DOI: 10.15740/HAS/AU/12.TECHSEAR(2)2017/365-369
Agriculture Update
Volume **12** | TECHSEAR-2 | 2017 | 365-369
Visit us : *www.researchjournal.co.in*
e ISSN-0976-6847

RESEARCH ARTICLE :

Effect of integrated nitrogen management on growth, yield and quality of sweet corn hybrid

A. BHARATHI, M. BALUSAMY, E. SOMASUNDARAM AND R. SHANMUGASUNDARAM

ARTICLE CHRONICLE :
Received :
10.07.2017;
Accepted :
23.07.2017

SUMMARY : Field investigation was carried out during *Rabi* 2014-2015 on clay loam soil at irrigated upland farms of Eastern block, Tamil Nadu Agricultural University, Coimbatore to identify the best integrated nitrogen management practices on sweet corn hybrid (Sugar 75). The experiment was laid out in Randomized Block Design with three replication and 12 treatments. The result shows that combined application of 25 per cent N as poultry manure with 75 per cent N as inorganic fertilizer produced higher green cob yield of 23.5 t ha^{-1} due to superior growth attributes and yield attributes. It was comparable with 25 per cent N as goat manure + 75 per cent N as inorganic fertilizer. However, quality parameters *viz.*, total sugars, starch, protein, TSS and phenols of sweet corn kernels and crude protein and crude fat content of green fodder were found higher with 25 per cent N as poultry manure with 75 per cent N as inorganic fertilizer.

How to cite this article : Bharathi, A., Balusamy, M., Somasundaram, E. and Shanmugasundaram, R. (2017). Effect of integrated nitrogen management on growth, yield and quality of sweet corn hybrid. *Agric. Update*, **12** (TECHSEAR-2) : 365-369; **DOI: 10.15740/HAS/AU/12.TECHSEAR(2)2017/365-369.**

KEY WORDS :
Sweet corn hybrid, Integrated nitrogen management, Growth, Yield attributes, Yield, quality parameters

Author for correspondence :
A. BHARATHI
Agricultural College and Research Institute (T.N.A.U.), MADURAI (T.N.) INDIA

See end of the article for authors' affiliations

BACKGROUND AND OBJECTIVES

Sweet corn [*Zea mays* (L.) sub sp. *saccharata* Sturt], is used as human food in the soft dough stage with succulent grain. The higher content of water soluble polysaccharide in the kernel adds texture and quality in addition to sweetness. The productivity of the hybrid largely depends on its nutrient requirement and management particularly that of nitrogen.Corn requires high quantities of nitrogen during the period of efficient utilization, particularly at 25 days after sowing and pre-tasseling (40 days after sowing) stages for higher productivity (Bravo *et al.*, 1995). Though the continuous use of fertilizers had significantly improved the crop productivity, heavy fertilizer application on the same field will drain the soil fertility rapidly and results in a plethora of problems (Gaur and Kumawat, 2000).

The success of future agriculture depends upon sustainability of production systems. Organic manures sustain the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of chemical inputs with adverse effects. But, the use of organic manures alone cannot sustain the production system due to limited

availability and their relatively low nutrient content (Palm *et al.*, 1997).

Objectives :

– To study the effect of integrated nitrogen management on growth, yield attributes and yield of sweet corn hybrid.

– To study the effect of integrated nitrogen management on quality parameters of sweet corn hybrid.

RESOURCES AND METHODS

The experiment on integrated nitrogen management of sweet corn hybrid was conducted at Eastern block form, Coimbatore during *Rabi* season (November 2014 –February 2015). The farm is situated in western agro climatic zone of Tamil Nadu at 11° N latitude and 77° E longitude with an altitude of 426.74 meters above mean sea level. The soil of the experimental field is clay loam, alkaline in reaction (pH: 8.6), non-saline (EC: 0.28 dSm^{-1}), medium in organic carbon (0.46 %) and low available nitrogen (208 kg ha^{-1}), medium available phosphorus (18 kg ha^{-1}) and high available potassium (415 kg ha^{-1}) in the plough layer.

Field experiment was laid out in Randomized Block Design with 12 treatments and replicated thrice. The treatments include, T_1 (25% N as FYM + 75% N as inorganics), T_2 (25% N as vermicompost + 75% N as inorganics), T_3 (25% N as poultry manure + 75% N as inorganics), T_4 (25% N as goat manure + 75% N as inorganics), T_5 (25% N as biogas slurry + 75% N as inorganics), T_6 (50% N as FYM + 50% N as inorganics), T_7 (50% N as vermicompost + 50% N as inorganics), T_8 (50% N as poultry manure + 50% N as inorganics), T_9 (50% N as goat manure + 50% N as inorganics), T_{10} (50% N as biogas slurry + 50% N as inorganics), T_{11} (100% N as inorganic) and T_{12} (100% N as inorganic + FYM @ 12.5 t ha^{-1}) which is the recommended practice and fixed as bench mark.

Sugar 75, a Syngenta hybrid was used as test crop. The recommended dose of fertilizer was applied as N: P_2O_5:K_2O @ 120:60:45 kg ha^{-1}. Based on N equal basis required quantities of organic manures were incorporated in the soil one week before sowing. P and K requirements of the crop were applied separately as fertilizer. All the package of practices was carried out as per recommendation of CPG (2012).

All the relevant biometric observations on growth parameters were recorded at periodic interval of the crop growth stages *viz.*, 30, 60 DAS and at harvest stage. The yield and yield attributes of green cobs and green fodder were recorded as per the procedure. By engaging standard procedures quality parameters *viz*., total sugars, starch, protein, TSS and phenols of sweet corn kernels and crude protein and crude fat content of green fodder were estimated. Data of each character collected were statistically analyzed using standard procedure of variance analysis.

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads:

Growth attributes :

At harvest, taller plants with more leaves and thick stems was recorded from plots treated with 25 per cent N as poultry manure + 75 per cent N as inorganic fertilizers (Table 1). It is due to increased uptake of N which being the chief constituent of protein and protoplasm, which vigorously induced the vegetative development of the plants. The higher availability of nitrogen seems to have promoted development of morphological structure by virtue of multiplication of cell division (Kumar, 2008). Leaf area index and dry matter were significantly correlated demonstrating that LAI is an indicator of its photosynthetic capacity and translocation. As a consequence, higher amount of radiation associated with higher LAI contributed to enhance dry matter production (Kumar, 2009).

Yield attributes and yield :

Application of 25 per cent N as poultry manure with 75 per cent N as inorganic fertilizer produced heaver green cobs with more kernels row^{-1} of longer corn embedded with more kernel rows $corn^{-1}$, which is comparable with application of 25 per cent N as goat manure with 75 per cent N as inorganic fertilizer (Fig. 1). This might be on account of overall improvement in growth as evinced from higher dry matter, leaf area index, (Table 1), and N uptake (Kumar, 2009). Sufficient availability of nitrogen suggest greater availability of metabolites synchronized to demand for growth and development of each reproductive structure consequently enhanced green cob and fodder plant (Abdullah, 2008).

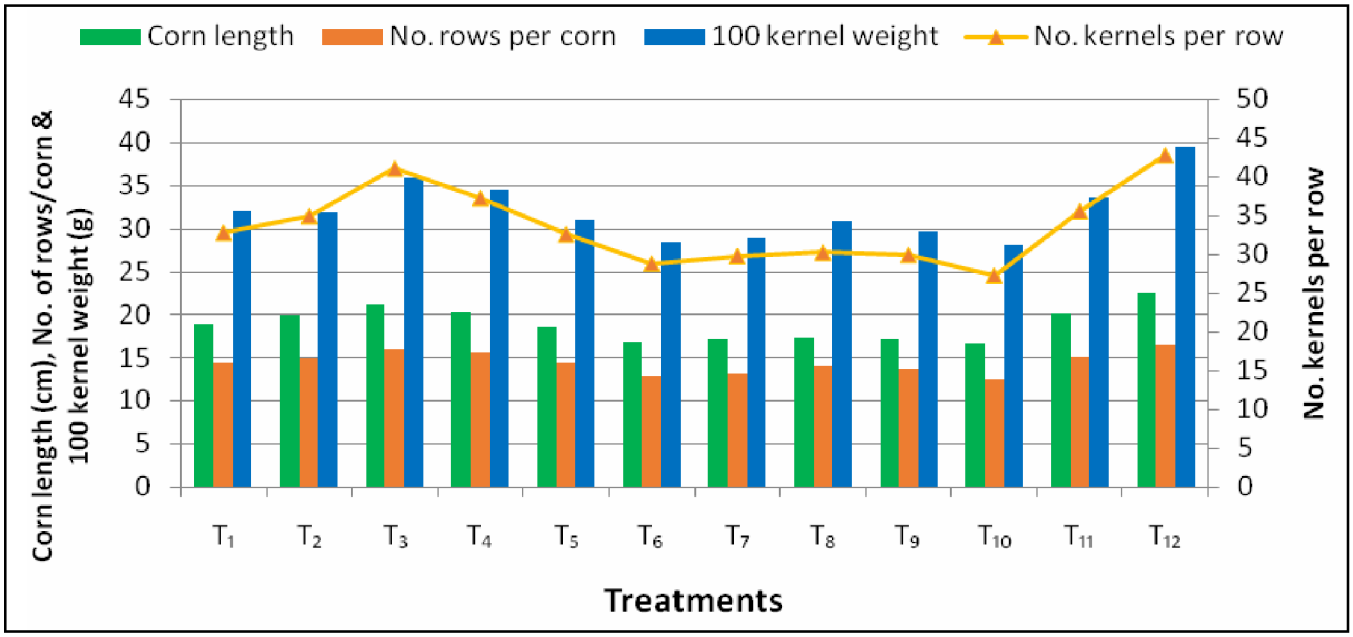

Fig 1 : Effect of integrated nitrogen management on corn length (cm), number of rows/corn, number of kernels/row and 100 kernel weight (g) of sweet corn kernel

Application of 25 per cent N as poultry manure with 75 per cent N as inorganic fertilizer produced higher biomass *i.e.* higher green cob yield of 23.5 t ha^{-1} and green fodder yieldof 27.1t ha^{-1}, which is comparable with application of 25 per cent N as goat manure with 75 per cent N as inorganic fertilizer (Table 1). This might be on account of overall improvement in growth as evinced from higher dry matter, leaf area index, and N uptake (Kumar, 2009).

Quality parameters:

Application of 25 per cent N as poultry/goat manure + 75 per cent N as inorganic fertilizer produced higher

Table 1: Effect of integrated nitrogen management practices on plant growth attributes and yields of sweet corn hybrid

Treatments	At harvest				Yield	
	Plant height (cm)	No. of leaves $plant^{-1}$	LAI	DMP (kg ha^{-1})	Green cob (t ha^{-1})	Green fodder (t ha^{-1})
T_1–25%N FYM + 75% inorganic	185.2	14.0	4.01	10557	20.8	23.9
T_2–25%N VC+ 75%N inorganic	187.8	14.1	4.06	11359	21.1	24.0
T_3–25%N PM + 75%N inorganic	202.6	14.4	4.86	12636	23.5	27.1
T_4–25%N GM + 75% N inorganic	191.5	14.4	4.09	12547	23.3	24.5
T_5–25%N BS + 75%N inorganic	183.2	13.9	4.00	10189	20.5	23.8
T_6–50%N FYM + 50%N inorganic	170.4	13.6	3.66	8332	17.9	22.3
T_7– 50%N VC + 50%N inorganic	172.6	13.7	3.70	8539	19.0	22.6
T_8– 50%N PM + 50%N inorganic	176.9	13.9	3.77	9404	19.7	22.9
T_9– 50%N GM + 50%N inorganic	173.8	13.7	3.72	8821	19.3	22.7
T_{10}– 50%N BS + 50%N inorganic	167.2	13.4	3.62	7982	17.3	22.0
T_{11}– 100% N inorganic	188.6	14.2	4.32	12026	22.7	25.2
T_{12}–100%N inorganic +12.5 t ha^{-1} FYM	224.4	14.6	5.38	13816	26.6	29.4
Mean	185.4	14.0	4.10	10517	21.0	24.2
S.E.±	7.8	0.2	0.26	955	1.3	1.1
C.D. (P=0.05)	16.2	0.4	0.54	1981	2.7	2.2

levels of total sugars, TSS, protein, starch and phenols of sugar corn kernels and crude protein and crude fibreof green fodder, which was found comparable with application of 100 per cent N as inorganic treatment (Table 2) (Fig. 2). Higher dose of nitrogen along with poultry/goat manure might have led to faster decomposition of manures leading to profused growth, higher dry matter production as N accumulation thereby increased crude protein and fibre yield of green fodder. This follows in line with Nath *et al.* (2009) and Suthar *et*

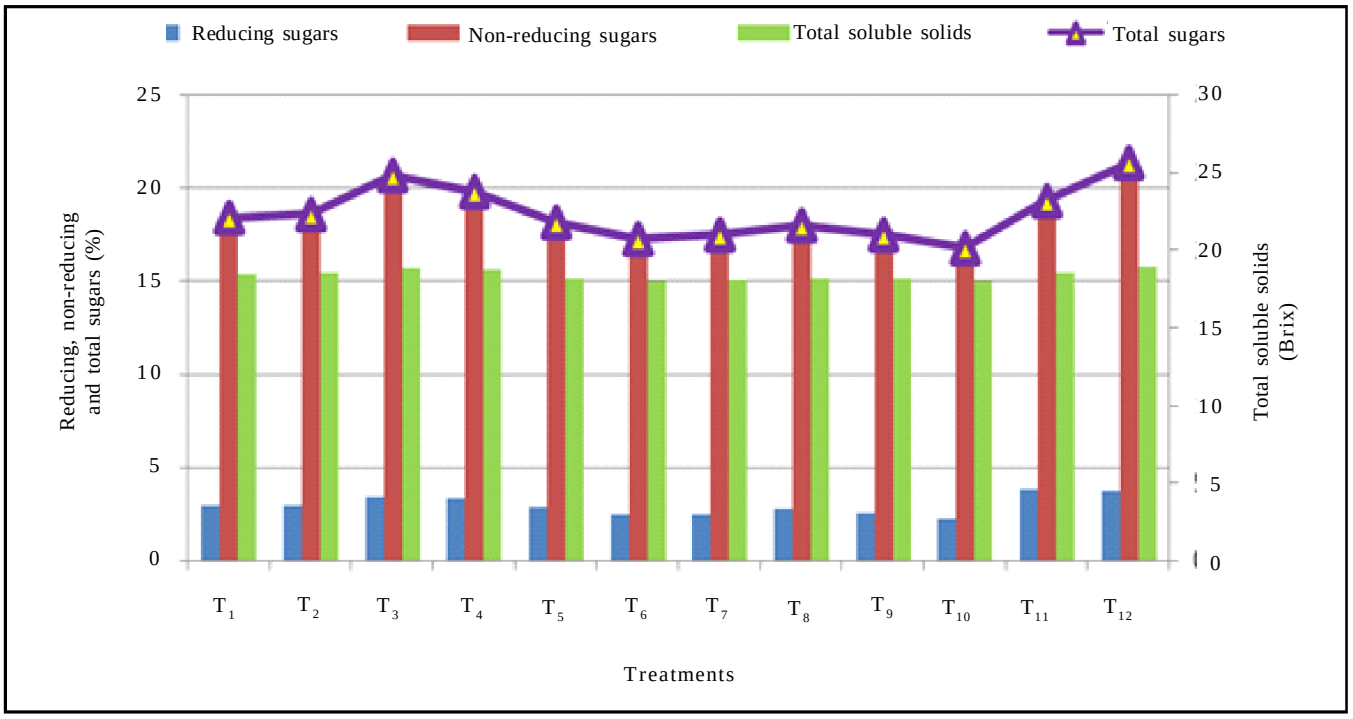

Fig 2 : Effect of integrated nutrient management on reducing sugar (%), non-reducing sugar (%), total sugar (%) and total soluble solids (°B) of sweet corn kernel

Table 2 : Effect of integrated nitrogen management on kernel and fodder quality with economics of sweet corn hybrid

Treatments	Kernel quality			Fodder quality economics			
	Starch (mg g^{-1})	Protein (%)	Phenols (%)	Crude protein (%)	Crude fibre (%)	Net return (Rs.)	B :C ratio
T_1–25%N FYM + 75% inorganic	64.0	8.7	0.17	6.7	36.3	130059	3.33
T_2–25%N VC+ 75%N inorganic	64.8	8.7	0.18	6.9	37.9	122384	2.86
T_3–25%N PM + 75%N inorganic	66.0	9.1	0.18	7.3	39.7	157015	3.94
T_4–25%N GM + 75% N inorganic	65.5	9.0	0.18	7.2	39.1	151694	3.84
T_5–25%N BS + 75%N inorganic	64.0	8.6	0.17	6.7	35.6	123626	3.08
T_6–50%N FYM + 50%N inorganic	62.0	8.4	0.15	5.7	34.6	103222	2.74
T_7– 50%N VC + 50%N inorganic	63.3	8.5	0.15	5.7	34.8	91232	2.15
T_8– 50%N PM + 50%N inorganic	63.8	8.6	0.16	6.6	35.5	122108	3.25
T_9– 50%N GM + 50%N inorganic	63.5	8.5	0.16	6.5	35.5	118942	3.18
T_{10} – 50%N BS + 50%N inorganic	61.8	8.3	0.14	5.6	33.6	90561	2.36
T_{11} – 100% N inorganic	65.1	8.9	0.18	7.0	38.5	149414	3.85
T_{12}–100%N inorganic +12.5 t ha^{-1} FYM	66.4	9.2	0.19	7.4	39.8	171125	3.64
S.E.±	0.7	1.1	0.01	0.3	1.1		
C.D. (P=0.05)	1.5	2.2	0.02	0.6	2.2		

al. (2014).

Economics :

Amongst various treatments, application of 25 per cent N as poultry manure with 75 per cent N as inorganic gave highest net returns (Rs. 157015 ha^{-1}) and B:C ratio (3.94) which was higher over rest of treatments (Table 2).

This might be on account of significant jump in yield of green cobs and green fodder. Further increase in nutrient level though increased green cobs and fodder yield but marginal increase in green cob and fodder yield unable to compensate higher prices of fertilizer.

Conclusion :

On the basis of results emanated from the present experiment conducted during *Rabi* 2014-15, it was concluded that under prevailing agro-climatic conditions, sweet corn variety 'Sugar 75' applied with 25 per cent N as poultry manure / goat manure with 75 per cent N as inorganic fertilizer produced huge biomass with superior quality kernels and fodder, thus, proved to be most efficient and economically profitable practice.

Authors' affiliations :

M. BALUSAMY, Vanavarayan Institute Agriculture (T.N.A.U.), Pollachi, COIMBATORE (T.N.) INDIA

E. SOMASUNDARAM AND R. SHANMUGASUNDARAM, Agricultural College and Research Institute (T.N.A.U.), COIMBATORE (T.N.) INDIA

REFERENCES

Abdullah, O. (2008). Effect of nitrogen on fresh ear yield and kernel protein content of sweet corn [*Zea mays* (L.) ssp.*saccharata*] under upper Mesopotamia region of Turkey. *Indian. J. Agric. Sci.*,**78** (1) : 50–52.

Bravo, B.E., Ureta, A.E. and Ashley, R.A. (1995). Alternative nitrogen fertility levels and profitability in sweet corn production. *J. Sustain. Agric.*, **5**: 95 – 104.

CPG (2012). *Crop production guide*. Published by Directorate of Agriculture, Chennai and TNAU, Coimbatore (T.N.) INDIA.

Gaur, B.L. and Kumawat, S.K. (2000). Integrated nutrient management in rice-wheat cropping system under south Rajasthan. In: National symposium on Agronomic challenges and strategies for New Millennium held at GAU, Junagarh, 15-18 Nov. pp.55-56.

Kumar, A. (2008). Growth, yield and water use efficiency of different maize (*Zea mays*)-based cropping systems under varying planting methods and irrigation levels. *Indian. J. Agric. Sci.*, **78** (3) : 244-247.

Kumar, A. (2009). Production potential and nitrogen use efficiency of sweet corn (*Zea mays*) as influenced by different planting densities and nitrogen levels. *Indian. J. Agric. Sci.*,**79**: 351-355.

Nath, K., Nepalia, V. and Singh, Dilip (2009). Effect of integrated nutrient management on growth and yield of sweet corn [*Zea mays* (L.) ssp. *saccharata*]. *Annl. Agric. Res.*, **30** : 73-76.

Palm, C.A., Myers, R.J.K. and Nandwa, S.M. (1997). Combined use of organic and inorganic nutrition on plant disease resistance and its mechanism. *Plant Nutr. Fert. Sci.*, **12**(3): 445 - 450.

Suthar, M., Singh, D., Nepalia, V. and Singh, A. K. (2014). Performance of sweet corn [*Zea mays* (L.) ssp. *saccharata*] varieties under varying fertility levels. *Indian. J. Agric. Sci.*, **59** : 168-170.