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Response of Sweet Corn to Different Sources of Nitrogen

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ABSTRACT

A field experiment was conducted during *rabi,* 2010-11 on sandy clay loam soils of S.V. Agricultural college, Dry Land Farm, Tirupati to study the influence of different organic sources on growth, yield and nutrient uptake of sweet corn. Recommended dose of N @ 120 kg ha^{-1} through urea registered largest leaf area index and maximum drymatter production at all the crop growth stages, The highest green cob yield of 3,930 kg ha^{-1} and green fodder yield of 15,951 kg ha^{-1} were recorded with the application of 100 per cent recommended dose of N followed by 75 per cent N through poultry manure and 25 per cent through *panchagavya* spray. The higher total nitrogen, phosphorus and potassium uptake were recorded with 100 per cent recommended dose of N @ 120 kg ha^{-1} through urea which was comparable with 75 per cent N through poultry manure (or) vermicompost in combination with 25 per cent through *panchagavya* spray.

Key words : *Panchagavya,* Poultry manure, Sweet corn, Vermicompost.

Sweet corn is of short duration, picked when immature (milk stage) and eaten as a vegetable, rather than as grain. Fresh cobs fetch high prices with increased demand. Sweet corn is an excellent source of sugars, dietary fibre, vitamin – B9, vitamin-C. beta-carotene, niacin in addition to potassium and magnesium. It is highly priced by corn fanciers for succulent and tender kernels with sweet flavour for human consumption in and around metropolitan cities. Nutritious green fodder obtained after harvest of green cobs, adds considerably to economic returns. Commercial production of this diversified corn in conjunction with assured markets and agro processing industries would go a long way in improving livelihoods of maize farmers. Huge quantities of organic materials such as farm yard manure, poultry manure, pig manure, vermicompost, green manures and crop residues can substitute the inorganic fertilizers to a large extent to maintain the productivity and environmental quality (Choudhary *et al.,* 2002). Keeping the above facts in view, a field experiment was conducted to know the influence of different sources of organic manures on growth, yield and nutrient uptake of sweet corn.

MATERIAL AND METHODS

The experiment was laid out in randomized block design with eleven treatments and replicated thrice. The soil was sandy loam in texture, low in available nitrogen (180 kg ha^{-1}) medium in available P_2O_5 (20 kg ha^{-1}) and K_2O (172 kg ha^{-1}). The treatments consisted of T_1- Recommended dose of nitrogen (120 kg ha^{-1}) through urea-(F N_{100}), T_2 - 100 per cent N through farm yard manure (FYM N_{100}), T_3 - 100 per cent N through sheep manure (SM N_{100}), T_4 -100 per cent N through poultry manure (PM N_{100}), T_5 - 100 per cent N through green manuring through *Glyricidia maculata* (GM N_{100}), T_6 -100 per cent N through vermicompost (VC N_{100}), T_7-75 per cent N through FYM + 25 per cent N through *panchagavya* foliar spray (FYM N_{75} + PG N_{25})T_8 - 75 per cent N through sheep manure + 25 per cent N through *panchagavya* foliar spray (SM N75 + PG N_{25}) T_9 - 75 Per cent N through poultry manure + 25 per cent N through *panchagavya* foliar spray (PM N_{75} + PG N_{25}), T_{10} -75 per cent N through green manuring+ 25 per cent N through *panchagavya* foliar spray (GM N_{75} + PG N_{25}) and T_{11} - 75 per cent N through vermicompost + 25 per cent N through *panchagavya* foliar spray (VC N_{75} + PG N_{25}). The test variety 'Madhuri' was sown at a spacing of 60 × 20 cm. The recommended dose of fertilizer applied was 120 kg N, 60 kg P_2O_5 and 60 kg K_2O ha^{-1}. Entire dose of phosphorus and potassium were applied as a basal dose through single super phosphate and muriate of potash, respectively. Different manures were applied at 15 days prior to sowing as per the treatment schedule on equal nitrogen basis. *Panchagavya* is a mixture of cow dung (1 kg), cow urine (750 ml), cow milk (500 ml), cow curd (500ml) and cow ghee (250 ml). In addition, sugarcane juice (750ml), tender coconut water (750 ml), pure honey (250 ml) and ripened bananas (250g) were also added to accelerate the fermentation process. After fifteen days of fermentation, the contents were filtered to get the clear stock solution of

Table 1. Nutrient content (%) of different organic manures.

Source	Nitrogen	P_2O_5	K_2O
Farmyard manure	0.46	0.23	0.49
Sheep manure	2.89	0.59	1.89
Poultry manure	2.42	1.16	1.23
Green manure (*Glyricidia maculata*)	2.40	0.26	2.52
Vermicompost	2.45	0.41	0.78
Panchagavya	2.30	2.01	2.52

Table 2. Growth parameters and yield of sweet corn as influenced by different sources of nitrogen.

Treatment	Leaf Area Index		Drymatter production (kg ha^{-1})		Green cob weight (g)	Green cob yield (kg ha^{-1})	Green fodder yield (kg ha^{-1})
	60 DAS	Harvest	60 DAS	Harvest			
T_1 : FN_{100}	1.70	2.26	1772	4512	149	3930	15951
T_2 :FYM N_{100}	0.97	1.31	1439	3669	117	2286	12808
T_3 : SM N_{100}	1.02	1.32	1531	3846	120	2302	12912
T_4 : PM N_{100}	1.03	1.36	1551	3859	123	2411	13000
T_5 : GM N_{100}	0.96	1.27	1345	3490	108	1769	8795
T_6 : VC N_{100}	0.96	1.28	1410	3548	114	2250	12222
T_7 : FYM N_{75} + PG N_{25}	1.06	1.58	1614	4509	132	2855	14324
T_8 : SM N_{75} + PG N_{25}	1.25	1.64	1624	4146	135	2961	15226
T_9 : PM N_{75} + PG N_{25}	1.36	1.68	1635	4207	138	3052	15282
T_{10} : GM N_{75} + PG N_{25}	1.03	1.40	1575	4009	125	2497	13094
T_{11} : VC N_{75} + PG N_{25}	1.03	1.42	1599	4014	129	2800	14262
SEm ±	0.12	0.12	25.5	98.6	1.47	48.4	44.9
C.D (p=0.05)	0.33	0.33	75.2	290.8	4.34	142	132

panchagavya. The stock solution was diluted to 5 per cent spray solution. It was applied as foliar spray @ 500 l ha^{-1} to sweet corn crop as per the treatments at fortnight intervals starting from 15 to 75 DAS, with high pore size nozzle to facilitate adequate interception by the crop foliage.

RESULTS AND DISCUSSION

Growth parameters

Application of recommended dose of nitrogen through urea (T_1) resulted in the highest LAI and dry matter production at 60 DAS and harvest, which was significantly higher than application of 75 per cent N through poultry manure + 25 per cent N through *panchagavya* through foliar spray (T_8), the later two treatments were on par with each other (Table 2). The developed crop stature and enhanced dry matter accrual with 100 per cent recommended dose of nitrogen through urea might be due to the nitrogen applied in two splits have been efficiently taken up by the crop matching with its physiological needs compared to organic manures. Among the organic manurial treatments, faster decomposition of poultry might have resulted in better availability of nutrients, enhanced the leaf area in turn resulted in higher dry matter production.

Yield attributes and yield

The beneficial effect of application of recommended dose of N through urea (T_1) on growth parameters and was subsequently reflected on improved green cob weight (Table 2). This might be due to higher drymatter accumulation along with effective partitioning of assimilates to the sink. Similar findings were observed by Mehta *et al.,*(2005) and Arun kumar (2006). The next best treatment was 75 per cent N through poultry manure + 25 per cent N through *panchagavya* foliar spray (T_9) because of higher per cent of nutrient value (2.42 % N, 1.16 % P_2O_5 and 1.23 % K_2O) compared to FYM (0.46 % N).

The highest green cob (husked) and green fodder yield were recorded with application of 100 per cent N through urea (T_1) and was significantly superior to all other treatments. Greater development of plant stature and yield attributes might be possible consequences for higher yield. Among the various organic manures tried, 75 per cent N through poultry manure + 25 N through *panchagavya* foliar spray (T_9) recorded higher green cob and green fodder yield which was on par with 75 per cent N through sheep manure + 25 per cent N through *panchagavya* foliar spray (T_8). The supremacy of poultry manure might be due to continuous availability of nutrients in soluble form for a quite longer period. So that the plant roots can very well compete with loss mechanisms and absorb more nutrients leading to better yield (Mohan das and Appavu, 2008). Maize performs better with application of poultry manure due to certain hormonal compounds present in it, as reported earlier by Brown (1958).

The lowest green cob and fodder yield recorded with 100 per cent N through green manuring with *Glyricidia maculata* + 25 per cent N through *panchagavya* foliar spray (T_{10}), might have been due to deflated stature of growth and yield components. Green manure was found to have the characteristic nature of slow release nutrients and could not meet the crop requirement at initial stages.

Nutrient uptake

Nitrogen uptake by sweet corn was found to be highest with application of recommended dose of N through urea (T_1). It might be due to adequate supply of nitrogen in two splits to meet the nutrient requirement at different crop growth stages resulting in greater absorption compared to organic sources, which were applied totally as a basal dose on equal nitrogen basis. Enhanced dry matter production also might have resulted in higher nitrogen uptake (Table 3). Higher phosphorus uptake recorded with 75 Per

Table 3. Nutrient uptake by sweet corn and post harvest soil fertility status (kg ha^{-1}) as influenced by different sources of nitrogen.

Treatments	Nutrient uptake (kg ha^{-1})			Post harvest available nutrient uptake (kg ha^{-1})		
	Nitrogen	P_2O_5	K_2O	Nitrogen	P_2O_5	K_2O
T_1 : FN_{100}	175	20	162	182	33	225
T_2 :FYM N_{100}	144	16	140	211	38	249
T_3 : SM N_{100}	147	17	142	212	38	250
T_4 : PM N_{100}	152	18	143	209	42	254
T_5 : GM N_{100}	136	15	139	231	41	252
T_6 : VC N_{100}	141	16	148	214	39	256
T_7 : FYM N_{75} + PG N_{25}	163	19	154	193	34	224
T_8 : SM N_{75} + PG N_{25}	168	20	158	197	35	221
T_9 : PM N_{75} + PG N_{25}	172	21	160	183	37	238
T_{10} : GM N_{75} + PG N_{25}	156	18	152	208	37	229
T_{11} : VC N_{75} + PG N_{25}	159	18	165	200	36	240
SEm $\pm$	2.2	1.08	1.87	2.3	1.3	2.86
C.D (p=0.05)	6.4	3.2	5.5	6.8	4.0	8.4

cent N through poultry manure + 25 per cent N through *panchagavya* foliar spray (T_9), might be due to its higher ease of availability which improved the ramification of roots. This was how ever on par with recommended dose of nitrogen (T_1). Potassium uptake by sweet corn was noticed to be the highest with 75 per cent N through vermicompost + 25 per cent N through *panchagavya* foliar spray (T_1), followed by recommended dose of nitrogen (T_1) and 75 per cent N through poultry manure + 25 N through *panchagavya* foliar spray (T_9).

Post harvest Soil nutrient status

The highest soil available nitrogen after the crop harvest was recorded with 100 per cent N through green manuring with *Glyricidia maculata* (T_5), might be due to slow composition of manure that enriched nitrogen status in soil (Table.3). Post harvest soil available phosphorus content was the highest with 100 per cent N through poultry manure (T_4). This is due to the fact that during mineralization process a number of organic acids were produced which released phosphorus from the insoluble phosphates (Mohandas and Appavu, 2008). The potassium content in soil recorded with 100 percent N through vermicompost (T6), due to increase in soil available potassium ascribed due to reduction in its fixation (Agbede *et al*., 2008). The post harvest soil available nutrient status was found to be the lowest recommended dose of N through fertilizer due to enhanced uptake by the crop with application of readily available inorganic sources.

However, since the study was aimed to bring out the performance of sweet corn to varied organic manures, it was found that poultry manure or sheep manure or FYM in combination with foliar application of *panchagavya* was better than application of organic manures alone without panchagavya. Foliar spray of *panchagavya* was meant to safe guard plants and promoting the vigour and health of the crop as it contains plant growth stimulants (Pathak and Ram, 2002).

From the present study it can be inferred that higher yield of sweet corn could be obtained with 100 per cent recommended dose of nitrogen @ 120kg ha^{-1} through urea. However, the use of organic manures to meet the nutrient requirement of crop would be an evitable practice in future, supply of 75 per cent N through poultry manure in combination with 25 per cent through *panchagavya* spray was also proved to be effective for higher yields of sweet corn.

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