SHORT COMMUNICATION

EFFECT OF NITROGEN LEVELS AND INTERCROPPING ON YIELD AND QUALITY OF SUGARCANE UNDER WIDE ROW (5 FT) PLANTING

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Abstract

The effect of nitrogen and intercropping on yield and quality of sugarcane under wide row planting (5ft) was studied with two plant crops during 2010-2011 and 2011-2012 at Agricultural Research Station, Perumallapalle, Andhra Pradesh. The experiment was laid out in a spilt plot design with four main plots of fertilizer nitrogen levels, i.e, 75% RDN (168kg N/ ha), 100% RDN (224 kg N/ ha), 125% RDN (280 kgN/ha) and 150% RDN (336 kgN/ha) with four intercrops, viz. *cowpea, cluster bean,* bhendi *(okra) and leafy vegetable as sub-plots. The results revealed that wide row (5ft) planted sugarcane crop responds very well up to 125% RDN and recorded the highest average cane yield with more cane diameter. With regard to intercrops, cowpea and cluster been crops performed better than okra and leafy vegetable producing higher pod yields. The interaction effect between the nitrogen levels and intercrops was not significant.*

Key Words: *Sugarcane, wider row spacing, nitrogen levels, intercrops, yield, economics*

Sugarcane is one of the most important commercial crops of India grown in almost all the states contributing significantly to the economy. While the high labor cost for various operations, especially harvesting and transportation, increases the cost of cultivation, non-availability of labor delays cultivation practices leading to considerable yield reduction. Under this situation mechanization for planting, inter-cultivation operations and harvesting would go a long way in making cane cultivation sustainable. Wide row method of planting would provide scope for mechanization by small machines such as power tiller and mini-tractor resulting in considerable saving in labor cost. Wide row planting technique has been proved to give high cane yield, sugar yield and better juice quality, and is spreading fast in tropical states (Sundara 2002). The effect of nitrogen and intercropping on yield and quality of sugarcane under wide row (5 ft) planting was examined in the present study to determine the optimum nitrogen requirement suitable intercrop for sandy soils.

The study was conducted with two plant crops during 2010-2011 and 2011-2012 at the Agricultural Research Station, Perumallapalle, Andhra Pradesh, India. The experimental field featured sandy loam soil with neutral pH and normal EC, low in organic carbon and available nitrogen, medium in available phosphorus and medium to high in available potassium. After land preparation was done with tractor drawn cultivator, disc harrow and rotavator, a ridger was deployed to open ridges and furrows with a spacing of 150 cm. Uniform dose of 112 kg P_2O_5 and 112 kg K_2O was applied as basally. The experiment was laid out in a spilt plot design with four main plots of nitrogen levels, i.e. 75% RDN, (168 kg N/ ha) 100% RDN, (224 kg N / ha) 125% RDN, (280 kg N /ha) and 150% RDN, (336kg N/ ha) and four intercrops, *viz*., cowpea, cluster bean, *bhendi* (okra) and leafy vegetable as sub-plots. Three budded setts of the variety 2003V46 (Bharani) (10 months in duration) were used as seed material

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Table 1. Yield and yield attributes of sugarcane as influenced by nitrogen levels and intercrops under wide row planting (5ft)

Treatment	Millable cane length (m)		Millable cane diameter (cm)		NMC/ha		Cane yield (t/ha)		Sucrose (%)		Intercrop yield (kg /ha)	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Main plots: Nitrogen levels												
75%RDN	2.26	1.64	2.56	1.89	60619	49617	66.12	57.92	18.02	18.80	505	178
100%RDN	2.66	2.14	2.92	2.25	65566	59880	84.07	66.22	18.04	19.18	555	147
125%RDN	2.76	2.42	3.03	2.50	71453	73535	86.75	89.08	18.10	19.30	531	167
150%RDN	2.72	2.53	2.98	2.64	70913	71365	87.86	86.72	18.28	18.79	454	156
. ..	0.071	0.07	0.05	0.039	2945.0	1045	0.924	7.32	0.17	0.22	47.5	17.3
LSD (0.05)	NS	0.17	0.12	0.095	5326.6	2557	2.26	17.9	NS	NS	NS	NS
Sub-plots: Intercrops												
Cowpea	2.55	2.13	2.84	2.31	66666	59682	81.83	70.82	18.01	19.301	925	182
Okra	2.66	2.22	2.84	2.27	67676	60688	79.83	72.68	18.27	19.17	350	124
Cluster bean	2.62	2.23	2.91	2.30	65150	62184	80.14	73.06	18.14	19.02	546	182
Leafy vegetable	2.57	2.25	2.90	2.40	60063	61698	80.04	73.38	18.02	19.09	202	172
SEd ±-	0.05	0.049	0.06	0.05	2432.4	1014	1.57	3.46	0.15	0.11	97.15	41.2
LSD (0.05)	NS	NS	NS	NS	5020.5	NS	NS	NS	NS	NS	237.7	NS
Interaction												
Main at sub	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	291.3	NS
Sub at main	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	196.3	NS

which were treated with bavistin @ 0.5 g+ 2 ml/lit of water and soaked with 750 lits of water for 30 minutes. Intercrops were sown in the wide gap between the rows with recommended fertilizer dosages. Irrigation was provided through drip system and 4-5 irrigations were also provided to the intercrops. Nitrogen treatments were imposed in two equal splits at 45 and 90 days after planting. Atrazine @ 2 kg/ ha was sprayed as pre-emergence treatment on the third day after planting. Intercultural operations like hand weeding, earthing up, trash twist propping, etc. were carried out as per recommendations. Yield and yield attributing parameters, *viz*. millable cane length, millable cane diameter, number of millable canes /ha and cane yield were recorded at the time of harvest. Juice quality parameters, *viz*. Brix%, sucrose% and CSS% were calculated at the time of harvest following standard procedures (Spencer and Meade 1963).

During both the years of study, millable cane length and cane diameter were significantly influenced by varied levels of nitrogen (Table 1). The tallest and thick canes were produced with 150% RDN and125% RDN . The height and weight of millable canes were influenced by N fertilization. The beneficial effect of N addition in terms of height and weight of millable canes was also observed by Cheema and Moolani (1970), Parashar et al. (1981) Sundara (2002) and Nagamadhuri et al. (2011). With regard to intercrops grown in wide rows, the millable cane length and diameter were not significantly influenced by them. During second year of study with cowpea grown as intercrop the millable cane length was reduced due to its creeper nature and smothering effect. The interaction between nitrogen levels and intercrop was not significant. Increased row spacing of 150 cm caused significant reduction in number of millable canes. Nitrogen levels from 75% RDN to 150% RDN significantly influenced the number of millable canes. During both years of study, 125% RDN recorded the highest number of millable canes. Under higher doses of nitrogen with wider row spacing (150cm), lodging effect was observed. These results are in accordance with Singh et al. (1994). With regard to intercrops during first year of study, more number of millable canes recorded in sugarcane + cowpea intercropping system followed by sugarcane + cluster bean cropping system. These results corroborate the results of Roodgai et al. (2001).

The row spacing of 150cm caused significant reduction in cane yield (Mahadevaswamy and James Martin 2001, 2002; Sundara 2003). During both the years of study, the cane yield was positively and significantly influenced by nitrogen levels (Table 1). Cane yield was significantly higher at 125% RDN which was, however, on par with that at 150% RDN. These results are in accordance with Rama Krishna Rao et al. (1989) and Srinivasa et al. (2003). The cane yield was not significantly influenced by the intercrops; similar results were reported by Haider et al. (2001). During first year of study, good yields of intercrops were recorded due to favorable moisture conditions. But in the second year, the yields from intercrops were lower due to insufficient supply of irrigation water to intercrops and the asynchrony of rainfall with the growing period of intercrops.

Quality parameters which included Brix%, sucrose% and CCS% were not influenced by variation in spacing (Sharma et al.,1991).The Brix %, sucrose% and CCS yield were not significantly influenced by nitrogen levels. The influence of intercrops on quality parameter (% Brix, % sucrose, % CCS) was not significant. Nevase et al. (2003) also reported that quality parameters, *viz*. Brix%, sucrose%, purity% as well as CCS% were not significantly influenced by intercrops, *viz*. cowpea, maize, chilli, cluster bean, radish and coriander.

Based on the pooled data of two years of plant crop, application of 125% RDN and 150% RDN realized highest cost benefit ratio with high net returns (Table 2). With regard to intercrops, *viz*. cowpea, cluster bean, okra and leafy vegetable realized statically similar monetary returns. These results indicated the possibility that intercropping provides additional income without affecting the main crop under wider row spacing. However, sugarcane row arrangement can be modified with 100-120cm, 30-150 cm to accommodate more number of inter crops. (Sundara, 2002 and Nagendran 1999). Overall, the present study indicated that wide row (5ft) planted sugarcane crop responds well up to 125% RDN which recorded the highest average cane yield With regard to intercrops, cowpea and cluster bean performed better than okra and leafy vegetable as they produced higher pod yields.

Table 2. Economics of sugarcane as influenced by nitrogen levels and intercrops under wide row planting (5ft)

Treatment	Equivalent yield (t/ha) [@]	Gross returns (Rs/ha)	Net returns (Rs/ha)	C:B ratio
		Nitrogen levels		
75% RDN	63.46	130230	40867	1.20
100% RDN	76.24	161335	69410	1.73
125% RDN	86.81	177604	87014	**1.94**
150% RDN	81.84	178056	86374	**1.92**
S Ed	5.08	8030.2	7871	0.09
LSD (0.05)	12.4	19654	19192	0.22
		Intercrops		
Cowpea	78.12	162053	70936	1.74
Okra	76.47	159949	71506	1.73
Cluster bean	77.47	161068	70108	1.76
Leafy vegetable	76.59	161823	71115	1.73
SEd	2.40	4112	4165	0.04
LSD (0.05)	NS	NS	NS	NS

[@]Mean of two plant crops

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