Available online at http://www.ijabbr.com

International journal of Advanced Biological and Biomedical Research

Volume 2, Issue 2, 2014: 300-305

EFFECT OF DIFFERENT UREA LEVELS ON YIELD AND YIELD COMPONENTS OF CORN 704

Sina Mohammadi Aghdam[1]*, Farhood Yeganehpoor[2], Bijan Kahrariyan[3], Edris Shabani[4]

[1] *M.Sc. Plant Breeding*, Faculty of Agriculture, University of Tabriz, Tabriz, Iran.
[2] Ph.D. Students in Agronomy, Faculty of Agriculture, University of Tabriz, Tabriz, Iran.
[3] Department of Agriculture, Miandoab Branch, Islamic Azad University, Miandoab, Iran.
[4] Ph.D. Students in Horticulture, Faculty of Agriculture, University of Tabriz, Tabriz, Iran.

ABSTRACT

According to urgent need of corn to nitrogen and since this element play a main role in improving of yield corn, thus, in order to investigate the effect of different levels of urea on yield and yield components of corn 704, an experiment was conducted randomized block with three replications in cropping year of 2012. Experimental treatments included six levels of urea (0, 30, 60, 90, 120 and 150 kg.ha^{-1}). Test parameters include the number of grain rows, number of grains per row, the number of grains per ear, grain weight, grain yield, biological yield and harvest index. Results showed that the effect of urea on the number of grain rows, number of grains per row, the number of grains per ear, grain weight, grain yield, biological yield and harvest index were significant. The highest amount of yield and yield components of corn was in the treatment of 150 kg.ha^{-1} of urea and lower in the control plots, respectively. To achieve the highest yield and yield components of 150 kg.ha^{-1} in urea is recommended.

Keywords: Urea, Grain yield, Harvest index, Biological yield.

1- INTRODUCTION

Corn is considered as a strategic crop for human and animal nutrition and has high importance in a broad compatibility with temperate and tropical climate zones, (Yazdan et al., 2009). Also, corn has an importance in the diet of humans and animals. Due to the high output power and high consumption indifferent countries and survey and finding ways has been priority to increase the quality and quantity of corn agriculture research consequently, efforts to produce more and more economical product is recommended (Cocks, 2003). Population growth in the world, especially in developing countries is increasing day by day. The expansion of arable and was small due to lack of economic competitiveness infertile land and agricultural systems. In addition to the events such as drought, disease, pests, floods, reducing soil fertility and erosion of existing urban expansion in arable land, environmental pollution reduce production. Given the importance of access to methods for increasing crop yield is of particular importance. Besides increasing the yield per unit area as the most important way to save human kind from hunger and poverty are largely dependent on correct selection and creation of high yielding varieties with high potential and quality characteristics, agronomic operations to use optimum fertilizer etc (Mardi, 1999). In a study by Onken et al., (1985) determined the vegetative growth after flowering is not important, so the

Corresponding Author E-mail: sinaghdam@gmail.com

nitrogen is removed from the vegetative organs are used exclusively in seed development. Use of nitrogen fertilizer significantly increased grain yield and biological (West, 2006). Experimenting with different levels of nitrogen on corn yield was studied and it was found that Kg/ha150 is showing the highest grain yield (Nandal et al., 1991). Since the nitrogen increased production of dry material and leaf area duration it may be expected grain will be heavier by increase of nitrogen consumption (Imam and Niknejaz, 1995). Majidian and Ghadiri (2003) reported that increased nitrogen increased ear length, ear diameter, number of grain rows per ear and the biological function (Majidian and Ghadiri, 2003).The aim of this study was to investigate the effects of different levels of urea fertilizer on corn crop by assessing its effect on crop yield, and yield component.

2- MATERIAL AND METHODS

In order to investigate the effect of different levels of urea on yield and yield components of corn704 an experiment was conducted in a randomized block with three replicates per agronomic in 15 kilometers from Kermanshah in longitude 47 degrees 04 minutes and latitude 34 degrees 19 minutes from the prime meridian. An altitude of 1410 meters above sea level and the average annual rainfall is 485.5mmper year. The city's cold climate is semi-arid with an average annual temperature of 13.4.

Table 1- Physical and chemical properties of experimental field soil

Depth (cm)	EC (ds/m)	P (ppm)	K (ppm)	pH	N (%)	Sand (%)	Silt (%)	Clay (%)	Soil type
0-30	2.5	19.7	255	7.8	0.06	73	14	13	Sandy loam

Treatments included six levels of urea (0, 30, 60, 90, 120and150kg.ha^{-1}). After substrate preparation and before the application of different levels of fertilizer, soil testing was performed (Table 1). The size each plot was 4.2 × 5 meters and include six rows of culture and a not culture row to prevent manure seepage from a plot to another plot and a cultured marginal row for omitting marginal effects was considered. Length of rows in each plot was five meters and spacing between repetitions was three meters. The disinfected seeds of considered density were cultured with line spacing of 60cm between two and three took the hill and watered immediately. At the four-leaf stage, plants were thinned out. Routine operations such as weeding and other crop pests and fighting with probable disease were done. Half the amount of nitrogen in the tests was to ground with last plowing before planting. Half the amount of nitrogen in the tests was given to ground with last plowing before planting. The rest of the nitrogen in two phases was distributed: an eight-leaf stage and remain of that before the start of crown flower as head in the plots. Traits including number of rows per ear, number of seeds per row, grain weight, number of grains per ear, grain yield, biological yield and harvest index. Earatmaturity, 10 plants were chosen at random from the two central rows of each plot, after removing margin from both sides of the border and grabbed it by ear and grain number per ear and the row number per ear were calculated. To determine the yield, grains of each plot were weighted with laboratory precision weighing scales, and then the mean of10 plants was carried out and on the basis of a considered aggregation, the weight of one plant per square meter was calculated and finally was obtained for plot in terms of hue. After physiologic maturity, the whole air organs were taken and were dried about 48 hours in the oven slowly at 75°C and then weighed. Harvest index was calculated as the ratio of economic

yield to biological function. Statistical analysis of data was performed by MSTAT-C software. Comparison with Duncan's multiple range tests was performed.

3- RESULTS AND DISCUSSIONS

3-1- Number of grain row

Analysis of variance (Table 2) showed that the treatment effect significant at the 1% level of on the number of grain rows per ear of corn there. According to table3, significant differences were observed between treatments, so that the maximum number of rows per ear of fertilizer was treatment of 150kgand the lowest was treatment for lack of urea (Table 3). The use of urea fertilizer increased corn growth stages of growth and development, which has increased the number of grain rows per ear of corn. Kafi Ghasemi and Isfahani reported that grain yield, grain weight, ear length and number of grains per ear rows were affected by nitrogen (Kafi Ghasemi and Esfahani, 2003).

3-2- Number of seeds per row

Analysis of variance showed that the treatment effect significant at the 1% level for the grains is corn rows (Table 2). So that the maximum number of rows of corn grain obtained from150 kg ha^{-1} urea and non-urea fertilizer treatments had the lowest (Table 3).Urea was effective in improving plant growth and thus increases the corn ear, which would increase the number of grain rows per ear of corn. The results of this study indicate that the positive effect of urea on the yield or number of grains per row that is also a similar conclusion by (Khan et al., 2001). The number of seeds per row of corn effect of different treatments of urea fertilizer in 1% probability level was significant (Table 2). According to Table 3, significant differences between treatments were observed, so that the maximum number of grains per ear was 150 $kg.ha^{-1}$ of fertilizers and the lowest was lack fertilizer. With the availability of nitrogen better condition will be for photo synthesis and reproductive growth of corn for grain, which will eventually increase. Number of grains per ear, depending on the genetic potential of the plant and the availability of nutrients in the vegetative and reproductive stages and forming tassels (Noor Mohammadiet al., 2003).

3-3- Weight of 100 grain

The effect of experimental treatments on weight of 100 grain was significant at the 1% level (Table 2). Also, according to table 3 significant differences between treatments were observed, the highest weight of 100 grain was for the treatment of urea of 150 kg. ha^{-1} and the least was for control treatment for lack of usage of fertilizer. The reason of increase of corn was a positive effect of urea on the growth of corn, increase of photosynthesis and transfer of photosynthesis material that results increase of weigh of seed. In a study by Oikeh et al., (1998) with increasing nitrogen level from 120 $kg.ha^{-1}$ increased grain yield for all hybrids tested.

3-4- Grain yield

Analysis of variance showed that the treatment had a significant effect on the mean of probability level of 1% level on corn grain yield (Table 2). As the highest grain yield was the treatment of 150 $kg.ha^{-1}$of urea and the lowest was treatment for lack of urea (Table 3). With increasing levels of urea, the amount of available nitrogen for plants increased which further increase the LAI, photosynthesis and ultimately increase the grain yield of corn. Usage of nitrogen effects on the growth, power of producing leaf area and photosynthetic capacity of the plant, so at the rate of

photosynthesis in corn leaf reduces by reducing of nitrogen levels also grain yield, grain weight, growing number and other components will be significantly affected by nitrogen treatments (Rajput, 1992). Increasing nitrogen fertilizer increased the grain yield and crude protein and amino acids. It has been reported that increased nitrogen from zero to180 nitrogen kg.ha^{-1} caused a doubling of corn yield but it has no change in yield at higher level (Rending et al., 1979; Sander et al., 1987).

3-5- Biological yield

Effect of different treatments of urea fertilizer on biological yield was significant at the 1% level (Table 2). According to table3, significant differences were observed between treatments, so that the highest was biological yield of 150 kg.ha^{-1}of fertilizer treatments and the lowest was the treatment of lack of fertilizer. The experiments have proved that nitrogen affects the quality and quantity of grain. Many studies have shown that nitrogen can increase grain yield and biological (Tsai et al., 1990). Of nitrogen fertilizer increases a significant amount of plant weight, root length and grain and biological yield (Anderson, 1984).

3-6- HI

Harvest index is the ratio of economic performance of total dry matter production which is an indicator of the of the plant's ability to allocate resources between vegetative and reproductive structures (Karoteret al., 2000). Analysis of variance showed that the treatment had a significant effect on harvest index of the one percent level of harvest index (Table 2). The highest harvest index obtained from 150 kg.ha^{-1} of urea and non-urea fertilizer treatments had the lowest (Table 3). Tavakoli (1995) said that the zero fertilizer with nitrogen fertilizer and harvest index showed significant differences.

Table 2- Analysis of variance of field traits

SOV	df	Mean square						
		Number of ear row	Number of seed in ear row	Number of Seed	Weight of 100 grains	Biological yield	Grain yield	HI
Replication	2	0.021^{ns}	0.177^{ns}	2.35^{ns}	7.64^{*}	681.2^{**}	44.2^{ns}	0.241^{ns}
Treatment	5	2.4^{**}	51.4^{**}	11614.3^{**}	34.15^{**}	80278.2^{**}	33126.1^{**}	26.19^{**}
Error	10	0.20	0.483	10.87	0.267	68.21	2.98	0.266
CV (%)	-	5.6	4.5	6.9	3.7	9.4	5.1	4.3

.ns, * and ** are no significant and significant at 5 and 1 % probability levels, respectively

Table3-Comparison of average yield and yield components under different levels of urea

Treatment	Number of ear row	Number of seed in ear row	Number of seed	Weight of 100 grain (g)	Biological yield ($kg.ha^{-1}$)	Grain yield ($kg.ha^{-1}$)	HI (%)
0	14.3 d	14.5 d	193 f	201 d	10392 e	4329 e	41.7c
30	15.1 cd	18.6 c	265.e	248 c	12485 d	6071 d	48.6b
60	16.6 c	19.5c	307 d	254 c	15299 c	7439 cd	48.6b
90	18.3 b	20.6 c	376 c	285 b	16294 c	8123 c	49.9b
120	19.6 b	25.6 b	501 b	301 b	19065 b	9014 b	47.3b
150	22.3 a	29.3 a	646 a	347 a	21397 a	10967 a	51.3 a

Means, For each planting date, followed by similar letter are not significantly different at the 1% probability level- using Duncan´s Multiple Range Test.

CONCLUSIONS

In this study, the highest grain yield was the treatment of150$kg.ha^{-1}$of urea and the lowest was treatment for lack of urea. With increasing levels of urea, the amount of available nitrogen for plants increased which further increase the LAI, photosynthesis and ultimately increase the grain yield of corn.

REFERENCES

Anderson EL (1984).Corn root growth and distribution as influenced by tillage and nitrogen fertilization. Agronomy Journal. 79: 544 - 549.

Carruthers K, Prithiviraj B, Cloutier D, Martin RC, Smith DL (2000). Intercropping corn with soybean, lupine and forages: yield component responses. Agron. J. 12(2): 103-115.

Cocks JW (2003). Plant density effects on tropical corn forage masses, morphology and nutritive value. Agronomy Journal, 90: 93-96.

Imam Y (1995). An introduction on physiology of agricultural plants (translation) Shiraz university press.

kafiGhasemi A, Esfahani M (2003). Investigate the effect of nitrogen fertilizer on corn yield and yield component of corn in Guilan. Abstracts of 7th Iranian Congress of Agronomy.

Khan R (2001). Response of mustard and wheat to pre-sowing seed treatment with pyridoxine and basal level of calciume. Indian. Journal. Plant physiol. Vol. 6. No. 3PP: 300-305.

Lone N, Khan A, Hayat N A, Azam, SZ, Samiullah M (1999). Evaluation of effect of some B Vitamins on root development of mustard. Ann. Appl. Biol. 134 (Supplement): 30-37.

Majidian M, Ghadiri N (2003).Survey of Effect o f water stress and nitrogen at different growth stages on yield, yield components and random of water use efficiency in corn, Abstracts of Iranian Congress of Agronomy and Plant Breeding.

Mardi M (1999). Genetically studying of 418 pee of deci type of gene bank of agriculture faculty by using multi variant methods. Master thesis. Agriculture Faculty. University of Tehran.

Nandal S, Agarwal K (1991). Response of winter corn to sowing dates Irrigation and nitrogen level. Journal North-west India-India.55: 628-663.

Noor Mohammadi G, Siadat A, Kashani A (2003). Cereal crops, Vol. 1 Shahid Chamran University Press.

Onken, A. B, R. L. Matheson, and D, M. Nesmith.1985. Fertilizer nitrogen residual nitrate – nitrogen effects on irrigated corn yield. Soil Science. Society of America Journal.49:134-139.

Rajput R J (1992).Relationship between N and K in corn. Abstracts of Botany. J. 43: 1693.19.

Rending VV, Broadbent FE (1979). Protein and amino acid in grain of corn grown with various levels of applied N. Agronomy Journal. 71:509-512.

Samiullah Khan NA, Ansari SA, Afridi MRK (1991). Pyridoxine augments growth yield and quality of mustard through efficient utilization of soil applied N P fertilizers. Acta Agronomy. Hung. 40: 111 – 116.

Sander DH, Allaway WH, Olson RA (1987). Modification of nutritional quality by environment and production practices.P.45.82.In R.A. Oison and K. J. Frey(ed).

Tavakkoli A (1995).Effects of azotes, phosphor and potassium fertilizer on growth and yield of corn, master thesis. Agriculture Faculty of Isfahan University.

Tsai CL, Tsai CY (1990). Endosperm modified by cross pollination corn to induce changes in dry matter and nitrogen accumulation. Crop Science. 30: 804-808.

West ML (2006). Response of corn hybrids to varying plant population densities. Field Crop. Abstact.42: 8569.

Yazdani M, Bahmanyar MA, Pirdashti H, Esmaili MA (2009). Effect of phosphate solubilization microorganisms and plant growth promoting rhizo bacteria on yield and yield components of corn. Inter. J. Biol. Life Sci.1:2.