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Effect of nitrogen fertilizer on yield component of maize

Farshad Sorkhi*, Mojtaba Fateh

Department of Agricultural Management, College of Agriculture Miandoab Branch, Islamic Azad University, Miandoab, Iran

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Abstract

For effect of nitrogen fertilizer on yield component of maize an experiment was carried out at Research Station of Islamic azad university of Miandoab in 2012. The experiment was conducted as factorial based on completely randomized block design with four replications. Cultivars included hybrids of SC301 and SC320 (early hybrids of corn). Treatments were nitrogen levels fertilizer (100, 150, 200 and 250 kg N ha^{-1}). Plant density was 90 plants ha^{-1}. In this study indicated that number of ear (ears m^{-2}) meter hybrid of SC320 was significantly higher than SC301 but number of grains (grains ear^{-1}) and 1000-grain weight (g) in hybrid of SC320 was significantly lower than SC301. It was found that increasing nitrogen fertilizer levels significantly increased the number of ears per unit area and one thousand grain weight reduced one number of grains per ear.

* **Corresponding Author:** Farshad Sorkhi ✉ farsorkhy@yahoo.com

Introduction

Maize (*Zea mays* L.) is the world's most widely grown cereal, and it is ranked third among major cereal crops (Ayisi and Poswell, 1997; Carruthers *et al*, 2007). In developed countries maize is mainly grown for animal feed, industrial products such as glucose, dextrose, and starch and specialized foods (Tollenaar *et al*, 1994; Malvar *et al*, 2008).

Nitrogen plays an essential role in the growth and development of the crop (Fageria and Baligar, 2005). It enhances the yield of the crop. Lack of nitrogen results in stunted growth, pale yellow color, small grain size and reduced yield. It is an essential component of amino acid and protein. The growth of plant primarily depends on nitrogen availability in soil solution and its utilization by crop plants.

Jalali *et al* (2010) with perform tow experiment in two years about effect of nitrogen fertilizer and organic matters on yield component of maize was recorded that, the highest grain yield, number of grains per ear, 100 grain weight from 250 kg ha^{-1} ura fertilizer. Sanjeev *et al* (1997) reported a significant increase in grain and stover yield with the application of 240 kg N ha^{-1}. Number of grains ear^{-1}, 1000-seed weight, and grain weight ear^{-1} increased significantly with the application of 180 N ha^{-1} and grain yield $plant^{-1}$ with the application of 240 kg N ha^{-1}. Jalali *et al* (2010) with perform tow experiment in two years about effect of nitrogen fertilizer and organic matters on yield component of maize was recorded that, the highest grain yield, number of grains per ear, 100 grain weight from 250 kg ha^{-1} ura fertilizer. reported that increasing pure nitrogen fertilizer of 150 kg ha^{-1} had significant effect on corn yield components, as an increasing number of ear, number of grains per ear and grain weight (Vanderlip *et al*, 1988; Sadeghi, 2000).

In this study, to detect the effects of different amounts of nitrogen required to improve the yield of maize, examined the effects of varying nitrogen fertilizer on seed weight, number of grains and number of ears in maize cultivars.

Material and methods

In order to study the "Effect of nitrogen fertilizer on yield component of maize" an experiment was carried out at at Research Station of Islamic azad university of Miandoab in 2012. The experiment was conducted as factorial based on completely randomized block design with four replications. The first factor included cultivars of hybrids SC301 and SC320 (early hybrids of corn). The second factor included nitrogen levels fertilizer (100, 150, 200 and 250 kg ha^{-1}).

Number of ears per square meter (ears m^{-2})

Plants were selected in one square meter per plot, their ears were counted and recorded (Abouziena *et al*, 2007).

Number of grains per ear (grains ear^{-1})

Five plants were selected randomly from each plot, their grains per ear were counted, averaged and recorded (Akmal *et al*, 2010).

1000-grain weight (g)

Two samples of thousand grains were taken at random from each treatment, weighed by digital balance in the laboratory and average was recorded (Sanjeev *et al*, 1997).

Analysis of data

Analysis of variance (ANOVA) method was applied to determine the significance of the results among different treatments and then Duncan test (Duncan's multiple range test) were evaluated. All the statistical analyses were done using the SPSS and MSTATC softwares (Poorter and Garnier, 1996).

Results and discussion

Number of ear (ears m^{-2})

Effects of cultivar, nitrogen fertilizer and interaction in cultivar with nitrogen fertilizer were significant on number of ear (Tab 1). Cultivar of SC320, number of ear was significantly higher than SC301 (Tab 2). With increasing nitrogen is increased the number of ears m^{-2} .The nitrogen fertilizer level of 250 kg N ha^{-1} obtained the highest number of ears m^{-2} (Tab 3), that for hybrids of SC320 and SC 301 were 52.43 and

39.36 ear, respectively (Tab 4).

Khan *et al.* (1999) are of the view that the maize hybrid 3335 which they used in their experiment, produced higher ears plant^{-1} only when higher level of N (210 kg ha^{-1}) is used. Inamullah *et al* (2011) reported With increasing nitrogen level from zero to 300 kg per ha significantly increased the number of ears per square meter.

Table 1. Mean square analysis variance of traits.

SV	df	ear number (ears m^{-2})	grain number (grains ear^{-1})	grain weight (g)
Repeat	3	214 ^{ns}.2	27 ^{ns}.106	39.64 ^{ns}
Cultivar	1	**80.03	*387.42	*564.14
Nitrogen	3	**115.56	*251.46	**774.51
Nitrogen × Cultivar	3	**38.73	**490.87	*413.76
Error	21	8.29	78.44	124.59
C.V (%)		6.91	11.52	9.58

ns, * and ** : non significant, significant at 5% and 1% respectively**.**

Table 2. Effect of cultivar on traits. Means followed by similar letters in each column are not significantly different at the 5% level of probability according to Duncan**.**

Treatment		ear number (ears m^{-2})	grain number (grains ear^{-1})	grain weight(g)
Cultivar	SC301	34.52 b	399.16 a	435.43 a
	SC320	49.18 a	337.3 b	298.63 b

Number of grains (grains ear $^{-1}$)

Cultivar, nitrogen fertilizer and interaction in cultivar with nitrogen fertilizer were significant on number of grains per ear (Tab 1). number of grains ear^{-1} of SC 301 was significantly higher than SC 320 (Tab 2).minimum and maximum number of grains per ear obtained from the nitrogen levels of 250 and 100 kg N ha^{-1}, respectively (Tab 3). The reason could be that increase the number of ears which reduces the number of grains per ear . The number of grains per ear in treatment of 250 kg N. ha^{-1} for hybrids of SC301 and SC320 were 314.12 and 274.28 respectively (Tab 4).

Table 3. Effect of nitrogen fertilizer on traits. Means followed by similar letters in each column are not significantly different at the 5% level of probability according to Duncan**.**

Treatment		ear number (ears m^{-2})	grain number (grains ear^{-1})	grain weight (g)
Nitrogen (kg ha^{-1})	100	37.78 b	441.20 a	336.7 d
	150	40.86 b	403.31 a	356.34 c
	200	42.85 ab	333.63 b	345.91 b
	250	45.90 a	294.2 c	400.19 a

Increased to 376 kg N ha^{-1} caused a significant increase in the number of grains per ear and grain weight in maize of SC704 (Akmal *et al*, 2010).The highest number of grains per ear was obtained with the use of 180 kg N ha^{-1} (Izadi and Imam, 2010). Increasing the number of grains per ear increased fertilizer use has also been reported by other researchers (Vanderlip *et al*, 1988; Sadeghi, 2000).

1000-grain weight (g)

Effects of cultivar, nitrogen fertilizer and interaction in cultivar with nitrogen fertilizer were significant on

1000 - grain weight (Tab 1). Thousand grain weight of SC320 was significantly lower than SC301 (Tab 2). The increasing nitrogen fertilizer levels increased one thousand grain weight (Tab 3). The highest seed weight was observed at 250 kg N ha^{-1}, that for SC320 and SC301 were 488.96 and 311.41 respectively (Tab 4).

Table 4. Iinteraction effect of cultivar and nitrogen fertilizer on traits.

Cultivar	Nitrogen (kg ha^{-1})	ear number (ears m^{-2})	grain number (grains ear^{-1})	grain weight (g)
SC 301	100	30.67 g	498.19 a	387.36 d
	150	33.50 f	461.89 a	423.52 c
	200	34.55 f	322.47 c	441.91 b
	250	39.36 e	314.12 c	488.96 a
SC 320	100	44.89 c	384.22 b	286.04 f
	150	48.24 b	345.91 bc	289.16 f
	200	51.17 a	344.79 c	307.92 e
	250	52.43 a	274.28 d	311.41 e

Means followed by similar letters in each column are not significantly different at the 5% level of probability according to Duncan.

Similarly, Mahmood *et al.* (2001) while studying the effects components of maize revealed that nitrogen had a significant effect on plant height, number of grains cob and 1000 grain weight. Reported that increasing nitrogen is significantly increase grain weight in maize (Blumenthal *et al*, 2003). Izadi and Imam (2010) reported with increasing nitrogen from 90 to 180 kg per hectare cause significant increase in seed weight of corn**.** Khan *et al* (1999) and Sharar *et al* (2003) also reported similar results.

Conclusion

Results presented In this study indicated that number of ear (ears m^{-2}) hybrid of SC320 was significantly higher than SC301 but number of grains (grains ear^{-1}) and 1000-grain weight (g) hybrid of SC320 was significantly lower than SC301. It was found that increasing nitrogen fertilizer levels significantly increased the number of ears per unit area and one thousand grain weight reduced one number of grains per ear.

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