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Effect of different amounts of nitrogen fertilizer on grain yield of forage corn cultivars in Isfahan

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Abstract

To evaluate the effect of nitrogen fertilizer amounts on grain yield of forage corn in 2012, a pilot was implemented in Islamic Azad University Agricultural Research Station, Isfahan, as a split plot in a randomized complete block design. Main plots consisted of four levels: control (no fertilization) , 50 , 100 and 150 kg per ha nitrogen from urea source and subplots , including several varieties of corn (single cross 704 , single cross 640 and single cross 540), respectively. Results indicate that the effect of nitrogen fertilizer and cultivar effects on the number of rows per ear, number of seed per row, number of grains per maize, seed weight and seed yield were significant. With more than 704 varieties of seed number per row and number of seeds per ear, more grain yield was produced. The 540 cultivar was not significantly different. Treated with 150 kg N ha- highest number of seed per rows and number of seeds produced. Treatment of 100 kg per hectare produced the highest seed weight and seed yield and seed weight could generate the maximum highest yield significantly different results, and treatment was 150 kg N ha. Thus, the results indicate that treatment of 100 kg per ha nitrogen to achieve maximum yield was good.

Key words: forage corn, nitrogen fertilizer, 100- grain weight, seed yield

INTRODUCTION

In the short time that humans need plants to produce good performance. This feature is partly because corn is able in a short time, to produce a high yield (Tavakoli, 1993). Wheat is the second production of corn (Hamidi et al, 2000). Corn grain yield per unit area involves multiplying the number of rows per ear, number of kernels per row and grain yield is affected by genotype and environment modified and may reduce or increase. Nitrogen availability affects plant growth and may cause changes in yield components. Increase the rate of accumulation of dry weight of aerial plant population and grain yield per unit area increases, because the increase in leaf area index and thus absorb more solar radiation and increase the growth rate of the product (Purcell et al 2002). Yield depends on the genetic potential of the crop species. However, climatic factors and nutrients important role in rapid achieve their genetic potential (Asghari and Hanson, 1984). Nitrogenous fertilizers are effective in increasing the performance and impact of the increase in grain protein (Kazemi, 1999). Nitrogen application is a good way to increase the yield of corn (Norwoodd, 2000; wienhold et al, 1995), but its mismanagement of water will contaminate the product. A high proportion of nitrogen and phosphorus in the grain is transported into the shoots that will be harvested (Ritchie et al, 1993). Ghasemi and colleagues (2002) reported that grain weight and grain yield of maize were affected by different amounts of nitrogen. El-Sheikh (1998) reported that application of 160 kg N ha significantly increased the number of grains per ear and yield. Dlamini (1990) reported that access to corn yield in the range of 3/5 to 5 tons per ha, 65-76 kg N/ ha-

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sufficient. Due to the climatic conditions of each area and the profile number of important factors to produce more yield per unit area, the selection of suitable varieties and chemical fertilizers are used. This study aimed to investigate the effect of nitrogen fertilizer on grain yield of maize varieties was conducted in Isfahan region.

MATERIALS AND METHODS

This investigation was conducted at Research Farm, Faculty of Agriculture, Islamic Azad University, Khorasgan Branch in 2012(Latitude $32^0/40$ N and Longtitude $51^0/48'$ E, *+1555*mm see level). The regional climate is classified as arid and very hot with arid summers on the basis of KOPPEN climate classification, but recommended classification for Iran ranks it as a region with arid and hot climate with relatively cold winter. Long-term average yearly precipitation and temperature of the region are 120 mm and 16^{o}C, respectively. Soil analysis was done before beginning of study at 0-30 cm and 30-60 cm. Average Electrical conductivity and pH of soil at 0-30 and 30-60 cm was 4.42 dS/m and 8.1,respectively. The soil of research field was composed of 34% silt, 17% sand, and 49% clay, with a clay texture which is a sort of Esfahan soils (Table 1).

Table 1. Soil analysis of experimental farm at 0-30 cm and 30-60 cm.

Depth (cm)	EC (dS/m)	pH	N (%)	CaCO3 (%)	OC (%)	P (ppm)	K (ppm)	Sand (%)	Silt (%)	Clay (%)	Soil texture
0-30	3.82	8.1	0.08	41	1.21	50.8	480	17	34	49	Clay
30-60	5.02	8.1	0.07	41	0.78	24.2	390	17	34	49	Clay
Average	4.42	8.1	0.075	41	0.995	37.5	435	17	34	49	Clay

The experiment was split plot layout based on randomized complete block design with three replications. Main plots were nitrogen fertilizer from urea source (0, 50, 100, 150 kg/ha) and sub plots were cultivars (S.C704, S.C640, S.C540). The seed plantation was done 24th June. Each plot contains four lines long, 7-meter plant, two plants on line 13 cm, 75 cm row spacing and plant density constant, 10.26 plants /m^2 respectively. To avoid mixing of different nitrogen fertilizer treatments stack and half meters from the main plots were considered. Plant spacing for planting of tree lines were marked on them. No. 2-3 seeds at a depth of 3 cm were placed after the full deployment of the 4-leaf shrubs bushes excess thinning operation was performed. The amount of nitrogen fertilizer needed for each treatment based on pure nitrogen from urea, based on a pilot scheme for each plot according to the exact area of each plot was calculated and distributed. This means that one third of N coincides with the planting, thinning to one-third and one-third of the nitrogen in the 8 to 12 leaf stage were used and immediately irrigation. The pre-planting herbicide atrazine to control weeds at a rate of 0.7 kg ha coincides with the second irrigation was used. The mechanical combat (hand weeding) with such Datura genus comprises weed grass, barnyard grass; stop, purslane, pigweed and Ivy were taken during the growing season. Measurement of yield and its components were performed in physiological maturity.

So that the marginal effect of randomly observing 4 ears per plot were subheading and number of rows per ear, number of seed per row and the number of grains per ear for each plot and then separate the grain from the cob and then were weighted and yield was determined based on 14% moisture. To determine seed weight in each of the four samples of 100 seeds per plot were randomly selected and their average weight was calculated. Analysis of variance (ANOVA) was used to determine the significant differences. Means were separated by Duncan ,s Multiple Test at P≤5%. Correlation coefficients were calculated for the relationship between parameters.

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RESULTS AND DISCUSSION

There was no significant effect of nitrogen on the number of rows per ear, and a trend was observed (Table 2). This shows the relative stability of this component is to yield results Taghizadeh (2011), Alizadeh et al (2007), Homayoun Far and Bahraminejad (2008) and Jfrtyary Dehaghani (2011) is consistent.

Nitrogen showed significant effects on number of grains per row at 1% level (Table 2). The highest number of seeds per row was obtained by treatment of 150 kg nitrogen per hectare; the difference was significant only with the treatment of 100 kg per hectare. However, other treatments were significantly different.

The lowest number of grains per row, no fertilization was achieved by treating only 50 kg treatment had no significant difference with other treatments, but the difference was significant (Table 3). results indicate that the increase in nitrogen from 100 to 150 kg, did not significantly increase the number of seeds in a row. Increase nitrogen use efficiency and eliminate the constraints of nitrogen for corn production plants will increase photosynthesis And will increase the number of seeds per row.

Costa et al (2002) and Hamidi et al (2000) reported in a separate report that nitrogen consumption increased number of kernels per row. Al-Rudha and Younis (1978) also increased the number of kernels per row is proportional to the nitrogen consumption were reported. Aktinoye et al (1997) concluded that high levels of nitrogen nutrition and low competitive intensity and aborted flowers in determining the number of eggs in a row, grain number per row increases as well.

Cultivar showed significant effects on number of grains per row at 1% level (Table 2) effects on grain number in row% probability level were significant (Table 1). The highest number of grains per row, number 704, was obtained by the difference was significant with the other figures. The lowest number of grains per row, number 640, was achieved by the 540 figure is simply the difference was not significant (Table 2). Inherent potential of each digit in the number of rows of kernels is a critical factor in the formation of this part of the performance. Nitrogen showed significant effects on number of grains per ear at 1% level (Table 2). The highest number of grains per ear was obtained by treatment of 150 kg nitrogen per hectare was significant difference with other treatments. Minimum number of kernel control treatment was achieved by only 50 kg N treatment showed no significant difference with other treatments, but the difference was significant (Table 2).

Persad and Sink (1990) increased the number of grains per ear in proportion to increasing levels of N fertilizer were reported. In this study, reducing the amount of nitrogen will cause a significant reduction in the number of grains per ear. It appears that the conditions resulting in the depletion of nitrogen deficiency in the allocation of leaves, leaf area index and its durability factor is reduced and thus, it is less of grains per ear assimilate necessary for the formation.

In this respect, Sinclair et al (1990) reported that the number of grains per ear is determined at the time of pollination and lack of assimilates for growing embryonic stem cells, has a negative effect on the number of grains per ear. Positive effects of increased nitrogen on number of grains per ear by have also been reported Aktinoye et al (1997).

Cultivar effects on grain number per ear were significant at the one percent level of probability (Table 2). 704 varieties yielded the highest number of grains per ear, which was significantly different from the other cultivars (Table 3).

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A nitrogen effect on seed weight was significant at the one percent level of probability (Table 2). Treatment of 100 kg N ha seed weight was obtained. The lowest seed weight, of nitrogen fertilizer treatments was not significantly different from other treatments (Table 3). Because these reactions appear to meet the growing needs of the next increase in nitrogen level of 100 kg N ha had no significant impact on grain weight. In Majdam and Madhaj study (2012), the amount of nitrogen increased grain weight was significant. Uhart and Andrade (1995) reported that average grain weight per ear at a rate of transfer of material between flowering and grain filling depends. This in turn leaves after anthesis life and a relationship is dependent on the source and destination. Tollenaar (1977) and Uhart and Andrade (1995) argue that the increase in seed yield due to nitrogen use may increase the number of grains per ear and grain weight gain is associated. Muchow (1994) believes that the loss of nitrogen is lower grain weight; however, the Purcino et al (2000) argue that nitrogen is not affected by seed weight. This inconsistency may be due to differences between maize hybrids in response to nitrogen Smiciklas and Below (1990). Cultivars showed significant effects on 100-grain weight at one percent level of probability (Table 1). The highest grain weight was about 540 varieties, significant differences were only 640 number and minimum grain weights were obtained by the digits 704, which showed significant figures with the others (Table 3). Effect of nitrogen on grain yield was significant at the one percent level of probability (Table 2). The highest yield of 100 kg N/ ha treatments had no significant difference with the treatment of 150 kg nitrogen, 50 kg and treated but the treatments showed no significant difference in fertilization. The control treatment had the lowest grain yield difference was no significant only with the treatment of 50 kg N ha but other treatments were significantly different (Table 3). In this experiment, based on the increase in yield due to increasing nitrogen levels seem to require plant nitrogen level of 100 kg per hectare, has been funded, and the subsequent increase in nitrogen yield no significant effect on the performance is reduced. Kamprath et al (1980) Corn grain yield increase due to increased nitrogen and increase the number of grains per ear and grain weight per ear were compared. Cultivar effects on grain yield were significant at the five percent probability level (Table 2). 704 figures showed that the highest grain yield difference was significant with 640 varieties, but there was no significant difference in the number 540. The figure of 640 shows the lowest yield statistically significant results not merely a figure of 540 (Table 3). Hybrid superiority in producing the highest yield of 704 may be due to genetic characteristics in relation to that produced longer maize Produce higher grain number and grain weight is more of a comment than other varieties demonstrated superior. Genetic variations in nitrogen use efficiency in maize hybrids by Moll et al (1982) have been reported. They believe that low levels of fertilizer nitrogen use efficiency for grain yield compared with the efficiency of nitrogen is greater changes. A significant positive correlation between grain yield and ear length (r=0.796**), number of grains per row (r=0.822**), number of grains per ear (r=0.856**) and 100-grain weight (r=0.366**) observed that demonstrate the impact of these traits on grain yield is increased.

Table 2. Analysis of variance for some measured experimental characteristics.

S.O.V	Degree of freedom	Mean square				
		number of row per ear	number of seed per row	number of seed per ear	seed weight	seed yield
Replication	2	0.737	11.687	1904.5	12.384**	329862.2*
nitrogen	3	0.691	44.474**	13943.9**	66.482**	1925437.3**
Eror	6	0.309	2.860	698.120	1.068	49869.5
cult	2	0.544	128.591**	25097.3**	26.546**	910592.4*
nitrogen ×cult	6	0.684	7.072	2024.6	13.329	60986.4
Eror	16	0.655	7.054	2397.7	23.09	179360.9

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Table 3.Mean comparison for some measured experimental characteristics.

S.O.V	number of row per ear	number of seed per row	number of seed per ear	seed weight	seed yield(kg/ha)
nitrogen					
0	14.17a	23/82c	336.6c	30.21c	2775b
50	14.31a	25.03bc	357.2bc	33.12b	2845b
100	14.28a	26.94ab	386.3b	36.85a	3623a
150	14.79a	28.89a	427.4a	33.35b	3598a
cult					
Sc704	14.31a	29.89a	429.5a	31.91b	3501a
Sc640	14.63a	23.71b	346.5b	33.35a	2954b
Sc540	14.22a	24.92b	3174ab	3489a	3174ab

In each column, means any cause at least one letter in common, based on Duncan's multiple test are not statistically significant at the 5% level.

Conclusions

Results indicate that 704 varieties produced the highest yield. Apparently, due to the genetic characteristics of the ear longer produce higher grain number, grain weight is more the result obtained. 540 varieties of 704 varieties did not yield significantly different. Treated with 150 kg N ha- is highest number of grain per row and number of seeds per ear produced. Treatment of 100 kg per hectare produced the highest seed weight and seed yield and seed weight could generate the maximum highest yield significantly different results, and treatment was 150 kg N ha. Thus, the results indicate that treatment of 100 kg per ha nitrogen, in order to achieve maximum performance has been good.

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