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Research Article

Effect of Nitrogen Fertilizer on Yield and Yield Components of Maize

Foruzan Mir, Hamid Reza Mobasser* and Hamid Reza Ganjali

Department of Agronomy, Islamic Azad University, Zahedan Branch, Zahedan, Iran

***Corresponding author:** hamidrezamobasser@gmail.com

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ABSTRACT

Maize (*Zea mays* L.) is the world's widely grown highland cereal and primary staple food crop in many developing countries. In the world production, maize is ranked as the third major cereal crop after wheat and rice. Nitrogen management in agro-ecosystems has been extensively studied due to its importance in improving crop yield and quality, and in mitigating the negative effects of fertilizer N losses such as nitrate contamination of groundwater, eutrophication of surface water, and greenhouse effect. The field experiment was laid out factorial with randomized complete block design with four replications. Treatments included variety (K.S.C 302 (A1) and K.S.C 704 (A2)) and nitrogen fertilizer consisted of control (B1), 75(B2), 150 (B3) and 225 kg/ha (B4). Analysis of variance showed that the effect of variety and nitrogen fertilizer on all characteristics is significant.

Key words: Biological yield, Harvest index, Plant height, Variety

INTRODUCTION

Maize (*Zea mays* L.) is the world's widely grown highland cereal and primary staple food crop in many developing countries (Kandil, 2013). It was originated in America and first cultivated in the area of Mexico more than 7,000 years ago, and spread throughout North and South America (Hailare, 2000). In the world production, maize is ranked as the third major cereal crop after wheat and rice (Zamir *et al*., 2013). The continuous development of shape and activity of a plant is called plant development (Development). Analysis of crop development basis on incremental distinct events, namely Pheno stage Such as seedling emergence, Flower initiation and emergence of flower will be easier the flowers will be easier. Nitrogen (N) is one of the critical nutrients for crop production and is generally applied in large quantities in form of fertilizer to soils (Malhia *et al*., 2001; Murshedul *et al*., 2006; Singh *et al*., 2007; Kong *et al*., 2008). However, most plants only utilize less than one-half of fertilizer N applied, and the loss of fertilizer N was high (Zhu, 2000; Zhu and Chen, 2002). Nitrogen management in agro-ecosystems has been extensively studied due to its importance in improving crop yield and quality, and in mitigating the negative effects of fertilizer N losses such as nitrate contamination of groundwater, eutrophication of surface water, and greenhouse effect (Hillin and Hudak, 2003; De Paz and Ramos, 2004; Alam *et al*., 2006; Dambreville *et al*., 2008). Soil exchangeable inorganic N is the common source of various N losses (Zhu, 2000), whereas the immobilization and release of fertilizer N in soil organic N and fixed NH^{4+} pools are important processes regulating fertilizer N transformation in soil, and play an important role in controlling soil Potential supply (Mubarak *et al*., 2001). Therefore, a key challenge in minimizing loss of chemical fertilizer N is how to decrease the superfluous accumulation of soil exchangeable inorganic N, accelerate its transformation to other N forms (such as organic N and fixed NH^{4+}), and synchronize the supply of available N with plant uptake during peak periods of crop N demand (Zhu, 2000; Lin *et al*., 2007). Understanding the accumulation of fertilizer N in soil inorganic N pool under different fertilization practices is of considerable importance in developing proper fertilization practice for minimizing fertilizer N loss while maximizing its use efficiency (Lu *et al*., 2008). Amount of Development and growth of plant has determined amount of growth in each of phenological stages of the phenological stages (Phenophases). And evaluation of crop development in relation to environmental conditions. Nitrogen has a major effect on growth among the major nutrients needed by plants (especially the three elements of N, P, K) and the growth of maize plant has been proven various experiments (Casta *et al*., 2002; Kagbe and Aderian, 2003; Salam and Subramanian, 1988) and Plants give it different responses.

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Maize need to nitrogen is different due to weather conditions, soil type and maize rotation (Bundy *et al.*, 1993., Green and Blackmer, 1995). Amount of Nitrogen stored in soil can affect plant growth and development (Muchow 1988; Mccullovgh *et al.*, 1994).

MATERIALS AND METHODS

Location of experiment

The experiment was conducted at the mirjaveh (in iran) which is situated between 29° North latitude and 62° East longitude.

Composite soil sampling

Composite soil sampling was made in the experimental area before the imposition of treatments and was analyzed for physical and chemical characteristics.

Field experiment

The field experiment was laid out factorial with randomized complete block design with four replications.

Treatments

Treatments included variety (K.S.C 302 (A1) and K.S.C 704 (A2)) and nitrogen fertilizer consisted of control (B1), 75(B2), 150 (B3) and 225 kh/ha (B4).

Data collect

Data collected were subjected to statistical analysis by using a computer program MSTATC. Least Significant Difference test (LSD) at 5 % probability level was applied to compare the differences among treatments` means.

RESULTS AND DISCUSSION

Harvest index

Analysis of variance showed that the effect of variety on harvest index was significant (Table 1). The maximum of harvest index of treatments K.S.C 704 was obtained (Table 2). The minimum of harvest index of treatments K.S.C 302 was obtained (Table 2). Analysis of variance showed that the effect of nitrogen fertilizer on harvest index was significant was significant (Table 1). The maximum of harvest index of treatments 225 kg/ha was obtained (Table 2). The minimum of harvest index of treatments control was obtained (Table 2).

Grain yield

Analysis of variance showed that the effect of variety on grain yield was significant (Table 1). The maximum of grain yield of treatments K.S.C 704 was obtained (Table 2). The minimum of grain yield of treatments K.S.C 302 was obtained (Table 2). Analysis of variance showed that the effect of nitrogen fertilizer on grain yield was significant was significant (Table 1). The maximum of grain yield of treatments 225 kg/ha was obtained (Table 2). The minimum of grain yield of treatments control was obtained (Table 2).

Biological yield

Analysis of variance showed that the effect of variety on biological yield was significant (Table 1). The maximum of biological yield of treatments K.S.C 704 was obtained (Table 2). The minimum of biological yield of treatments K.S.C 302 was obtained (Table 2). Analysis of variance showed that the effect of nitrogen fertilizer on biological yield was significant was significant (Table 1). The maximum of biological yield of treatments 225 kg/ha was obtained (Table 2). The minimum of biological yield of treatments control was obtained (Table 2).

Plant height

Analysis of variance showed that the effect of variety on plant height was significant (Table 1). The maximum of plant height of treatments K.S.C 704 was obtained (Table 2). The minimum of plant height of treatments K.S.C 302 was obtained (Table 2). Analysis of variance showed that the effect of nitrogen fertilizer on plant height was significant was significant (Table 1). The maximum of plant height of treatments 225 kg/ha was obtained (Table 2). The minimum of plant height of treatments control was obtained (Table 2).

Table 1: Anova analysis of the maize affected by variety and nitrogen fertilizer

Sov	df	Harvest index	Grain yield	Biological yield	Plant height
R	3	4.93	42813.08	756744.7	213.36
Variety (A)	1	101.53*	188191.1*	3031953.1*	712.53*
Nitrogen (B)	3	135.25**	209013.4**	1869453.1*	352.55*
A*B	3	89.53**	240918.3**	5424661.4**	161.13ns
Error	21	15.84	28939.03	436804.3	114.43
CV	-	9.007	4.69	8.16	8.53

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

Table 2: Comparison of different traits affected by variety and nitrogen fertilizer

Treatment	Harvest index	Grain yield	Biological yield	Plant height
Variety				
K.S.C 302	42.40b	3545.4b	7790.6b	120.62b
K.S.C 704	45.96a	3698.8a	8406.3a	130.06a
Nitrogen fertilizer				
Control	38.81c	3408.8b	7593.8b	118.12b
75	43.31b	3630.2a	7875b	121.50ab
150	46.43ab	3647.8a	8206.3ab	129.43a
225	48.18a	3801.5a	8718.8a	132.31a

Any two means not sharing a common letter differ significantly from each other at 5% probability.

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