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## Effect of Organic and Inorganic Fertilizer Application on Maize Fodder Production

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**Abstract:** The field experiment was conducted at Students' Experimental Farm, Sindh Agriculture University Tandojam, Pakistan to assess the maize growth and fodder yield under varying combinations of organic manure (Farm Yard Manure (FYM) at the rate of 1500, 3000 and 4500 kg ha<sup>-1</sup>) and inorganic fertilizers (0, 60, 90, 120 and 150 kg N ha<sup>-1</sup>). The results revealed that all the maize plant parameters were significantly affected with the incorporation of FYM and nitrogen levels. Among the plant characters, tall plants, maximum stem girth, more green leaves and highest maize fodder yield were observed with the application of 120 kg N ha<sup>-1</sup> with combination of 3000 FYM. It was concluded that the inorganic nitrogen application is the common practice of the farmers, but if, farmyard manure will be supplemented there may be significant increase in maize fodder yield.

**Key words:** Maize, fodder, nitrogen, FYM, organic, inorganic

### INTRODUCTION

Pakistan, being the agricultural country is quite back in producing satisfactory crop yields due to many constraints, among those, appropriate nutrient supply is important. The cultivated areas needs to be supplemented with synthetic fertilizers added with organic fertilizers to enhance agricultural productivity. Worldwide, there is growing interest in the use of organic fertilizer due to depletion in the soil fertility because continuous use of chemical fertilizers create potential polluting effects due to chemicals in the environment<sup>[1]</sup>.

The recycle and use of nutrients from organic manure has been given more consideration for insuring sustainable land use and agricultural production development. The long term effects of the combined application of organic and inorganic fertilizers in improving soil fertility and crop yield have been demonstrated by Lin and Lin<sup>[2]</sup>, Xie *et al.*<sup>[3]</sup>, Chen *et al.*<sup>[4]</sup>, Chen *et al.*<sup>[5]</sup> and Liu *et al.*<sup>[6]</sup>. Recently Wang *et al.*<sup>[7]</sup> reported that organic and inorganic fertilizer showed great benefits not only for the increase in the N uptake by plant and in soil available N, but also for the improvement of maize yield. Looking the economic importance of maize as fodder for animal production, the research was conducted to explore the appropriate nitrogen levels with the supplement incorporation of FYM for achieving satisfactory fodder yield.

### MATERIALS AND METHODS

The field study was conducted to investigate the effect of organic and inorganic fertilizer application on maize fodder production at Students' Experimental Farm,

Department of Agronomy, Sindh Agriculture University Tandojam, Pakistan. The treatments applied were: different nitrogen levels (0, 60, 90, 120 and 150 kg ha<sup>-1</sup>) and fresh Farm Yard Manure (1500, 3000 and 4500 kg ha<sup>-1</sup>). The inorganic N fertilizer was obtained from Urea source. The various N levels were split applied. First application of N with whole P<sub>2</sub>O<sub>5</sub> and fresh FYM was done during land preparation. The 2nd and 3rd N incorporation were made at 20 and 30 days of sowing. All other the cultural practices for area maintenance were adopted uniformly. The data collected were statistically analyzed through MSTATC statistical package.

### RESULTS AND DISCUSSION

The statistical analysis of variance for plant height, stem girth, number of green leaves per plant and maize fodder yield under different organic and inorganic fertilizers showed significant differences at 5% probability level. However, statistically results for these traits were non-significant for interaction of organic and inorganic fertilizer levels (Table 1).

The results of experiment showed that the application of 3000 kg FYM ha<sup>-1</sup> was much effective in recording maximum plant height (150.82 cm), thicker stems (4.08 cm), more number of green leaves per plant (6.22) and highest fodder yield (41823.03 kg ha<sup>-1</sup>) followed by 4500 kg FYM ha<sup>-1</sup>. The lower levels of FYM (1500kg ha<sup>-1</sup>) significantly exhibited dwarf plants, reduced stem girth, lesser green leaves and minimum maize fodder yield (Table 1).

The assessment for different nitrogen levels indicated that 120 kg N ha<sup>-1</sup> from Urea was much effective in attempting taller plants (198.94 cm), thicker stems (5.70 cm), more green leaves per plant (8.59) and highest

Table 1: Maize fodder parameters under organic and inorganic fertilizers

N-levels	Farm Yard Manure (kg ha <sup>-1</sup> )			N-level mean
	1500	3000	4500	
<b>Plant height (cm)</b>				
0	95.07	100.33	105.17	100.19e
60	111.13	121.47	119.13	117.24d
90	125.87	135.63	131.73	131.08c
120	195.57	203.77	197.50	198.94a
150	181.10	192.90	183.37	185.79b
FYM Mean	141.75c	150.82a	147.38b	-
	FYM (A)	N-Levels (B)	A x B	
LSD (5%)	1.606	3.634	-	
LSD (1%)	2.415	4.854	-	
S.E.	0.563	1.275	-	
<b>Stem girth (cm)</b>				
0	2.23	2.30	2.57	2.37e
60	2.70	3.20	2.93	2.94d
90	3.37	4.10	3.80	3.76c
120	5.40	6.10	5.60	5.70a
150	4.37	4.70	4.43	4.50b
FYM Mean	3.62b	4.08a	3.87ab	-
	FYM (A)	N-Levels (B)	A x B	
LSD (5%)	0.310	0.262	-	
LSD (1%)	0.418	0.349	-	
S.E.	0.109	0.091	-	
<b>Green leaves per plant</b>				
0	2.50	3.13	3.73	3.12d
60	4.23	5.37	4.30	4.63c
90	4.80	5.47	5.37	5.21c
120	6.73	10.67	8.37	8.59a
150	5.80	6.47	5.97	6.08b
FYM Mean	4.81c	6.22a	5.55b	-
	FYM (A)	N-Levels (B)	A x B	
LSD (5%)	0.329	0.594	-	
LSD (1%)	0.439	0.794	-	
S.E.	0.115	0.208	-	
<b>Maize fodder yield (kg ha<sup>-1</sup>)</b>				
0	19393.23	23619.56	41823.03	23668.23d
60	23886.34	28501.47	26277.91	26221.91d
90	34593.86	40466.42	38696.63	37918.97c
120	38144.88	59796.65	48459.73	48800.42a
150	35067.60	56731.05	43412.87	45070.51b
FYM Mean	30219.19c	41823.03a	36967.81b	-
	FYM (A)	N-Levels (B)	A x B	
LSD (5%)	2004	3490	-	
LSD (1%)	3324	5079	-	
S.E.	510.4	1070	-	

maize fodder yield (48800.42 kg ha<sup>-1</sup>) followed by 150 and 90 kg N ha<sup>-1</sup> (Table 1).

The interaction of organic and inorganic fertilizers exhibited non-significant differences among them, however higher values for plant height, stem girth, number of green leaves and maize fodder yield were recorded in the plots treated with 120 kg N ha<sup>-1</sup> with the additional application of 3000 kg FYM ha<sup>-1</sup>. Further, it was noted that the plant traits decreased as the organic and inorganic levels increased or decreased beyond 120 kg N ha<sup>-1</sup> or 3000 kg FYM ha<sup>-1</sup>.

The results of the experiment confirm the findings of Gonzalez *et al.*<sup>[8]</sup> they reported that organic manure and chemical fertilizer i.e. 15-15-15 kg NPK ha<sup>-1</sup> which was

supplied as essential nutrition at initial establishment stage recorded the best results for the measured variables like height of the plant, width of the stem, dry weight of the shoots and roots. Materechera and Salagae<sup>[9]</sup> were also in the opinion that higher plant height of maize could be achieved with the application of chicken and cattle manure. Further, Vadivel *et al.*<sup>[10]</sup> observed that enriched farmyard manure and 60 kg N ha<sup>-1</sup> gave the tallest plants of maize. All these researches were in the idea that combination of organic and inorganic fertilizers increased the thickness of the stems. They also observed that cattle and chicken manure increase the leaves per plant of maize crop. Rong Xiang *et al.*<sup>[11]</sup> reported that reasonable application of combined inorganic and organic fertilizer decreased soil bulk density, increased soil moisture, soil fertility, growth of maize and output and promoted maize grain quality. It is suggested that the reasonable application ratio of combined inorganic and organic fertilizer ranging from 25 to 50% organic + 75 to 50% chemical fertilizer should be applied for maize fodder production. From the present results, it was concluded that among the tested treatments, 3000 kg FYM ha<sup>-1</sup> with 120 kg N ha<sup>-1</sup> comparatively produced better maize growth and higher maize fodder yield. Therefore, it is recommended that application of 3000 kg FYM ha<sup>-1</sup> with 120 kg N ha<sup>-1</sup> is the suitable combination for getting the most profitable and economical yield of green maize fodder.

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