

Original Research Article

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## Yield and Quality Parameters as Influenced by Nutrient Management Studies in Sweet Corn

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### ABSTRACT

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A field experiment was conducted at the Agricultural College Farm, Bapatla, during *kharif* 2017 to study the effect of five phosphorus levels to sunhemp as preceding green manure which was incorporated at 50% flowering stage with four replications was analysed in RBD design and four nitrogen levels to succeeding sweet corn crop was analysed in split plot design with four replications. The effect of phosphorus levels to preceding sunhemp green manure crop to succeeding sweet corn with different levels of nitrogen was analysed. The results revealed that application of 40 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> to preceding sunhemp green manure crop significantly recorded highest yield and quality parameters viz., green cob yield with husk, green cob yield without husk, green fodder yield at harvest, crude protein, crude fibre and total ash content at harvest in both straw and grain. Among the nitrogen levels to sweet corn recorded highest yield attributes and quality parameters were recorded at 120 kg N ha<sup>-1</sup>.

### Introduction

Due to intensive farming, the farmer do not get sufficient time gap to grow green manures. Farmers are not ready to sacrifice the main crop for the sake of growing green manure crop and incorporate it.

However, if a green manure crop is grown with the early showers and incorporated before sowing of *kharif* crop, it will add considerable quantity of biomass to the soil. Leguminous green manuring crop respond well to phosphorus fertilization because nodulation and nitrogen fixation require high P status in host plant which can be facilitated

by mycorrhizal symbiont. Sweet corn production requires soil nitrogen in high quantities to meet its growth and yield requirements, as this crop partitions more N to the grain than any other nutrient derived from the soil.

Supply of nitrogen through fertilizers alone is costly. Hence application of green manure to the soil enhances the N availability to sweet corn.

### Materials and Methods

The field experiment entitled “Yield and quality parameters as influenced by Nutrient

management studies in sweet corn” was conducted at the Agricultural College Farm, Bapatla during *khariif*, 2017. The soil was sandy clay loam in texture, slightly saline in reaction (0.5 EC), Neutral (7.3 pH), low in organic carbon (0.3 %), low in available nitrogen (188.8 kg ha<sup>-1</sup>), medium in available phosphorus (30.7 kg ha<sup>-1</sup>) and high in potassium (282.2 kg ha<sup>-1</sup>).

Twenty treatment combinations comprising five phosphorus levels to preceding green manure crop P<sub>0</sub> - Control P<sub>1</sub> - 10 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>, P<sub>2</sub> - 20 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>, P<sub>3</sub> - 30 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>, P<sub>4</sub> - 40 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> and four nitrogen levels to sweet corn N<sub>1</sub> - 60 kg N ha<sup>-1</sup>, N<sub>2</sub> - 80 kg N ha<sup>-1</sup>, N<sub>3</sub> - 100 kg N ha<sup>-1</sup>, N<sub>4</sub> - 120 kg N ha<sup>-1</sup> in Main plots and Sub plots were tested in split plot design with four replications.

The recommended dose of 120 kg N, 60 kg P<sub>2</sub>O<sub>5</sub> and 60 kg K<sub>2</sub>O were applied through SSP and MOP as a basal application. Nitrogen was applied through urea in two splits as per the treatments.

The weather conditions during the crop growth period were normal. The mean maximum and minimum temperature recorded during crop period were 32.0<sup>0</sup> C and 22.9<sup>0</sup> C respectively. The mean maximum and minimum relative humidity is 82.1 and 69.6 respectively.

The crop was planted with a spacing of 60 × 20 cm. The plot size was 6.4 m × 6 m and 5.2 m × 3.6 m respectively. Weeding and plant protection measures were followed as and when needed. Observations regarding the periodical growth and yield attributing characters, cob and fodder yield were recorded.

The data were analysed statistically by adopting the standard procedures described by Gomez and Gomez (1984).

## Results and Discussion

### Yield

Regarding yield (Table 1), increased with increase in P<sub>2</sub>O<sub>5</sub> kg ha<sup>-1</sup> to preceding green manure crop. Significant improvement in overall growth of the crop by virtue of increased phosphorus doses. This greater availability of photosynthates, metabolites and nutrients to develop reproductive structure seems to have resulted in increased productive plants, with the phosphorus levels to green manure crop.

Whereas, among the nitrogen levels to sweet corn with increase in the level of nitrogen to sweet corn from 60 to 120 kg N ha<sup>-1</sup>, the green cob (with husk) yield increased significantly. The green cob yield recorded with application of 120 kg N ha<sup>-1</sup> (13,653 kg ha<sup>-1</sup>) was significantly higher over 60 kg ha<sup>-1</sup> and was on a par with 100 and 80 kg N ha<sup>-1</sup> and the lowest green cob yield (12,543 kg ha<sup>-1</sup>) was observed with application of 60 kg N ha<sup>-1</sup>. The highest green cob yield (without husk) 11,966 kg ha<sup>-1</sup> recorded with 120 kg N ha<sup>-1</sup> applied to sweet corn which was significantly superior over 100, 80 kg N ha<sup>-1</sup> and 60 kg N ha<sup>-1</sup>. The lowest green cob yield without husk (10,734 kg ha<sup>-1</sup>) was recorded with 60 kg N ha<sup>-1</sup>.

Application of 120 kg N ha<sup>-1</sup> significantly enhanced the green fodder yield (17,218 kg ha<sup>-1</sup>) which was on par with 100 and 80 kg N ha<sup>-1</sup>. The positive response to higher level of nitrogen on green cob yield could be ascribed to overall improvement in crop growth that enabled the plant to absorb more nutrients, moisture, higher light interception and increased leaf area which might have enabled the plants to accumulate more quantities of photosynthates in the sink. Similar findings was also reported by kar *et al.*, (2006) Bhatt *et al.*, (2012) Singh *et al.*, (2012) Shankar *et al.*, (2013) and Ejaz *et al.*, (2014).

**Table.1** Yield of sweet corn as influenced by phosphorus levels to preceding green manure crop and nitrogen levels to sweet corn

Treatment	Green cob yield with husk	Green cob yield without husk	Green Fodder yield
<b>Main plots - Phosphorus levels (kg ha<sup>-1</sup>) to sunhemp</b>			
Control	9512	8343	14778
10	11540	9567	15014
20	13836	12288	16887
30	14248	12309	16962
40	15331	13520	18461
SEm±	476.4	239.3	496.9
CD (P=0.05)	1468.1	737.6	1531.3
CV (%)	14.7	8.5	12.1
<b>Sub- plots – Nitrogen levels (kg ha<sup>-1</sup>) to sweet corn</b>			
60	12543	10734	15235
80	12675	11176	16352
100	12703	10946	16877
120	13653	11966	17218
SEm ±	498.3	218.2	507.6
CD (P=0.05)	1424.3	623.7	1451.0
CV (%)	17.2	8.7	13.8
<b>Interaction (P×N)</b>			
SEm ±	1114.2	488.0	1135.2
CD (P=0.05)	NS	NS	NS

**Table.2** Crude protein (%) of sweet corn as influenced by phosphorus levels to preceding green manure crop and nitrogen levels to sweet corn

Treatment	Crude protein	
	Straw	Grain
<b>Main plots - Phosphorus levels (kg ha<sup>-1</sup>) to sunhemp</b>		
Control	6.4	8.2
10	6.5	8.2
20	6.6	8.8
30	6.7	8.9
40	6.7	9.1
SEm±	0.1	0.2
CD (P=0.05)	NS	NS
CV (%)	8.9	12.2
<b>Sub- plots – Nitrogen levels (kg ha<sup>-1</sup>) to sweet corn</b>		
60	6.5	8.7
80	6.6	8.7
100	6.6	8.7
120	6.6	8.6
SEm ±	0.1	0.1
CD (P=0.05)	NS	NS
CV (%)	9.1	8.8
<b>Interaction (P×N)</b>		
SEm ±	0.3	1.1
CD (P=0.05)	NS	NS

**Table.3** Crude fibre (%) of sweet corn as influenced by phosphorus levels to preceding green manure crop and nitrogen levels to sweet corn

Treatment	Crude fibre	
	Straw	Grain
<b>Main plots - Phosphorus levels (kg ha<sup>-1</sup>) to sunhemp</b>		
Control	23.5	3.4
10	25.6	3.7
20	28.5	4.4
30	30.4	4.7
40	32.6	5.6
SEm±	0.5	0.1
CD (P=0.05)	1.8	0.3
CV (%)	8.4	10.4
<b>Sub- plots – Nitrogen levels (kg ha<sup>-1</sup>) to sweet corn</b>		
60	26.5	4.1
80	27.9	4.3
100	28.7	4.4
120	29.2	4.6
SEm ±	0.5	0.1
CD (P=0.05)	1.5	0.3
CV (%)	8.7	12.2
<b>Interaction (P×N)</b>		
SEm ±	1.2	0.2
CD (P=0.05)	NS	NS

**Table.4** Total ash content (%) at the time of harvest in sweet corn as influenced by phosphorus levels to preceding green manure crop and nitrogen levels to sweet corn

Treatment	Total ash content	
	Straw	Grain
<b>Main plots - Phosphorus levels (kg ha<sup>-1</sup>) to sunhemp</b>		
Control	7.2	13.0
10	9.1	14.2
20	11.7	16.7
30	14.1	19.1
40	15.3	20.3
SEm±	0.3	0.2
CD (P=0.05)	1.0	0.8
CV (%)	11.4	6.5
<b>Sub- plots – Nitrogen levels (kg ha<sup>-1</sup>) to sweet corn</b>		
60	11.1	16.3
80	11.1	16.4
100	11.5	16.7
120	12.3	17.3
SEm ±	0.2	0.2
CD (P=0.05)	0.8	0.7
CV (%)	11.2	7.1
<b>Interaction (P×N)</b>		
SEm ±	0.6	0.5
CD (P=0.05)	NS	NS

## Quality parameters

In the present study, it was observed that all the Quality parameters (Table 2–4) viz., crude protein, crude fibre, Total ash content at harvest were increased with increase in application of  $P_2O_5$  to the preceding sunhemp green manure crop from control to  $40 \text{ kg } P_2O_5 \text{ ha}^{-1}$ . Among the nitrogen levels to sweet corn the highest crude protein (6.6%) was recorded with  $120 \text{ kg N ha}^{-1}$  the lowest crude protein (6.5 %) with  $60 \text{ kg N ha}^{-1}$  at harvest in straw and the highest crude protein (8.7%) was recorded with  $120 \text{ kg N ha}^{-1}$  the lowest crude protein (8.6%) with  $60 \text{ kg N ha}^{-1}$  at harvest in grain. Numerically higher crude protein at higher nitrogen fertilizer might be due to high nitrogen concentration in plant at higher fertility levels thus emphasizing the fact that nitrogen plays a role in protein synthesis. The nitrogen content in straw and grain were not significantly influenced by the different treatments tried in the trail. As the crude protein content was estimated by multiplying nitrogen content with the factor 6.25, hence the non-significant differences in crude protein content in straw and grain. The crude fibre (29.5%) was recorded with  $120 \text{ kg N ha}^{-1}$  and lowest (26.5 %) crude fibre at harvest in straw respectively was registered in  $60 \text{ kg N ha}^{-1}$  and the crude fibre (4.6%) was recorded with  $120 \text{ kg N ha}^{-1}$  and lowest (4.1 %) crude fibre at harvest in grain respectively was registered in  $60 \text{ kg N ha}^{-1}$ . Phosphorus fertilization to preceding sunhemp resulting in higher drymatter accumulation and after incorporation added higher organic matter at higher levels. The high organic matter incorporated facilitated all the essential plant nutrients more available to the succeeding sweet corn which exhibited increased growth. Applying fertilizer nitrogen at high levels too favoured higher growth and development this might have encouraged the sweet corn plant to have more photosynthetic area and produced more of the photosynthates. These

increased carbohydrates during metamorphoses could have stored in the form of cellulose and hemicelluloses in cell walls and this could be ascribed as the reason for high crude fibre in sweet corn. Significantly the lowest (11.1%) and the highest (12.3%) total ash content were registered in  $120 \text{ kg N ha}^{-1}$  and  $60 \text{ kg N ha}^{-1}$  in straw. Significantly the lowest (16.3%) and the highest (17.3%) total ash content were registered in  $120 \text{ kg N ha}^{-1}$  and  $60 \text{ kg N ha}^{-1}$  in grain. Increase in ash contents (%) might be due to increase in growth parameters and also drymatter production in the higher available nutrients. These findings are in conformity with Ayub *et al.*, (2003), Bhatt. (2012) and Rashid and Iqbal. (2012).

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