القرصي ، والنصف الثاني تمت زراعته عن طريق البازرة الخاصة بالزراعة بدون حراثة ، كانت جميع العمليات الزراعية المنفذة متساوية، مثل مكافحة الادغال، الري التكميلي، معدل البذار 120 كغم للهكتار، إضافة الأسمدة، تاريخ الزراعة في 2011/11/27. درست صفات ارتفاع النبات(سم)، سمك الساق(ملم)، عدد الأشطاء في المتر المربع، عدد السنابل في المتر المربع ، طول السنبل(سم)، عدد الحبوب في السنبل، وزن 1000 حبة، الوزن النوعي (الاختباري) كغم/هكتولتر، حاصل الحبوب والحاصل الحيوي وحاصل القش كغم للهكتار، وبينت نتائج التحليل الاحصائي للمعاملات المدروسة باختبار دنكن عند مستوى المعنوية 5% ، وجود تفوق معنوي في صفات كمية حاصل الحبوب والقش ، الحاصل البيولوجي ، وعدد الأشطاء والسنابل في المتر المربع تحت معاملة الزراعة بدون حراثة مقارنة بالحراثة التقليدية.

Introduction

Among the problems facing the agricultural production is the environmental changing so the most important principle we need is saving water sources (Zhu and Lia 1997), It has become a extreme needed for new techniques to solve the Problems of climate changes, for that zero tillage has spread worldwide and become a familiar and recognized in the world because of its benefits in maintenance sources of soil and water supply (Ma and Tong 2007).

Juan et al (2008) found when he compared some growth traits and grain yield of winter wheat in North China, that the wheat had given a higher grain yield under the treatment of zero tillage compared with conventional tillage , in addition to its influence in maintaining soil moisture.

The study of Alrijabo and Hassan (2011) that compared Z.T. with Conventional Tillage (farmer method) in growth and yield traits for wheat. the results showed that ZT. was higher than the Conventional Tillage in number of grains spike⁻¹, grain yield, and straw biomass (gm m⁻²).

Due to the high cost of fuel and labor associated with conventional tillage, and because of their advantageous environmental consequences, interest in reduced and zero tillage systems has increased. ([Hannu Känkänen](#), et al. 2011)

Alrijabo (2012a) in his research on effect of ZT planting method on Wheat and barley mentioned that grain yield in ZT planting method was not less than CT. in any way.

In a field study by Alrijabo (2012b) in three different environmental sites within the region of low rainfall area, new agricultural technology of Zero Tillage were implemented in 2006-2007 season compared with conventional agriculture , results showed that the highest significant values in grain yield , number of spikes per square meter , plant height and specific weight traits was in Z.T planting method.

In a field study by Alrijabo(2012c) in 2006-2007 season three planting methods (ZT, Chisel and CT.) were used with numerous varieties of Bread Wheat and Durum Wheat in three different environmental sites within the region of rainfall area but under supplementary irrigation , as a scientific evaluation for the two used planting methods (Z.T and Chisel) in comparing with CT. and its effect on the studied traits in each crop, ZT planting method was significantly superior in 11 traits (grain yield , No. of spikes m^{-2} , weight of 1000 grain, No. of grains spike $^{-1}$, straw biomass , plant height , specific weight in Bread wheat and grain yield , , weight of 1000 grain, No. of grains spike $^{-1}$, plant height , in Durum wheat) while Chisel in 4 traits (weight of 1000 grain, No. of grains spike $^{-1}$ in Bread wheat and No. of spikes m^{-2} , straw biomass in Durum wheat) then CT. in 2 traits only (weight of 1000 grain in Bread wheat and specific weight in Durum wheat) .

Johasen et al (2012) compared the performance of both conventional tillage and zero tillage , the results showed that zero tillage was equal or better than conventional tillage in many crop and economic traits , in addition to a clear improvement in soil properties , water conservation and erosion resistance.

Sandeep et al. (2012) indicated that adopting a better tillage system not only improves the soil health and crop productivity but also improves the environment. A field experiment was conducted to investigate the effects of tillage and irrigation management on wheat (*Triticum aestivum* L.) production in a post-rice (*Oryza sativa* L.) management system on silt clay loam soil (acidic Alfisol) for 2003-2006. Four irrigation levels and two tillage systems (ZT: zero tillage and CT: conventional tillage) were tested. Results from this study concluded that ZT system was better compared to the CT system even with lower yields due to lower input costs for this treatment.

Many studies have shown that zero tillage (ZT) in combination with a surface crop residue layer - two components of conservation agriculture (CA) practice - can improve the agronomic water balance by increasing the amount of water that is readily plant available. (Sommer et al. 2012).

The research aims to evaluate the efficiency of the performance of zero tillage farming method in improving the yield and its components for the wheat crop, compared with conventional tillage.

Materials and Methods

Bread wheat cham-6 cultivar was obtained from ICARDA through the conservation agriculture project which belong to the Iraqi Ministry of Agriculture in

collaboration with the Faculty of Agriculture and Forestry at Mosul University and the College of Agriculture at the University of Tikrit. RCBD design with three replicates and one factor which is tillage system with two level (conventional tillage and zero tillage) study was implemented during the growing season 2011-2012 in 6 hectares field under supplementary irrigation in Salah Aldin province in Iraq , each experimental unit area was one hectare . Except planting methods all other factors such as fertilizer dosage(80 kg N ha⁻¹and 120 kg P₂O₅ ha⁻¹) , weed control, supplementary irrigation , seeding rate(120 kg ha⁻¹) sowing date(27/11/2011) are the same, conventional tillage was implemented by using disc plow (figure -1) for plowing soil before sowing grains by normal seeder (figure-2) with bird tongue tine (figure-3) , while the second level was direct seeding without plowing (zero tillage) using new seeder specialized for this type of planting (figure - 4). Traits studied were ; plant height (cm). by determine the average height of 20 plant samples for each replicate from ground level and up to the top of spike except awn, stem thickness measured by Carbon Fiber Composites Digital Caliper from above the third node , the number of tillers per square meter , number of spikes per square meter , spike length (cm). , number of grains per spike , weight of 1000 grain (gm.) , test weight kg hectoliter⁻¹ , grains yield , straw yield and biological yield were measured by weighing the grain , straw and grains + straw as kg per hectare respectively in each experimental unit. The results were analyzed for significance by using Duncan test at 5% level of significance.



Fig (1) Disc plow .



Fig (2) normal seeder



Fig (3) Different between ZT seeder tine (green) and normal seeder bird tongue tine



Figure (4) Zero Tillage seeder with press wheels

Results and Discussion

The results appears that the highest significant values in No. of spikes m^{-2} (387.1) , biological yield (9630 kg ha.^{-1}), grain yield(3893 kg ha.^{-1}) and straw yield (5737 kg ha.^{-1}) traits were in zero tillage planting method comparing with the same traits in conventional tillage which recorded (308.3) spikes number m^{-2} , (8213 kg/ha.)biological yield, (3185 kg ha.^{-1}) grain yield and (5028 kg ha.^{-1}) straw yield respectively. No significant differences were obtained from the other traits. These results were approved with the results found by Juan et al (2008) that the wheat crop had given a higher grain yield under the treatment of zero tillage compared with conventional tillage, also supported by the results found by Jat et al (2009), that zero tillage was equal or better than conventional tillage in many crops and economic traits , in addition to a clear improvement in soil properties , water conservation and erosion resistance. From these results it is obviously appear that zero tillage planting method was better than conventional tillage in grain yield and straw yield . This significant increasing in grain yield was due to the increase in spikes number per square meter not to the weight of 1000 grain or grains number in spikes because there were no significant differences between these two traits in the two planting methods.

Table (1) the results of growth , yield and its components traits of bread wheat .

| Traits | Zero Tillage | Conventional Tillage |
|----------------------------|--------------|----------------------|
| plant height (cm) | 88.5 A | 87.4 a |
| stem thickness (mm) | 2.40 A | 2.92 a |
| number of tillers m^{-2} | 429.5 A | 365.3 a |
| number of spikes m^{-2} | 387.1 A | 308.3 b |
| spike length (cm) | 7.9 A | 8.1 a |

| | | |
|---|-----------|-----------|
| number of grains spike ⁻¹ | 25.5 A | 24.9 a |
| weight of 1000 grain | 40.4 A | 37.1 a |
| specific (test) weight kg hectoliter ⁻¹ | 79.2 A | 78.3 a |
| grain yield kg ha. ⁻¹ | 3893 A | 3185 b |
| biological yield kg ha. ⁻¹ | 9630 A | 8213 b |
| straw yield kg ha. ⁻¹ | 5737 A | 5028 b |

References

1. Alrijabo , Abdulsattar A. and Hassan H. Hassan(2011)Effect of seed grading , seed rate and zero tillage planting method on growth , yield and its components of durum wheat (*Triticum durum DESF.*)under rainfed area. Mesopotamia J of Agric. : (39) 1: 177-190.
2. Alrijabo , Abdulsattar A. (2012a) Effect of the new farming system – Zero Tillage in growth , yield and its component of bread wheat , durum wheat and barley crop in moderate rainfall area in Ninevah province. International Food and Agricultural Congress, February,15-19, 2012, Antalya, Belek, Turkey.
3. Alrijabo , Abdulsattar A. (2012b) Effect of the new farming system – Zero Tillage in growth , yield and its component of Barley crop in Low Rainfall Area in Ninevah province.Iraqi J. for Soil Science (12) 1:178-188
4. Alrijabo , Abdulsattar A. (2012c) Effect of the new farming system – Zero Tillage in growth , yield and its component of bread wheat and durum wheat crops under supplementary irrigation area in Ninevah province. Minia International Conference for Agriculture and Irrigation in the Nile Basin

- Countries, 26th -29th March 2012, El-Minia, Egypt.
5. HannuKänkänen, Laura__Alakukku, YrjöSalo and TimoPitkänen (2011) Growth and yield of spring cereals during transition to zero tillage on clay soils. *European Journal of Agronomy*, 34(1) : 35–45
 6. Jat. M.L., M.K. Gathala, J.K. Ladha, Y.S. Saharawat, A.S. Jat, Vipin Kumar, S.K. Sharma, V. Kuma and Raj Gupta(2009), Evaluation of precision land leveling and double zero-till systems in therice–wheat rotation: Water use, productivity, profitability and soil physical properties *Soil & Tillage Research* 105 : 112–121.
 7. Johansen.C., M.E. Haque, R.W. Bell , C. Thierfelder and R.J. Esdaile,(2012), Conservation agriculture for small holder rainfed farming: Opportunities and constraints of new mechanized seeding systems, *Field Crops Research* 132 : 18–32.
 8. Juan. Li Su- Chen Ji-Kang, Chen Fu, Li Lin, and Zhang Hai-Lin, (2008), Characteristics of Growth and Development of Winter Wheat Under Zero Tillage in North China Plain: *Acta. Agron. Sin.* 34(2): 290–296.
 9. Kankanen, H. , Laura Alakukku, YrjöSalo and TimoPitkanen(2011) Growth and yield of spring cereals during transition to zero tillage on clay soils, MTT Agrifood Research Finland, FI-31600 Jokioinen, Finland,
 10. Ma G-Z, Tong H. (2007), The study and analyzing of the affection to the winter wheat by conservation agricultural technology in the dry land farming area. *J Agric Mechanization Res* , (5): 139–142 (in Chinese with English abstract).
 11. Sandeep K. , Pradeep K. Stephen H. and Anderson K. (2012) Tillage and Rice-Wheat Cropping Sequence Influences on Some Soil Physical Properties and Wheat Yield under Water Deficit Conditions. *Journal of Soil Science* ISSN: 21625360 Vol: 02 Issue: 02 Pages: 71-81 Provider: DOAJ Publisher: Scientific Research Publishing .
 12. Sommer,R. , Piggin, C. , Haddad, A. and Hajdibo,A. (2012) Simulating the effects of zero tillage and crop residue retention on water relations and yield of wheat under rainfed semiarid Mediterranean conditions. *Field Crops Research* ISSN: 03784290 Year: 2012 Volume: 132 Pages: 40-52Provider: Elsevier DOI: 10.1016/j.fcr.2012.02.024
 13. Zhu W-S and Jia C-Q. (1997). Effects and prospects of reduced tillage with mulch in wheat. *Filed Crop* , (4): 26–27 (in Chinese).