Green Fodder Yield and Nutrient Composition of African Tall Maize Fodder (Zea mays) With Various Nitrogen-Phosphorus Levels

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Abstract— *The effect of different combination of Nitrogen-Phosphorus levels was studied in a field experiment particularly on the fodder yield and quality of African tall maize fodder. Nitrogen-Phosphorus fertilizers at the rate of 0-0, 100-30, 120-40 and 160-50 kg per ha were applied. Green fodder yield and dry matter percentage were influenced significantly by the application of nitrogen and phosphorus. Maximum green fodder yield was obtained at Nitrogen-Phosphorus level of 160-50 kg / ha. Quality parameters such as crude protein, crude fibre, ether extract, total ash, calcium and phosphorus contents were also influenced significantly by the application of Nitrogen-Phosphorus fertilizers. All Nitrogen-Phosphorus combination produced higher crude protein, crude fibre ether extract, total ash, calcium and phosphorus contents over control. The present study indicates that significantly higher green fodder yield with improved nutrient composition in the form of dry matter, crude protein, crude fibre, ether extract, total ash, Calcium and phosphorus can be achieved with NP fertilizers in an effective combination level of 160-50 followed by 120-40 and 100-30.*

Keywords— Maize fodder, fertilizer, Nitrogen-Phosphorus levels, fodder yield and nutrient composition.

I. INTRODUCTION

Maize (*Zea mays*) is one of the main kharif crop in India including many Asian countries. It was originated in Maxico and it has been cultivated from pre-historic times by the aboriginal people of America. In India its cultivation is popular for grain as well as for livestock fodder. It is one of the earliest introductions from America, grown in warm and moist regions of India for green fodder and silage. Being an indispensible and most important constituent of animal ration it provides energy and protein to the animals (Maiti and Wesche-Ebeling, 1998). In India maize fodder is cultivated in various agro climatic zones. It is evident that various factors such as composition of soil, irrigation, climatic condition, varieties, strains, manure and fertilizers affects on growth, yield and its quality in the form of chemical composition. Keeping all other factors constant if the fertilizer application is altered, considering the most economic factor the yield and quality can be improved. The efforts were taken in this experiment to study the effect of altering NP levels to the best possible combination for optimum production in the form of green fodder yield and chemical composition in the form of dry matter yield, crude protein, crude fibre, ether extract, total ash, calcium and phosphorus.

II. MATERIALS AND METHODS

The present experiment was conducted to study the effect of different levels of nitrogen and phosphorus (NP) on green fodder yield and qualitative aspects of the African tall maize fodder in the form of nutrient content viz. dry matter yield, crude protein, crude fibre, ether extract, total ash, calcium and phosphorus. Initially four plots were made of equal size (30 x 10 m^2). First plot was without any application of fertilizers (NP level 0-0 kg/ha) and considered as control. Second plot was applied fertilizer with NP level 100-30 kg/ha, third plot was applied fertilizer with NP level 120-40 kg/ha and fourth plot was applied with NP level 160-50 kg/ha. The crop was sown in a single row with 25 cm space between two rows. Overall quantity of fertilizer, containing nitrogen and phosphorus in the form of urea and triple super phosphate was applied at the time of sowing. All other common agricultural practices were performed uniformly to all treatment groups.

Fodder was harvested after 90 days. The green fodder yield was measured for all treatment groups individually on the same scale. Fodder samples (as such) were collected as per standard sample collection technique. Representative six samples of four treatments were collected and processed as per routine standard laboratory procedures and analyzed for proximate principles (dry matter, crude protein, crude fibre, ether extract and total ash), phosphorus (A.O.A.C., 2003) and calcium content (Talpatra *et al*., 1940). Data were

statistically analyzed (Snedecor and Cochran, 1986) to draw conclusion.

III. RESULTS AND DISCUSSION

The average values of green fodder yield, chemical composition of Maize fodder are given in Table1**.**

The average values of green fodder yield (T / ha) were significantly different from each other with the highest yield in NP level 160-50 (44.97±0.64) followed by 120-40 (38.41 ±0.35), 100-30 (31.84 ±0.32) and least in NP level 0-0 (27.02 ±0.25). The higher yield with NP level 160-50 was observed mainly due to the higher growth rate absolutely from the beginning till the harvesting. The highest dry matter percentage was observed in plot receiving NP level 160-50 (22.38±0.37) which was significantly higher and different

from other plots receiving NP levels of 120-40 (19.33±0.24), 100-30 (16.60±0.15) and lowest dry matter percent in NP level 0-0 (13.86±0.20). Supplementation of higher NP levels significantly affected dry matter content of the fodder. The results observed are in close concern as with Khandaker and Islam (1988), Reddy et al. (1987) and Singh et al. (1996).

Crude Protein content of the fodder was significantly affected by application of NP fertilizers. The highest crude protein content was observed with NP level 160-50 (10.83 ±0.31) followed by 120-40 (9.28 ±0.18), 100-30 (7.95±0.16) and lowest crude protein content was observed in plot receiving 0-0 fertilizer (5.03±0.08). The crude protein content in the plot receiving NP level 160-50 was almost double than control receiving NP level 0-0. It is absolutely evident from this result that the NP supplementation has significantly affected crude protein content and application of at least 100-30 NP fertilizer will increase crude protein content by 30% than the control (0-0). The same trend was observed with the crude fibre content of the fodder with highest values in plot receiving NP level 160-50 (27.55^{d} ±0.21) followed by 120-40 (26.17^{c} ±0.13), 100-30 (24.57^{b} ±0.09) and least crude fibre content was observed in plot receiving NP level of 0-0 (22.12^{a} ±0.24). The crude fibre content of all four plots receiving different NP levels were found significantly different from each other. The results observed for these parameters are similar with Khan et al. (1996), Khalid Mahmud (2003) and Iqbal et al. (2006). The ether extract content of the fodder was also found significantly affected by NP application with highest fat content in 160-50 (1.85^{b} ±0.07) followed by 120-40 (1.82^{b} ±0.08), 100-30 (1.75^{b} ±0.07) and lowest in 0-0 (1.16^{a} ±0.03). The plots supplemented with NP fertilizers (160-50, 120-40 and 100-30) did not shown significant difference among them but were found significantly different and higher than control (0-0). It is revealed from the data that NP application can increase the ether extract content with minimum NP level (100-30) but further increase in NP levels (120-40 or 160-50) may not significantly affect on this parameter.

The total ash content of fodder was significantly influenced by different levels of nitrogen and phosphorus fertilizers. The application of 160-50 combination revealed highest ash content (10.02±0.19) followed by 120-40 (9.07±0.08), 100-30 (8.32±0.06) and lowest ash content was observed in control (7.16±0.02). Increase in NP levels from 100-30 to 120-40 and 160-50 has significantly affected total ash percent of green fodder.

This observation is in close agreement with Ayub et al. (2002) and Khalid Mahmud (2003). The same trend was observed in case of Ca and P content. The Ca and P content were significantly affected by NP application and were significantly different from each other and control. The highest Ca and P percent was observed in plot applied with NP level 160-50 (0.74±0.01 and 0.31±0.00) followed by 120-40 (0.63±0.01 and 0.27 ±0.00), 100-30 (0.52±0.02 and 0.22 ±0.01) and lowest Ca and P was observed in fodder plot supplemented with 0-0 fertilizers (0.43±0.01 and 0.17 ±0.00). The increase in Ca and P content of the fodder was observed mainly due to the increased uptake and deposition of these inorganic elements in the plots supplemented with the progressive NP levels.

Table-1: Effect of different Nitrogen-Phosphorus Levels on Performance of Maize Fodder.

Parameters	**Nitrogen-Phosphorus Levels (N-P Levels) kg / ha**			
	0-0	**100-30**	**120-40**	**160-50**
Green Fodder Yield (T / ha)	27.02^{a} ±0.25	31.84^{b} ±0.32	38.41^{c} ±0.35	44.97^{d} ±0.64
Dry Matter (%)	13.86^{a} ±0.20	16.60^{b} ±0.15	19.33^{c} ±0.24	22.38^{d} ±0.37

Crude Protein (%)	5.03^{a} ±0.08	7.95^{b} ±0.16	9.28^{c} ±0.18	10.83^{d} ±0.31
Crude Fibre (%)	22.12^{a} ±0.24	24.57^{b} ±0.09	26.17^{c} ±0.13	27.55^{d} ±0.21
Ether Extract (%)	1.16^{a} ±0.03	1.75^{b} ±0.07	1.82^{b} ±0.08	1.85^{b} ±0.07
Total Ash (%)	7.16^{a} ±0.02	8.32^{b} ±0.06	9.07^{c} ±0.08	10.02^{d} ±0.19
Calcium (%)	0.43^{a} ±0.01	0.52^{b} ±0.02	0.63^{c} ±0.01	0.74^{d} ±0.01
Phosphorus (%)	0.17^{a} ±0.00	0.22^{b} ±0.01	0.27^{c} ±0.00	0.31^{d} ±0.00

Means with different superscripts within the same row differs significantly.

IV. CONCLUSION

From the above study it was concluded that significantly higher green fodder yield with improved nutrient composition in the form of dry matter, crude protein, crude fibre, ether extract, total ash, Ca and P can be achieved with NP fertilizers in an effective combination level of 160-50 followed by 120-40 and 100-30.

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