

Study of Different Tillage Methods and Planting Patterns on Corn Yield

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ABSTRACT

Planting pattern can be studied as a crop development activity in corn grain yield which affect plant growth conditions. Tillage is a system which begins after harvesting the previous plant. Conventional tillage and conserving 30% straw in the field are some supposed methods in drought stress management and conserving water content in the field. In order to study the effects of different methods of tillage and planting patterns in grain corn cropping this study was held in Arsanjan in 1389. 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. Sas software was used for data analysis and the treatments was compared with Duncan method. 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 and also grain yield.

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

Introduction

Corn is one of the most important plant in Fars province and also Arsanjan which is used in alternation after wheat. According to drought in latest years this product is facing serious threats and it's necessary to use some new methods to reduce the effects of stress to minimum degree.

Due to researches using waste materials of plant is one of the ways of managing drought and conserving soil humidity and also as a result increasing soil organic matter.[1]

In order to investigate the effect of different planting patterns and number of plants per unit area on grain yield, harvest index and biomass of maize in the form of a factorial experiment based on

randomized complete block was performed. Results showed that planting a single row and double row had no significant differences on biological yield but in other traits significant difference was found depend on planting pattern. Double row planting pattern with 8 plants per meter square due to appropriate density and proper distance between plants, is suitable for cold regions.[11]

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 intrest in this two method and his ability in

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promoting this method, today is named the father of no tillage cultivation.[8]

In order to investigate the effects of different 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 1388 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.[3]

Michael Karter and coleages [6] worked on the effect of tillage on grain yield of corn in two methods of no tillage and using tradition tillage and they conclude that grain yield has not been affected.

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.[5]

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.[12]

In an experiment by Hains *et al.*, [4] the effect of planting pattern of corn on yield and root formation was examined and concluded that in 8 planting pattern, covering plant between the crop has good effects and other methods reduced corn yield.

Rafiee [9] 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 tonnes per hectare obtained.

To investigate the effects of different tillage methods and planting different Configurations, 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 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 Eradekan and 1 kg laso per ha was used. During the eruption the necessary care performed and in the second half of September 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 Yield measured using SAS statistical software variance performed Duncan and treatment method were compared.

Result and discussion

1-Yield:

The most important factor in this study, grain yield per hectare is a factor that influenced the number of plants per unit area, number of ear per plant, grain number and grain weight per ear.

1-1 Effect of different tillage methods on yield:

Different tillage methods on yield significant differences at 1% level are shown.(table1) The straw stubble and add it to the soil the best performance and burn rate of the lowest straw yield per unit area is shown (Chart 1)

Results from this study conducted by Shirley Phillips, experiments conducted in Isfahan (2008), Michael Carter and colleagues [6], Sihem ben et al [10] and Tomas bogdon [12]. The effect of different tillage methods and use of plant residues before planting and tillage increased soil physical properties were investigated and concluded that the use of mulch and plant debris before planting different tillage methods and significant effect on corn forage yield and seed that has had fits because this can impact on soil moisture, increase soil organic matter and improve soil physical properties can be expressed.

Table 1: results of variance analysis for effect of treatments on yield

Source	DF	SS	MS	Fvalue
rep	3	1716990	572329.9	0.38 ns
a	2	1.6E+08	80024977	52.96**
Rep a	6	9065543	1510924	
b	3	40376817	13458939	13.13**
ab	6	15381704	2563617	2.5**
error	27	27674604	1024985	
total	47	2.54E+08		

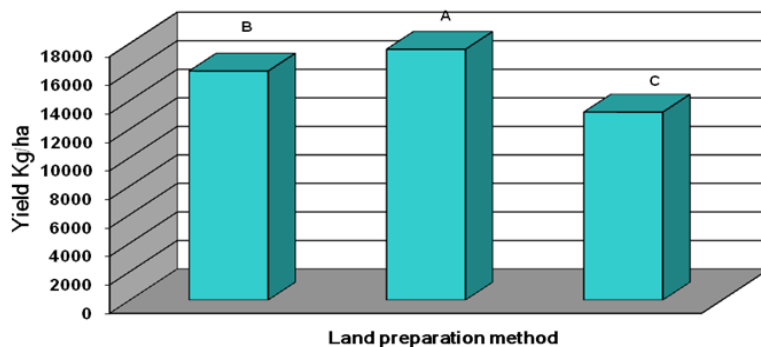


Chart 1: Effect of land preparation methods on the average performance

Table 2: Effect of different tillage methods on grain yield Kg / ha

a ²	a ₁	treatment a ₁
17575	16048	average 13170
B	B	class C

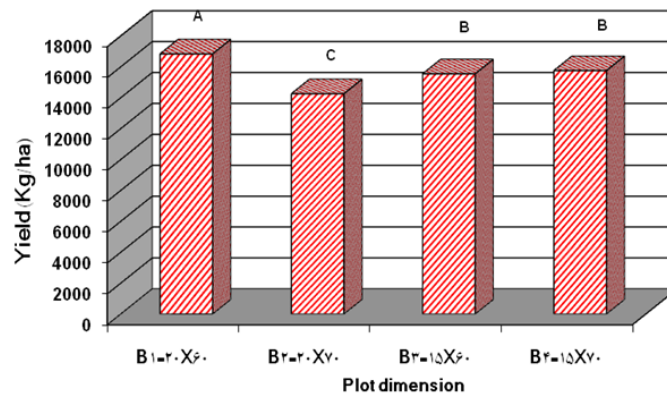


Chart. 2: Effect of plot dimensions on the average of yield

Table. 11: Effect of different planting arrangement on yield

b ₂	b ₁	b ₄	treatment b ₃
14255	16837	15754	average 15546
C	A	B	class B

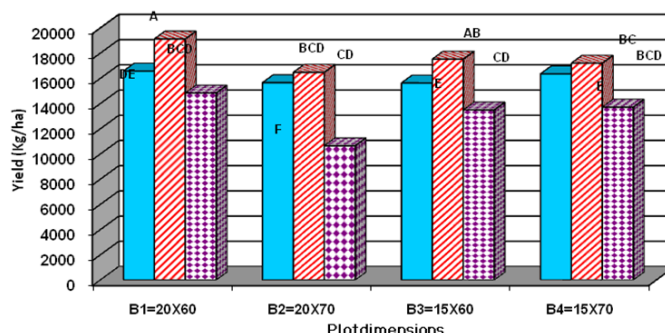


Chart. 3: The interaction between land preparation methods and plot dimensions on yield

Table. 3: Interaction of different tillage methods and different planting arrangement on yield.

a ₁	a ₃	treatment a ₂
A 19120	BCD 16570	b ₁ DE 14830
BCD 16470	CD 15650	b ₂ F10650
AB 17520	CD 15830	b ₃ E 13490
17200	BCD 16350	b ₄ E 13710 BC

1-2 Effect of different planting arrangement on yield Kg / ha:

The results showed that different planting arrangement on grain yield per unit area, has a significant difference at 1% (table 1) the results of this study, the results of tests conducted by Azeri and Khajehpour [2] and experiments conducted in Isfahan and surveys conducted by Heinz *et al* [4] and colleagues. Rafiee [9] The effect of different planting arrangement on yield and forage maize yield components seed compared the data and concluded that the different arrangement planting and plant density had no significant effect on performance.

1-3 Interaction of Different Methods of Tillage and Planting Arrangement on Yield:

Results show interaction between different methods and arrangement of different tillage planting on yield has the best yield about 60 × 20 and makeup treatments exist and lowest straw yield about 70 × 20 arrangement and burning straw and Was stubble (Chart 3) The results of this study results Rafiee [9] and Michael Carter, *et al* [6] also has a positive hand.

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