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# Effect of different tillage methods and water removal in some developmental stages on yield and yield components of wheat hamun cultivar

**Mohammad Javad Motamedipur[1], Hamid Reza Mobasser[2*] and Hamid Reza Ganjali[3]**

1. Master of Agriculture, Zahedan Branch, Islamic Azad University, Zahedan, Iran
2. Department of Agriculture, Zahedan Branch, Islamic Azad University, Zahedan, Iran
3. Department of Agriculture, Zahedan Branch, Islamic Azad University, Zahedan, Iran

***Corresponding author:*** Hamid Reza Mobasser

**ABSTRACT:** To study the effect of different methods of tillage and irrigation removes some developmental stages on yield and yield components of wheat plain, strip-plot experiments (split split tape) in a randomized complete block design with three replications in crop year 2012 agricultural and natural Resources Research station of Sistan was carried out. In this experiment, treatments tillage include: T1: conventional tillage, including moldboard plow to a depth of 25 cm and a disc to a depth of 15 cm, T2: low-tillage or tillage surface including disk depth of 15 cm, T3: tillage depth including subsoiler plowing to a depth of 50 cm and depth 15 cm disc and remove irrigation treatments consisted of four levels: W0: full irrigation (control) consisted of five stages: tillering, stem elongation, heading, grain filling and dough. W1: removal of grain filling and dough stages. W2: Delete heading and grain filling stages. W3: Delete stages of tillering and stem elongation. The results showed that tillage methods on the number of ears per square meter, number of grains per spike, grain weight and plant height were significant at the 5% level and biological yield, grain yield and harvest index showed no significant effect at 5% level . Remove the irrigation treatments on yield and characteristics of this test were significant at the 5% level.

***Keywords*:** Wheat, yield, Tillage, Irrigation

## INTRODUCTION

Several factors affect wheat production is among the most important soil structure and crop factors, 11% of the total arable land in the world is having congestion problems (Van Lynden, 2000). Tillage causes of permeable soils are compacted (Arnaez, 2007). Tillage can process biological and non-biological soil formation directly by changing the structural features such as cracks, aggregate and connections, and indirectly through changes in soil conditions for the biological and non-biological processes such air-conditioning, thermal behavior, etc. affect permeability ( El Titi, 2003). The effects of no-tillage, low-tillage and conventional tillage on wheat yield Concluded that the difference between tillage methods and the interaction between tillage and soil moisture content in the different stages of stem elongation, Flowering and grain filling were not significantly different tillage methods on grain yield and other agronomic traits were significantly different except for plant height and harvest index. The population growth and the need for agricultural production and water resources in the world to seriously consider the issue of water scarcity is So that in the future water will be the main challenge for developing countries, food production, water availability and sustainability of water resources on depends (Braun, 2010). Deficit irrigation including irrigation methods with a view to increasing production per unit of water consumed. This method is superior to the vast lands of the year, due to reduced precipitation, water resources are limited, it is more common in areas that

are exposed to water deficit, the deficit irrigation as a way to increase water use efficiency (Howell, 2004)**.** Stress at any stage of life that affects plant growth But the amount and severity of damages, compensation capacity and its effect on the developmental stage of the final product to be stressed plants depends (Faroeq, 2008 ). The five-year study in which gachsaran like Sistan region is warm, the soil moisture, tillage methods was significant only in the second year and at stem elongation and grain yield were significant differences between tillage methods and moldboard has the highest yield (Rahimzadeh, 2004). These tests determine the effect of different methods of tillage and irrigation removes some developmental stages on yield and yield components of wheat were plain.

## MATERIALS AND METHODS

To study the effect of different methods of tillage and irrigation removes some developmental stages on yield and yield components of wheat plain, strip-plot experiments (split split tape) in a randomized complete block design with three replications in crop year 2012 agricultural and natural Resources Research station of Sistan was carried out. In this experiment, treatments tillage include: T1: conventional tillage, including moldboard plow to a depth of 25 cm and a disc to a depth of 15 cm, T2: low-tillage or tillage surface including disk depth of 15 cm, T3: tillage depth including subsoiler plowing to a depth of 50 cm and depth 15 cm disc and remove irrigation treatments consisted of four levels: W0: full irrigation (control) consisted of five stages: tillering, stem elongation, heading, grain filling and dough. W1: removal of grain filling and dough stages. W2: Delete heading and grain filling stages. W3: Delete stages of tillering and stem elongation. Traits such as plant height, number of ears per square meter farm that can be done, and the remaining notes that more time was needed after the harvest was attempting to measure. Plant height, plant height measured from the soil surface to the tip of the spike, excluding awn was performed with a single centimeter. Number of spikes per square meter based on spike counts in a square meter and the number of kernels per ear, based on the average number of seeds in 10 randomly performed. Hitting action and separation of grains and straw were manually grain weight scales for each plot were weighed precisely and accurately centigram me Based on grain yield in kilograms per hectare was calculated. After determining grain weight, grain yield, divided into four samples of 250 seeds per plot were selected and the system automatically counts the number of seeds was. After data collection, analysis of variance was conducted through MSTATC statistical program.

## RESULTS AND DISCUSSION

### *Biological yield*

Results from analysis of variance table (Table 1) indicate that tillage methods, biological yield, 5% had no significant effect. According to the variance analysis table (Table 1) observed that the removal of irrigation on Biological yield at 5% level had a significant effect, the comparison shows (Table 3) the highest yield to treatment W0 irrigation (control) to 16 780 kg ha and the lowest yield of W3 treated with 12530.33 kg achieved a 25% reduction relative to the control indicates. Analysis of variance table shows the interaction of tillage practices and irrigation procedures on the removal of Biological yield, 5% have had a significant impact.

### *Grain yield*

According to the variance analysis table (Table 1) shows a significant effect of tillage methods yield at 5% are not. Variance analysis table (Table 1) show that irrigation treatments on yield at 5% level had a significant effect is based on the comparison (Table 3) Most of the treatments W0 irrigation (control) and 889.6822 kg ha and less the yield of W3 removal treatments at tillering and stem elongation with irrigation is 111.4554 kg ha A 33% reduction relative to the control indicates that the difference in a group are W1. Generally, the yield stress is reduced. The reduction in vegetative growth stage because of the reduced number of grains per spike and spikes per square meter and a decrease in the reproductive stage due to weight loss or reduction of seed and grain number per is ear. Drought at grain filling stage, especially if the heat is associated with accelerated aging, weight loss and grain filling period is reduced (Shakiba, 1996).

Table 1. Combined analysis of variance for grain yield and related traits

| S.O.V | df | Harvest index | Grain yield (kg/ha) | Biological yield (kg/ha) | Thousand grain weight (gr) | Number of grains per spike | Number of spike |
|---|---|---|---|---|---|---|---|
| | | Mean-square | | | | | |
| R | 2 | 4926.861$^{*}$ | 27.750$^{ns}$ | 11.517$^{*}$ | 100833.333$^{ns}$ | 250744.444$^{*}$ | 11.111$^{ns}$ |
| Tillage | 2 | 1220.111$^{*}$ | 135.750$^{*}$ | 57.412$^{*}$ | 2770833.333$^{ns}$ | 217086.111$^{ns}$ | 1.861$^{ns}$ |
| Error a | 4 | 133.444 | 13.250 | 10.484 | 3252916.667 | 1355861.111 | 15.153 |
| Irrigation | 3 | 33011.667$^{*}$ | 86.630$^{*}$ | 73.598$^{*}$ | 28532129.630$^{*}$ | 90682.077* | 120.546$^{*}$ |
| Error b | 6 | 647.306 | 13.824 | 23.654 | 1668240.741 | 328077.778 | 2.741 |
| Tillage* Irrigation | 6 | 1028.556 $^{*}$ | 10.269$^{*}$ | 7.967$^{*}$ | 3896018.519$^{*}$ | 1074108.333$^{*}$ | 20.380$^{*}$ |
| Error c | 12 | 758.278 | 5.046 | 15.606 | 1359212.963 | 402783.333 | 7.116 |
| CV % | - | 8.64 | 4.87 | 9.40 | 7.79 | 11.64 | 7.38 |

*, **, ns: significant at p<0.05 and p<0.01 and non-significant, respectively.

***Harvest index***

According to the variance analysis table (Table 1) tillage methods on HI, 5% had no significant effect. Results from analysis of variance table (Table 1) show that irrigation methods on the removal of HI has a significant effect at 5% level, Harvest index majority dedicated to economic organs is organic material made. By comparison (Table 3), the highest Harvest index of treatment W0 (control) with 22.40 percent and 31.33 percent, with the lowest Harvest index of W1 treatment has been decreased by 22% relative to the control. W2 and W3 treatments were also statistically significant in one group were not statistically different. Stress reduction is Harvest index, this reduction in vegetative stage of spike per square meter decreases and the decrease of grain per spike and grain weight loss due to reproductive growth stage. The results with the results provided by (Ali, 2001; Wang, 2004) is consistent.

***Number of spike per square meter***

According to the analysis of variance table (Table 1) observed that tillage methods significant effect on the number of spike per square meter have 5% level. Comparison shows (Table 2) with the highest number of spike per square meter methods conventional tillage with 330 spikes per square meter and the lowest owned treatment reduced tillage depth with 312 spikes which was treated soil Interrupt are placed in a group and were not significantly different. According to the variance analysis table ( Table 1 ) results indicate that the number of spikes per square meter of irrigation treatments had significant effect at 5% level . Based on the comparison ( Table 3 ) observed that the greatest number of spike per square meter of treated W0 irrigation (control ) with 382 spikes per square meter and the minimum number of spike per square meter of treated W3 240 spike has been attributed to control treatment decreased by 37% .

***Number of grains per spike***

Results of analysis of variance shows a significant effect of tillage methods on grain number per ear 5% level are shown in Table 2 show that the highest number of grains per spike of reduced tillage treatments with 49 that seed treatment with conventional tillage in a group are statistically significant and the lowest belongs to the deep tillage treatments were a 42 seed. According to the variance analysis table irrigation treatments significant effect on the number of grains per spike had the 5% level, so that the greatest number of kernels per treatment W0 (control) with 50 seeds and and the lowest treatment W2, remove irrigation during heading and grain with 42 grains has been reduced by 15% relative to the control indicates a group were also treated W1 and W3 (Table 3). Also, many researchers believe that the critical flowering stage of wheat growth stages to water stress at flowering stage drought has caused severe damage to grain yield of grains per spike is reduced (Moustafa, 1990 ).

Table 2. The mean yield of different tillage methods

| Treatments | Mean-square | | | |
|---|---|---|---|---|
| | Plant height | Thousand grain weight (gr) | Number of grains per spike | Number of spike |
| T1 | 330.33$^{a}$ | 47.167$^{a}$ | 43.22$^{a}$ | 89.083$^{a}$ |
| T2 | 313.66$^{b}$ | 48.917$^{a}$ | 43.39$^{a}$ | 82.167$^{b}$ |
| T3 | 312.16$^{b}$ | 42.417$^{b}$ | 39.52$^{b}$ | 81.583$^{b}$ |

The means with common letters, the difference is not statistically significant

***Thousand grain weight***

According to the variance analysis table (Table 1) results indicate that tillage methods, a significant effect on grain weight at 5% level had, Table 2 shows that the highest seed weight of low-tillage with 39.43 grams with conventional tillage in a group are statistically And the lowest belongs to the tillage depth was 52.39 g. Results of the variance analysis table (Table 1) show that irrigation methods on Thousand grain weight effects significant at 5% level have so most of the weight seed treatment W0 (control) and 87.45 g, respectively, and the lowest W2 treated with 5.39 g of Thousand grain weight was decreased by 14% compared to the control treatment was also observed that the difference in treatments W1 and W3 are in a group (table 3).

Table 3. The mean yield and yield components in different irrigation

| Mean-square | | | | | | |
|---|---|---|---|---|---|---|
| Treatments | Harvest index | Grain yield (kg/ha) | Biological yield (kg/ha) | Thousand grain weight (gr) | Number of grains per spike | Number of spike |
| W1 | 382.222[a] | 50.111[a] | 45.872[a] | 16780 | 6822.889[a] | 40.22[a] |
| W2 | 344.889[b] | 45.667[ab] | 40.247[ab] | 15520.222[ab] | 4878.778[c] | 31.33[c] |
| W3 | 307.556[c] | 42.556[b] | 39.503[b] | 15000[b] | 5551[b] | 36.78[b] |
| W4 | 240.222[d] | 46.333[ab] | 42.552[ab] | 12530.33[c] | 4554.111[c] | 36.22[b] |

The means with common letters, the difference is not statistically significant

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