



Research Article

Growth Attributing Traits of Maize Affected by Different Nutrient Management in Lamjung Nepal

Manish Kumar Pal*, Prakash Marasini and Salikram Ghimire

Institute of Agriculture and Animal Science (IAAS), Lamjung, Nepal

*Corresponding author email: ramanpal273@gmail.com

Abstract

A field experiment was conducted during the spring season of 2016 at research field of Institute of Agriculture and Animal Science (IAAS), Lamjung, Nepal to evaluate effect of different nutrient management on growth attributing traits of maize. The experiment was laid out in Randomized Complete Block Design (RCBD) having three replications with following treatments; T1(Control), T2 (0.18:0.09:0.06 kg NPK), T3 (3.75 kg vermicompost), T4 (7.5 kg Poultry manure), T5 (11.25 kg goat manure), T6(15 kg cattle manure) and T7(13 kg Asuro). All these fertilizers were used per plot (15 m²) and the maize variety was Arun-2. The results showed that the application of poultry manure produced the highest plant height, leaf area index and dry matter which was followed by vermicompost. The application of goat manure gave the highest benefit cost ratio.

Keywords: Economic analysis; Growth attributing trait; Maize

Introduction

Maize is the second most important crop after rice in terms of area and production in Nepal. It is a way of life for the hill farmers of Nepal. It is a traditional crop grown for food, feed and fodder. Maize demand has been constantly growing by about 5% annually in the last decades (Sapkota & Pokhrel, 2013). Per capita maize consumption in Nepal was 98 g/person/day (Ghimire *et al.*, 2015). Therefore, total quantity of maize requirement for food per year is around 2.9 million mt and the production during 2014 was 2.283million mt, hence the deficit was 0.67 million mt. According to recent data total area of cultivation 982761 ha, production 2283222 mt and yield 2458 mt/ha.

In a 100-gram serving, maize kernels provide 86 calories and are a good source (10-19% of the Daily Value) of the B vitamins, thiamin, niacin, pantothenic acid (B5) and folate. In moderate amounts, they also supply dietary fiber and the essential minerals, magnesium and phosphorus whereas other nutrients are in low amounts. Deep, loamy, fertile soils, rich in organic matter, are preferred for satisfactory growth of maize. Well-drained soils with adequate moisture supply are required for uninterrupted growth of this crop. By establishing the crops with the on-set of the rainy season, the crops can be harvested before depletion of soil moisture.

Maize produces a greater quantity of biomass than other cereal plants, which is used for fodder. Digestibility and palatability are higher when ensiled and fermented, rather than dried.

Soil fertility degradation still remains the single most important constraint to food production in Nepal and an efficient cycling of nutrients among crops, animals and soil is crucial to the sustained productivity of the farming systems (Adhikari *et al.*, 2014). Organic manure also helps to improve the physical condition of the soil and provides the required plant nutrients. It enhances cation exchange capacity and acts as a buffering agent against undesirable soil pH fluctuations. The application of organic manure has been found to have higher comparative economic advantage over the use of inorganic fertilizer. Also, as a result of increased popularity of organic crop production, more information is needed comparing the growth and yield of crops produced organically or using inorganic fertilizer. The objective of this study was to evaluate the effects of different organic manures and inorganic manure application on the growth performance and yield potentials of maize grown in lamjung.

Rainfed farming means the cultivation of crops on relatively dry land that lacks easy access to irrigation and moisture

requirement at any growth and development stages of crop. Rainfed farming area falls mainly in arid, semi-arid, and dry sub humid zones in the world but the Nepalese sub-tropical region is also rainfed. In Nepal, about 65% of the total arable land is under rainfed (Thapa, 1995). The variation in rainfall under rainfed zone especially during spring season feels long dry spell, early withdrawal and also increasing temperature caused stressful environment to plant growth, all of which strongly influence the productivity level of maize. This study was carried out to find out the best type of manure or fertilizer which enhance production and productivity of Maize.

Materials and Method

This experiment was conducted at research field of IAAS, Lamjung whose geographical location was 725Masl, 28°7'-28°10'N, 84°24'-84°28'E. during March to June, 2016. The experimental design was randomized complete block design (RCBD) with three replications. The plot size was 15m² (5m x 3 m) with spacing of 60 cm x 20 cm (RR x PP). The hoeing and earthing up was carried out at 40DAS. Climatic parameters during the experiments at Lamjung Nepal is shown in Table 1. Soil properties of the experimental field is shown in Table 2.

The treatment details were following;

- T1: Control -
- T2: NPK @ 0.18:0.09:0.06 kg/plot
- T3: Vermicompost @ 3.75 kg/plot
- T4: Poultry manure @ 7.5 kg/plot
- T5: Goat manure @11.25 kg/plot
- T6: Cattle manure @ 15 kg/plot
- T7: Asuro @13 kg/plot

The parameters namely plant height at 40 and 66 DAS, leaf area index at 40 and 66 DAS and dry matter at 40 and 99 DAS were recorded. Data was analyzed by using spss16.0 version and means were separated by using Duncan test at 0.05 level and 0.01 level of significance.

Table 1: Climatic parameters during the experiments at Lamjung Nepal

Parameters	March	April	May	June
Tmax	19.392	21.757	22.042	14.213
Tmin	4.9083	7.04	10.877	14.213
Tair	11.842	15.437	16.824	18.067
RH	32.608	30.577	48.287	69.527

Table 2: Soil properties of the experimental field

Soil content	Amount
PH at 19 °C	5.2
Organic matter	2.01%
Nitrogen	0.14 mg/g
Phosphorus	1.1 microgram/g
Potassium	38 microgram/g
Calcium	0.61 mg/g
Zinc	2.1microgram/g

Result and Discussion

At 40 DAS, the highest plant height was seen in poultry manure. It is significantly at par with Vermicompost, cattle manure and control. The plant height was seen least for NPK treatment (Fig 1).

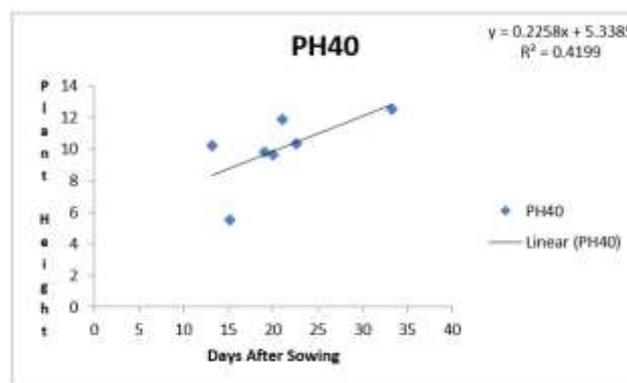


Fig 1: Scatter plot diagram of plant height at PH40

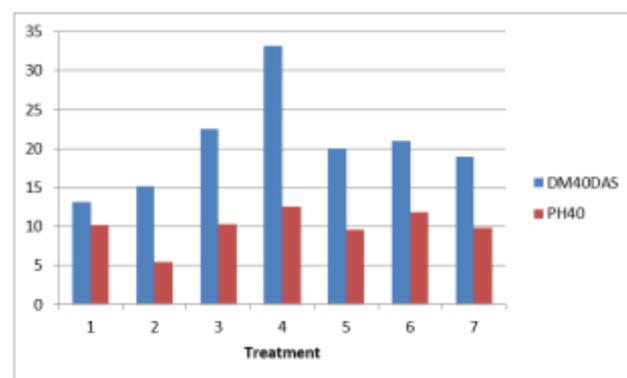


Fig 2: Plant height and Dry matter yield of different treatments at 40 DAS.

At 66 DAS, the highest plant height was again seen in poultry manure. It is statistically at par with vermicompost, cattle manure. The lowest plant height was seen in the control plot.

Leaf area index at 40DAS was highest in the poultry manure. Other treatments were statistically at par. At 66DAS, the highest LAI was found in the poultry manure which is statistically at par with the cattle manure and vermicompost.

DM at 40DAS was the highest amount of dry matter was found in the poultry manure, while vermicompost, goat manure ,cattle manure and asuro are statistically at par. DM at 99DAS was the highest amount of DM was found in the poultry manure, while vermicompost, cattle, goat manure are statistically at par. In addition, control plot, asuro and NPK are significantly different. Growth parameters at

different growth stages of maize as affected by different fertilizers at Lamjung, Nepal is shown in Table 3.

From the Table 4 of economic analysis, we found highest B: C ratio of goat manure while least was for vermicompost. This was seen because of higher cost of the manures. The treatments asuro, poultry manure, and cattle manures also showed similar B:C ratio as goat manure.

Table 3: Growth parameters at different growth stages of maize as affected by different fertilizers at Lamjung, Nepal.

Treatment	DM40DAS	DM99DAS	PH40DAS	PH66DAS	LAI40DAS	LAI66DAS
Control	13.16 ^d	328 ^b	10.2 ^{ab}	34.92 ^c	0.0830 ^b	0.449 ^d
NPK	15.19 ^{cd}	378.7 ^b	5.493 ^c	43.29 ^{bc}	0.0713 ^b	0.858 ^c
Vermicompost	22.53 ^b	807.3 ^a	10.36 ^{ab}	63.02 ^{ab}	0.1145 ^b	1.458 ^a
Poultry manure	73.22 ^a	835.3 ^a	12.513 ^a	66.43 ^a	0.1643 ^a	1.715 ^a
Goat manure	19.97 ^{bc}	615.3 ^{ab}	9.193 ^b	45.38 ^{bc}	0.0798 ^b	1.104 ^{bc}
Cattle manure	21.03 ^{bc}	618.0 ^{ab}	11.867 ^{ab}	62.33 ^{ab}	0.1032 ^b	1.371 ^{ab}
Asuro	18.99 ^{bcd}	404.7 ^b	9.820 ^{ab}	42.94 ^{bc}	0.0854 ^b	1.024 ^{bc}
SEM(±)	2.049	87.1	0.959	6.17	0.01344	0.1096
LSD(0.05)	6.315	268.3	2.956	19	0.04140	0.3377
CV (%)	13.5	26.5	16.8	20.9	23.2	16.7
P-Value	0.001	0.006	0.006	0.019	0.006	0.001
General mean	26.30	570	9.92	51.2	0.1002	1.140

Table 4: Economic analysis of maize under different fertilizer management at Lamjung, Nepal

Cost of cultivation	Revenue	b/c	Benefit
Fixed cost			
Land rent	5000		
Seed	4000		
Labor cost	75000		
Tools and equipment	5000		
Total(a)	89000		
Variable			
Control	-	35000	0.39
NPK	4000	42000	0.451
Vermicompost	75000	55000	0.33
Asuro	5000	38000	0.40
Poultry manure	50000	61000	0.43
Goatmanure	30000	45000	0.48
Cattle manure	25000	49000	0.42

The application of 14 and 10 t/ha of poultry manure resulted in significantly higher leaf area index and dry matter production (Prasad, *et al.*, 2003), which is found to be same with our results. A field study was conducted at vanavavarayar institute of agriculture and the result shows that, integrated nutrient management has positive effect on growth parameters of maize such as leaf area and plant height (Kannan *et al.*, 2013). Plants that received poultry manure grew taller than other plants possibly because more concentrated nutrients or minerals were made readily available and easily absorbable by the receiving plants leading to faster growth and development. This is harmony with the findings and reports (Lombin *et al.*, 1992).

Conclusion and Recommendation

The variation in growth parameters i.e. plant height and leaf area index was observed due to application of different fertilizers. The application of poultry manure at the rate of 7.5 kg/15m² plot area produced highest values of growth parameters followed by vermicompost. For the mid hill region of Nepal, Poultry manure is the best organic nutrient that provide better growth of maize plant with highest Dry matter yield followed by Vermicompost. Because of poultry manure's high nitrogen content, it has long been recognized as one of the most desirable manures. Besides fertilizing crops, manures also supply other essential plant nutrients and serve as a soil amendment by adding organic matter, which helps improve the soil's moisture and nutrient retention.

Acknowledgements

The authors expressed their deep sense of gratitude to Asst. Prof. Lal Prasad Amgain, Ph.D., Department of Agronomy, Campus Chief presently at IAAS, Lamjung Campus for his valuable suggestions, constructive comments and

encouragement throughout the research period. They also express their warm regards to Asst. Prof. Madhav Neupane, Ph.D., and Asst. Prof. Roshan Subedi for their constructive criticism and suggestions. In addition, they would like to acknowledge their respective seniors Abhishek Shrestha and Bishal Dhakal for their supportive role. Furthermore, they would like to acknowledge IAAS, Lamjung Campus family for providing such a platform for them to carry out this research effectively and efficiently.

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