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Response of Maize Fodder to Different Nitrogen Levels and Harvesting Times

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Abstract

A field experiment was conducted at Faisalabad, Pakistan, during 2000, to study the effect of 50,100 and 150 kg N ha^{-1} on maize (*Zea mays* L.) cultivar 'Golden' harvested 40, 50 and 60 days after sowing. The green fodder yield was significantly increased with increasing nitrogen levels and maximum (43.62 t ha^{-1}) was obtained when the crop was fertilized at the rate of 150 kg N ha^{-1}. The increase in yield was mainly due to greater plant height (144.92 cm), stem diameter (1.78 cm), leaf number (12.22) and leaf area (207.0 cm^2) per plant. The crop harvested 60 days after sowing owing to greater plant height (172.99 cm), stem diameter (1.68 cm), leaf number (12.29) and leaf area (207.1 cm^2) per plant, produced significantly higher yield (44.44 t ha^{-1}) than the crop harvested earlier. The crop harvested 60 days after sowing and fertilized at the rate of 150 N kg ha^{-1} seems to be the best combination for getting higher green fodder yield of maize under agro-ecological conditions of Faisalabad.

Key words: Nitrogen, harvesting time, maize fodder, green fodder yield

Introduction

Maize in addition to providing grains for animals and human consumption is also being used as fodder for animals or for conservation by drying or ensilage. Maize fodder is very much liked by animals due to being succulent and palatable. Fodder scarcity is considered a major limiting factor for a prosperous livestock industry in Pakistan. The fodder production is approximately 52-54% less than the actual requirement for animals (Bhatti, 1988). It is therefore, imperative to make efforts to increase production of fodder in the country. The horizontal expansion in fodder is not possible due to human population pressure. So the only solution is to increase yield on per unit area basis. One way of doing so is to determine its fertilizer requirement. The plant nutrition not only affect the forage production but also improve the quality of forage from view point of its protein content (Ayub *et al*., 2002b). Harvesting time is another important factor affecting the yield of forage crops. Optimum harvest time increased yield with increased nitrogen rates (Siddique *et al*., 1989). Delaying harvest increased yield but decreased quality parameters (Agath *et al*., 1997 and Ayub *et al*., 2002a). The information on the interactive effects of nitrogen application and harvesting time on green fodder yield of fodder maize is lacking in Pakistan. The present study was therefore, designed to determine the optimum nitrogen rate and harvesting time for obtaining higher green fodder yield of maize.

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Materials and Methods

A field experiment to evaluate the response of fodder maize to nitrogen levels of 50, 100 and 150 kg ha^{-1} when harvested 40, 50 and 60 days after sowing was conducted at Agronomic Research Area, University of Agriculture, Faisalabad, Pakistan. The experiment was laid down in randomized complete block design with factorial arrangement having three replications and measuring a net plot size of 2.4 m x 9 m. The crop was sown with single row hand drill in 30 cm spaced rows on April 10, 2000. Prescribed doses of nitrogen and basal dose of phosphorus at the rate of 60 kg ha^{-1} were applied at the time of seedbed preparation in the form of urea and single super phosphate, respectively. All other practices were kept normal and uniform for all the treatments. The data regarding growth and yield parameters were recorded following standard procedures. The data collected was analyzed statistically by using Fisher's analysis of variance technique and differences among treatment means were compared using least significant difference test at 5 % probability level. (Steel and Torrie, 1984).

Results and Discussion

The data regarding yield and yield components are presented in table 1. The effect of nitrogen levels and harvesting times on plant density was not significant. These non-significant results can be attributed to the use of uniform seed rate having same viability in all the plots. Rafiq *et al*. (1996) had also reported that nitrogen application did not affect the plant density.

Table 1: Growth and yield of maize fodder as influenced by nitrogen levels and harvesting time.

	Stand Density (m^{-2})	Plant Height (cm)	Stem diameter (cm)	No. of leaves $plant^{-1}$	Leaf area $plant^{-1}$ (cm^2)	Green fodder yield (t ha^{-1})
Nitrogen (kg ha^{-1})						
50	41.11 NS	97.38 c	1.26 c	10.19 c	165.4 c	31.02 c
100	40.67	120.20 b	1.41 b	11.16 b	185.2 b	36.32 b
150	40.44	144.92 a	1.78 a	12.22 a	207.0 a	43.62 a
SED	-	5.35	0.049	0.38	4.63	0.85
Harvesting times (days after sowing)						
40	4033 NS	80.20 c	1.32 c	9.80 b	166.0 c	30.46 c
50	40.67	109.31 b	1.46 b	11.48 a	184.6 b	36.05 b
60	41.22	172.99 a	1.68 a	12.29 a	207.1 a	44.44 a
SED	-	5.35	0.049	0.38	4.63	0.85

Any two means not sharing a letter in common differ statistically at 5% probability level.

Plant height was affected significantly by nitrogen application. The plant height was increased significantly with each increased nitrogen level. The plots receiving 150 kg N ha^{-1} produced the tallest plants against the minimum plant height at nitrogen level of 50 kg ha^{-1}. Significant increase in plant height with nitrogen application has also been reported by Ayub *et al*. (2002b). Harvesting time also significantly affected the plant height. The plots harvested 60 days after sowing produced significantly taller plants as compared to those harvested on 40 and 50 days after sowing. An increase in plant height with delayed harvesting has also been reported by Musa *et al.* (1993) and Ayub *et al*. (2002a).

A significant increase in stem diameter was observed at each increased rate of nitrogen fertilizer. The plot fertilized at the rate of 150 kg N ha^{-1} produced significantly thicker stems than all other nitrogen levels. These results are supported by Ahmad (1999) and Ayub *et al*. (2002a&b). Among the harvesting times, plots harvested 60 days after sowing produced significantly thicker stem than other treatments. The minimum stem thickness was obtained in plots harvested 40 days after sowing. Increase in stem diameter with delayed harvesting has also been reported by Siddique *et al.* (1989) and Ayub *et al*. (2002a).

Nitrogen application significantly icreased the number of leaves $plant^{-1}$ and all nitrogen levels differed significantly from each other The maximum leaves $plant^{-1}$ were observed in plots receiving nitrogen at the rate of 150 kg ha^{-1}. Safdar (1997) has also reported that nitrogen application increased number of leaves $plant^{-1}$. The crop harvested 50 and 60 days after sowing produced statistically similar number of leaves per plant but both these treatments have significantly higher number of leaves $plant^{-1}$ than crop harvested 40 days after sowing. These results confirm the findings of Ashraf (1976).

Increase in nitrogen rates significantly increased the leaf area $plant^{-1}$. The maximum and minimum leaf area $plant^{-1}$ was recorded at nitrogen levels of 150 and 50 kg ha^{-1}, respectively. Significant increase in leaf area with nitrogen application can be attributed to more number of leaves per plant. These results are quite in line with those of El-Hattab *et al*. (1980) and Ayub *et al*. (2002a). Harvesting time also significantly affected the leaf area $plant^{-1}$. The plots harvested 60 days after sowing produced significantly more leaf area $plant^{-1}$ than earlier harvesting times**.** Minimum leaf area was observed when crop was harvested 40 days after sowing. Musa *et al.* (1993) had also reported a significant increase in the leaf area $plant^{-1}$ with delaying the harvest.

Green fodder yield was increased with increased nitrogen rate and increase was significant at each increased nitrogen rate. The minimum green fodder yield was recorded in plots receiving 50 kg N ha^{-1}. The increase in yield was mainly due to more number of leaves and leaf area $plant^{-1}$, stem diameter and plant height. Similar results have also been reported by Safdar (1997) and Ayub *et al*. (2002a&b). Plots harvested 60 days after sowing due to more number of leaves and leaf area $plant^{-1}$, stem diameter and plant height produced significantly higher green fodder yield than plots harvested earlier. Plots harvested 40 days after sowing gave minimum green fodder yield. Increase in green fodder yield with delayed harvesting has also been reported by Genter *et al.* (1970) and Ayub *et al*. (2002a). Interaction between nitrogen levels and harvesting times for all the parameters discussed was not significant.

References

Agath, B.M., Jethwa, M.A., Khanpura, V.D. Kaneria B.B. and Mathukla, R.K. Effect of harvesting stages and levels of N and P on yield, quality and uptake of nutrients by fodder maize (*Zea mays* L). Gujrat Agri. Univ. Res. J., 1997, 22: 104-106.

Ahmad, B. Effect of different levels of nitrogen and seeding densities on growth, yield and quality of maize fodder. MSc. (Hons) Thesis, Dept. Agron.,Univ. Agri., Faisalabad, Pakistan. 1999.

Ashraf, M. Yield and quality in sorghum ratoon crop (fodder) as influenced by sowing times and intervals of cutting. MSc. (Hons) Thesis, 1976. Dept. Agron.,Univ. Agri., Lyallpur.

Ayub, M., Nadeem, M.A., Tanveer, A. and Husnain, A. Effect of different levels of nitrogen and harvesting times on growth, yield and quality of sorghum fodder. Asian J. of Plant. Sci. 2002a, 1: 304-307.

Ayub, M., Nadeem, M.A., Sharar, M.S. and Mahmood, N. Response of maize fodder to different levels of nitrogen and phosphorus. Asian J. of Plant Sci. 2002b. 1:352-354.

Bhatti, B.M. National perspective of fodder crops in Pakistan. NARC, Islamabad, PP: 1-2. 1988.

El-Hattab, H.S., Hussain, N.A., Hattab, A.H., Rauf, M.S. and El-Nomany, A.A. Growth analysis of maize in relation to grain yield as affected by nitrogen levels. Zeitschriflfur Acher and Pflanzentau, 1989, 49:46-57 (Field Crop Absts., 33(12): 9882; 1980).

Genter, C.F., Jones, G.D. and Carter, M.T. Dry matter accumulation and depletion in leaves, stem and ears of maturing maize. Agron., J., 1970, 62:535-37.

Musa, M., Gondal, M.R., Ali, A. and Ashraf, M. Effect of cutting at different plant growth stages and heights above ground level on green fodder and dry matter yields of Sadabahar. J. Agric. Res., 1993,.31:409-12.

Rafiq, M., Akhtar, M.S. and Muhammad, N. Effect of nitrogen application on fodder yield and quality of maize. J. Agric. Res., 1996. 34: 1007-110.

Safdar, Z. Optimization of nitrogen and its effect on yield and quality of maize. MSc. (Hons) Thesis, Dept. Agron., Univ. Agri., Faisalabad, Pakistan, 1997.

Siddique, M., Bajawa, M.S. and Makhdum, M.I. Yield and quality of maize fodder as influendced by different stages of harvesting and nitrogen rates. Pak. J. Sci and Indust. Res. 1989, 32:766-67.

Steel, R G.D. and Torrie, J H. Principles and Procedures of Statistics, 2nd ed. McGraw Hill Book Company, Singapore, PP: 173-7, 1984 .