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ORIGINAL ARTICLE

Study the Relationship Between Yield Components of Corn With Planting Patterns and Tillage Methods

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ABSTRACT

In order to Study the relationship between yield components of corn with planting patterns and tillage methods this study was held in Arsanjan in 2010. The experiment was laid out in a split plot design with 4 replications in which 3 methods of tillage which include plow and disk with straw, plow and disk without straw and plow and disk with burning straw was considered as main plots and 4 planting methods 20×60, 20×70, 15×60, 15×70 considered as sub plots. The results showed there was no significant difference between the treatments in the number of plant in each area unit, but there was some significant difference in yield components include: number of ear per meter square, number of grain per ear, 1000 grain weight and as a result grain yield. And in all studied factors, putting the straw under the ground concluded to be the best method of tillage and burning them was the worst. Although in 20×70 treatment the best planting pattern was achieved for yield component.

Key words: maize, tillage method, planting pattern, yield component,

Introduction

Maize is one of the world's highest value crops, with a multibillion dollar annual contribution to agriculture. The great adaptability and high yield of maize as a food, feed and forage crop have led to its production on a massive scale, with acreage expanding at the expense of other crops [1].

Conservation tillage (no till and reduced tillage) practices simultaneously conserve soil and water resources, reduce farm energy and increase or stabilize crop production.

Conservation tillage leads to positive changes in the physical, chemical and biological properties of a soil [4,16,17,18]. Soil physical properties that are influenced by conservation tillage include bulk density, infiltration and water retention [10].

Improved infiltration of rainwater into the soil increases water availability to plants, reduces surface runoff and improves groundwater recharge [7]. Reduced soil cultivation reduces farm energy requirements and overall farming costs as less area has to be tilled [9].

Shirley Phillips one of the pioneers of research on cultivation without tillage in Lexington, Kentucky University, wanted to prove that no tillage method for producing crop is worthless. But after observing the results, he became one of the adherents and most successful promoters in no tillage cultivation, not only in the United States. Shirley Philips because of his interest in this two method and his ability in promoting this method, today is named the father of no tillage cultivation [11].

In order to investigate the effects of different

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amounts of surface residue and tillage on barley yield and yield components of forage maize grown in the second culture, an experiment was conducted in 2009 in Isfahan. The results showed that tillage effects on stem diameter, shoot dry weight, total dry weight and leaf weight ratio than the shoot fresh weight has significant difference [6].

Surveys conducted by Azari and Khajehpour has shown that planting pattern has significant effects on grain per ear, grain number and grain yield in a row, leaf area index and harvest index [2].

Carlos Kruter in Chile said: planting without tillage through the use of remainants of corn and wheat in the soil will prevent soil erosion and in 19 years of cultivation without tillage consecutive the amount of organic matter of soil increases from 1.7 percent to 10.6 percent [8].

Experiment in low-rainfall areas of North Africa in order to test the minimum tillage on corn yield in two kind of soil, clay and sandy was conducted in 2007. The results showed that three types of tillage system, had no significant difference [15].

In order to study the effects of planting density and planting pattern of seed corn and its effect on reducing the usage of herbicides an experiment was performed in 1386 in Weed Research Institute. The planting pattern of corn on four levels considered as a major factor and the five levels of herbicides as subplots. Based on the results of planting two rows pattern with the density of 25% greater than usual and the composition of Atrazine, one liter with 5 liters Aradykan per ha was suggested as the best treatment [6].

In an experiment in 2004 in isfahan, in order to determine the effect of plant density and planting pattern and spatial pattern of corn canopy on growth and physiological parameters were performed and shown that the effect of corn planting patterns on growth parameters of pigweed is less than the density of corn. Promoting planting two rows of corn and applying higher densities without the use of herbicides through crop growth competitive parameters, pigweed growth will reduce [5].

In an experiment in 2006-2007 in Pishavar on corn with three tillage factors in completely randomize design was performed. The results showed that in two years plant product and yield was not affected by tillage. Of course weed management was done [8].

Ben *et al* compared two methods of tillage and no tillage implement traditional tillage and crop rotation on increasing soil fertility in terms of semiarid Mediterranean and the experimental results of four years do show that most parameters of reviews for various products in the traditional tillage methods obtained [13]

Tomas Grab in an experiment examined the effect of plant mulch and tillage methods on soil

characteristics on wheat culture and concluded that the existence of plant residues with tillage made the soil better and omitting tillage caused the soil to have less permeability and no tillage had no effect on wheat yield [14].

Rafiee in order to determine the appropriate density and planting pattern of maize varieties KSC700 experiment using a randomized complete block design to strip plot - factorial implemented in Khorram Abad. The results showed that double row planting pattern density is possible so that planting two rows with 75 cm row spacing and density of 95 thousand plants per hectare with 12.24 tons per hectare yield significant advantages compared to other treatments was. In a row planting pattern, row spacing 60 cm with a density of 80 thousand plants per hectare yield 10.9 tons per hectare obtained [12]. To investigate Study the relationship between yield components of corn With planting patterns and tillage methods, this experiment was performed in 2010 in Arsanjan functions and objectives of the implementation of increased soil organic matter and thus increase the performance of corn and also review various Configurations planting on yield and yield components Corn and recommend the best method and best tillage planting of corn farmers work area.

Material and methods

The experiment has been implemented in 2010 in Arsanjan at the height of 1650 meters of sea level and 29 degrees 55 minutes latitude and 53 degrees longitude and 18 minutes.

In this experiment the split plot design with completely randomized block design with 4 replication was used in which the main plot was tillage methods (A) in three degrees

A1 tillage and disk without straw

A2 tillage and disk with straw

A3 tillage and disk and burning straw

And the sub factor was different planting method (B) in 4 treatment

B1 20*60 Each row distance 60 cm and 20 cm between plants on the line

B2: 20*70 Each row distance 70 cm and 20 cm between plants on the line

B3: 15*60 Each row distance 60 cm and 15 cm between plants on the line

B4: 15*70 Each row distance 70 cm and 15 cm between plants on the line

Tillage operations was began after wheat harvest in a state with no tillage straw in all main plots and all straw collected by workers and in the case of existing straw, we added 50 kg per ha urea and also plow and disk was done. For burning treatment we burned the main plots of this factor and after completing we plowed the field. Before Operation

tillage sample mixed soil depth of 0 -30 cm removed in the laboratory of Soil Science studied and based on analysis of soil and recommended lab value 150 kg super phosphate Triple, 100 kg of potassium sulfate and 250 kg of urea was used. Nitrogen fertilizer recommendations in three stages, including 50 kilograms while planting, 100 kg in 50 cm height and 100 kg of plant flowering were used. After the tillage operations and methods of forecasting accuracy in order to test the plant in rows 60 and 70 cm distance with a labor force of construction and use of maize 704 varieties by 15 and 20 cm distance and were planted by hand. Each test consisted of six lines planting of ten meters in length, the distance between a line of no planting in main plots and the distance between the two lines was considered no planting distance between repeated testing and the establishment of a climate with two meters of irrigation was determined.

Immediately after planting farm irrigation operations has done and within a week the second irrigation was performed. All seeds were planted at a distance of 15 to 20 days to fight the green weeds of farm herbicides rate 4 kg Aradykan and 1 kg laso per ha was used. During the eruption the necessary care performed and in the second half of October harvested and necessary notes were performed. For this purpose two border lines in each side removed and the four middle lines were harvested in each plot and plant height of ten random measurements and number of plants per square meter, ear number per square meter - Total rows per ear, grain number per ear and grain weight and total weight of seeds in a square meter measured using SAS statistical software variance performed Duncan and treatment method were compared.

Result and discussion

Number of Ear per Meter Square:

1-1 the Effect of Different Tillage Method:

Experiment results show the different tillage methods on ear number per square meter had a significant difference at 5% level.(table 10) The straw in the soil had shown the most ears per square meter and burning straw had the lowest number of ear in square meters. (chart 1).

The results of these tests match the tests carried out in Isfahan the different effects of surface tillage on yield of barley and forage corn yield in the second culture was examined and the results showed tillage on stem diameter, dry weight, ear number, has had a significant effect [6].

2-1 Effect of Different Planting Pattern on Ear Number in Square Meter:

The results show a different arrangement of implanted ear number per square meter was not statistically different. Most ear per square meter to 60×15 arrangement that had the greatest number of plants was and 70×20 had the lowest number of ear m to treatments that have the lowest number of plants. (chart 2).

The results of this research and the research conducted by Azeri and Khajehpour concluded that a significant effect of planting pattern of grain per ear, number of rows affected the grain yield. Also, test results conducted by Rafiee showed that different density and planting pattern of corn conforms the results [2,12].

3-1 Interaction of Different Tillage Methods and Different Planting Arrangement on the Number of Ear per Meter Square:

Results Show interaction can be seen between different methods of tillage and planting arrangement on the number of ear per meter square, that the most number of ear related to treatment with 60×20 arrangement with tillage in straw and the lowest number of ear per meter was in 70×20 treatments planting and burning straw. (chart 3).

Number of Grain per Ear:

2-1 Effect of Different Tillage Methods on Grain per Ear:

The results show different tillage methods was significantly different on grain per ear at 1%. (table 10) the existence of straw in the soil causes the greatest number of seeds per ear and burning straw has the lowest number of grains per ear. (Chart 4) The results showed that different planting arrangement was significantly different at 1% on grain yield per unit area, the results of this study results Rafiee (2009) Michael Carter and colleagues (2005) the impact of different tillage methods and use of plant residues before planting to increase soil organic matter and in increased performance on yield components of corn were examined and resulted that tillage operations and use of plant residues increased the yield components of grain per ear [12,8].

2-2 Effect of Different Planting Arrangement on the Number of Grain per Ear:

Different planting arrangement on grain per ear showed significantly different at 5% and the highest number of grains per ear was for the 60×20 arrangement and the lowest number of grains per ear for 70×20 arrangement. (chart 5).

The results showed that different planting arrangement on grain yield per unit area, has a significant difference at 1% and the results of the

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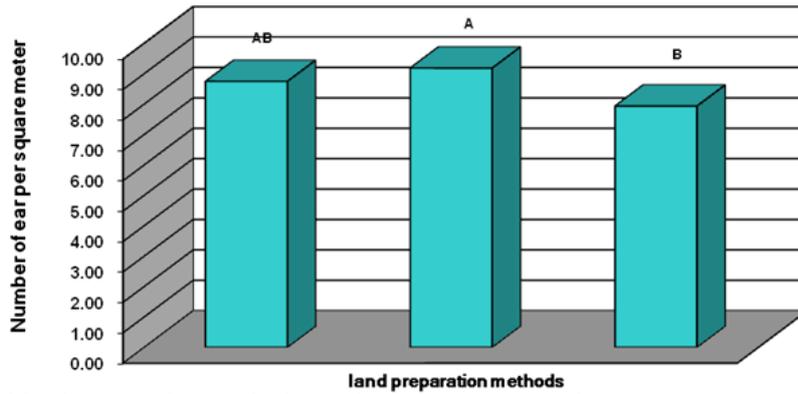


Chart 1: Effect of land preparation methods on the average ear number per square mete.

Table 1: Different tillage methods on ear number per square meter

| treatment | a ₁ | a ₂ | a ₃ |
|-----------|----------------|----------------|----------------|
| average | 8/75 | 9/19 | 7/93 |
| class | AB | A | B |

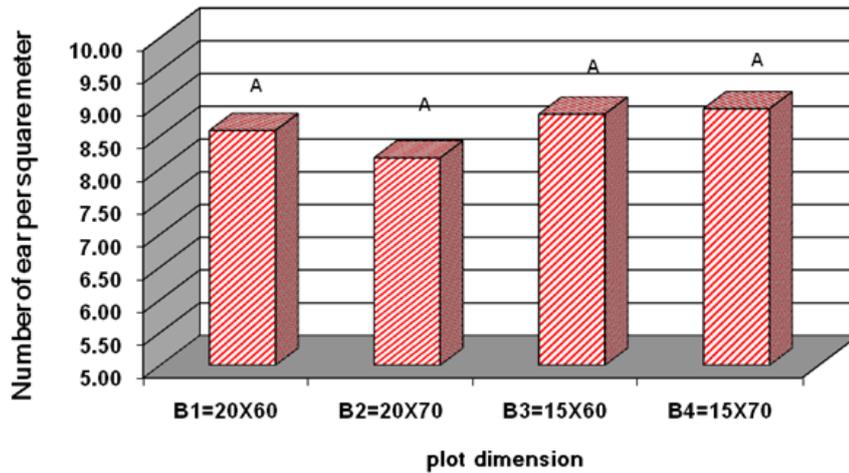
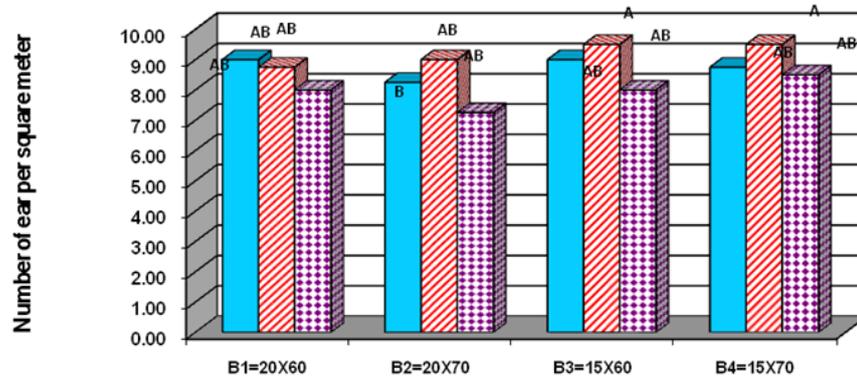


Chart 2: Effect of dimensions on the average number of ear in square meter.

Table 2: Effect of Different planting pattern on the number of ear per square meter.

| treatment | b ₁ | b ₄ | b ₃ | b ₂ |
|-----------|----------------|----------------|----------------|----------------|
| average | 9/18 | 9/57 | 8/83 | 8/91 |
| class | A | A | A | A |



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Chart 3: The interaction between land preparation methods and dimensions of plots on ear number per square meter.

Table 3: Interaction preparation and planting techniques on the ear number per square meter.

| treatment | a ₁ | a ₂ | a ₃ |
|----------------|----------------|----------------|----------------|
| b ₁ | AB8/75 | AB9/00 | AB8/00 |
| b ₂ | AB8/25 | B7/25 | AB9/00 |
| b ₃ | AB9/00 | A9/50 | 00/AB8 |
| b ₄ | AB8/75 | A9/50 | AB9/50 |

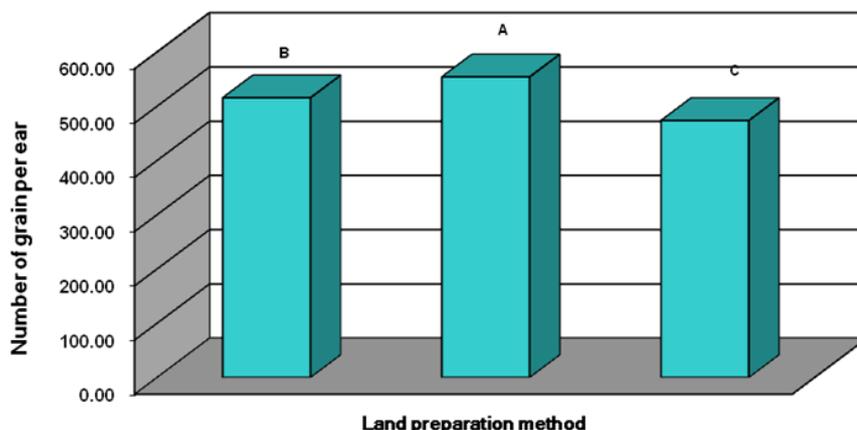


Chart 4: Effect of land preparation methods on the average number of grains per ear.

Table 4: Effect of different tillage methods on grain per ear.

| treatment | a ₁ | a ₂ | a ₃ |
|-----------|----------------|----------------|----------------|
| average | 515/63 | 554/19 | 473/75 |
| class | B | A | C |

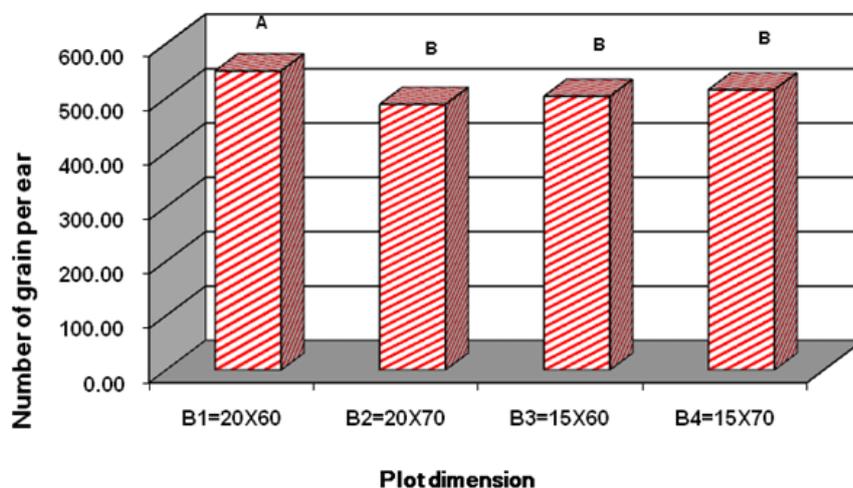


Chart 5: Plot impact on the average dimensions of grain per ear.

Table 5: Effect of different planting arrangement of grain per ear.

| treatment | b ₁ | b ₂ | b ₃ | b ₄ |
|-----------|----------------|----------------|----------------|----------------|
| average | 550/17 | 488/75 | 503/58 | 515/58 |
| class | A | B | B | B |

research results conducted by Rafiee (2009) conducted in Isfahan that Effect of different planting densities on yield and yield components of corn placed and the results have reviewed the various planting arrangement on the yield component of grain per ear, including the impact has had a significant match [12].

2-3 Interaction of Different Methods of Tillage and Planting Configurations of Grain per Ear:

Experiment results indicate that among the various methods of tillage and planting Configurations interaction can be seen the largest number of grains per ear related to 60 × 20 arrangement with straw and the lowest number of grains per ear about 70 × 15 arrangement treatments And the straw was burned (Chart 6) the results indicated that different planting arrangement on grain yield per unit area, has a significant difference at 1%, the results of this study results Rafiee (2009)

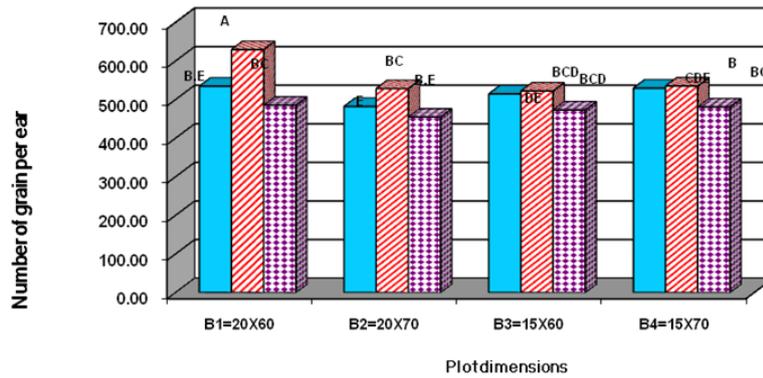


Chart 6: The interaction between land preparation methods and dimensions of plots on grain per ear.

Table 6: Interaction of tillage methods and different planting arrangement on the number of grains per ear.

| treatment | a ₁ | a ₂ | a ₃ |
|----------------|----------------|----------------|----------------|
| b ₁ | 00/535BC | 630A | 5/485DE |
| b ₂ | 50/482BE | 8/528 BC | 00/455E |
| b ₃ | 00/515BCD | 50/522BCD | 3/473DE |
| b ₄ | 530BC | 5/535B | 30/481CDE |

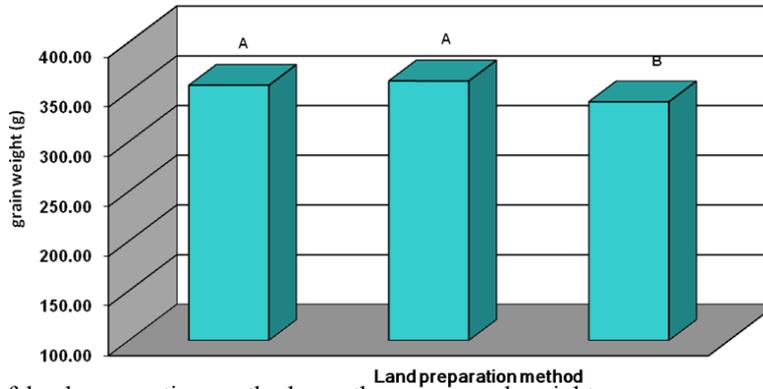


Chart 7: Effect of land preparation methods on the mean seed weight.

Table 7: Effect of tillage methods on grain weight.

| treatment | a ₁ | a ₂ | a ₃ |
|-----------|----------------|----------------|----------------|
| average | 56/356 | 9/360 | 00/340 |
| class A | A | B | |

and Michael Carter Colleagues (2005) also has a positive hand [12,8].

3- Grain Weight:

3-1 Effect of Different Tillage Methods on Grain Weight:

Different tillage methods on grain weight significantly different at 5% level are shown (table 10). Most seed weight was for straw treatment and the lowest number of seed weight for straw burning. (Chart 7).

The results of this experiment with the results of experiments conducted by Michael Carter colleagues (2005) and surveys conducted in Isfahan (2009) [8] and the experiment done by Tomas bogdon (2008) and Sihem ben (2010) The effect of different methods of tillage and use of plant residues and plant mulch in corn farming examined were the

result: different methods and use of mulch tillage increased plant performance, including performance yield component, ear number per unit area, grain number per ear, grain weight function has a significant effect of corn conforms [15,10].

3-2 Effect of Different Configurations of Planting Seed Weight:

The results show different Configurations planting seed weight significantly different from 1% shows (Chart 8) the results indicated that different planting arrangement on grain yield per unit area, has a significant difference at 1%. The results of this study, the results of experiments conducted by Rafiee (2009) that the density of different corn reviewed and concluded that the planting of different Configurations significant performance and yield components of maize grain are conformed [12].

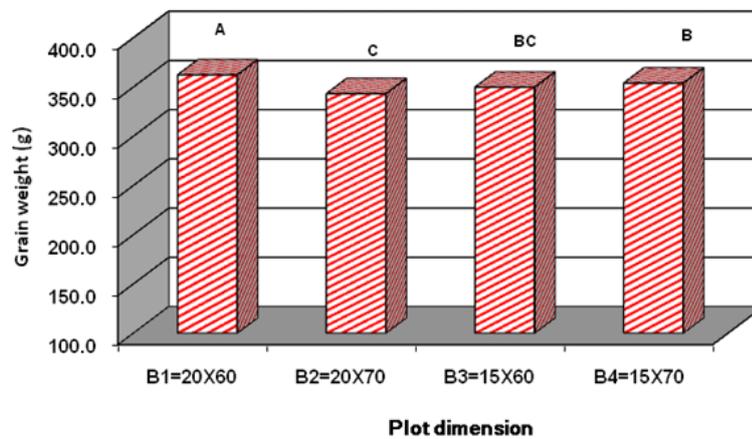


Chart 8: Effect of plot dimensions on average grain weight.

Table 8: Effect of different planting arrangement on grain weight.

| treatment | b ₁ | b ₂ | b ₃ | b ₄ |
|-----------|----------------|----------------|----------------|----------------|
| average | 5/362 | 3/343 | 350 | 354 |
| class | A | C | BC | B |

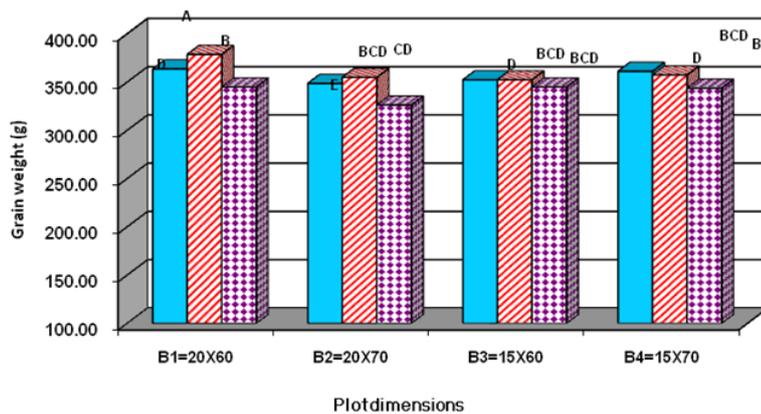


Chart 9: Interactions of plot dimensions and land preparation methods on grain weight.

Table 9: Interaction of different tillage methods and planting patterns on grain weight.

| treatment | a ₁ | a ₂ | a ₃ |
|----------------|----------------|----------------|----------------|
| b ₁ | 8/363B | 378/8A | 0/345D |
| b ₂ | 8/348CD | 355BCD | 3/326E |
| b ₃ | 5/352BCD | 352BCD | 0/345D |
| b ₄ | 3/361BC | 5/357BCD | 8/343D |

Table 10: Mean squares for yield and yield components

| Source | DF | G y(g/m ²) | NER | KNER | K wt.(g) |
|--------|----|------------------------|------------|------------|------------|
| rep | 3 | 572329.9ns | 3.83333ns | 2.36111ns | 37.5ns |
| a | 2 | 80024977** | 4.020833** | 6.4375** | 1951.563** |
| Rep a | 6 | 1510924 | 1.9375 | 1.381944 | 66.14583 |
| b | 3 | 13458939** | 1.5* | 1.361111* | 772.2222** |
| ab | 6 | 2563617ns | 0.4375ns | 0.381944ns | 173.7847** |
| error | 27 | 1024985 | 1.532407 | 1.208333 | 67.70833 |

3 -3 Interactions of Different Tillage Methods and Planting Patterns on Grain Weight:

This experiment shows interaction between different methods of different tillage, planting arrangement has most grain weight in planting 60 × 20 along with straw stubble and lowest seed weight to the arrangement of 70 × 15 and burning straw

(Chart 9).

The results showed that different planting arrangement on grain yield per unit area, has a significant difference in level of 1%. Results from this study with results Rafiee (2009) and Michael Carter (2005) and Sorkhi *et al* (2010) the price creeps has a positive alignment. [12,8,14].

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