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EFFECT OF SPACINGS, NITROGEN LEVELS AND BIOFERTILIZERS ON YIELD AND QUALITY OF SUGARCANE

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Abstract : A field experiment was conducted during 1990-91 at the Regional Research Station, Mandya on effect of spacings and biocultures in conjunction with fertilizers on cane variety Co 62175. Results revealed that the recommended spacing of 0.9 m with 250 kg ha-1 was the best. Both biocultures viz., *Alotobaclor* sp. and *Azospirillum* sp. were found advantageous and their use along with any levels of N benefitted the variety to obtain better yield. Study did not support the saving of N levels due to biofertilization.

Key words : Biofertilizer, nitrogen level, spacing, sugarcane.

INTRODUCTION

In order to contain environmental pollution and judicious use of N fertilizers, the organic culture is envisioned (Alexander, 1985). Saving of energy with appropriate technology towards manifestation of food production is assuming ever importance. Biological nitrogen fixation has remained the focal topic of research in agriculture for supplying N in inexpensive way. This entails the use of bio-agents in conjunction with chemical fertilizers as a key to attain this goal. Hence, for different spacings the present investigation was taken up.

MATERIALS AND METHODS

The experiment was conducted at the Regional Research Station, Madya (12° 18'N, 76° 1'E), Karnataka state during 1990-91. The soil was loamy mixed isohypothermic Udic Hapluspalf, having medium organic carbon (0.39%), low available N (197 kg ha ^{1}) P (6.8 kg ha ^{1}) and K (136 kg ha $^{-1}$). The precipitation received during the crop growth period was 350.4 mm with a deficit of 414.6 mm as compared to normal.

The experiment was laid out in split plot design comprising spacings of 0.6 and 0.9 m in main plots and combination of nitrogen (125, 250 and 375 kg ha ^{1}) with biofertilizers (*Azorobacter* sp. and *Azospirillum* sp.) in subplots replicated thrice. The chosen variety for the study was CO 62175 a mid late, high tonnage variety. The planting was taken up during second week of November and biofertilizers at the rate of 5 kg ha $^{-1}$ was well mixed with powdered farm yard manure and uniformly applied to the treatment plots after four days of first top dress i.e., on 49th day.

RESULTS AND DISCUSSION

In the present study, the narrower spacings of 0.6 m was as effective as wider spacings of 0.9 m in respect of cane or sugar yield (Table 1). The higher tiller survival rate and cane parameters resulted the compensation of reduced stalk density by narrower spacing to achieve the same yield levels to that of wider spacing (Nandihalli and Singh, 1982). By virtue of marginally higher stalk density, narrower spacing had higher uptake of nitrogen (Sundara, 1989).

The dose response curve was parabola with a maximum yield of 203.16 t ha ^{1} at 250 kg N ha $^{-1}$. This N level achieved taller (25 cm more) with thicker (0.2 cm more) canes having additional weight (350 g per cane) as compared to N level of 125 kg ha ^{1} (Table 2). Further increase in N level to 375 kg ha ^{1} did not reflect either in improvement of growth or yield attributes. This is in line with the contention of many researchers who limited the N application to a moderate levels to achieve higher yield (Abayomi, 1987; Jayabal and Chockalingam, 1990). However, even N level of 375 kg ha ^{1} did not depress the juice quality (Table 3) which is peculiar to Co 62175 (Srinivasan, 1985). Sugar yield followed

Table 1. Effect of spacings, nitrogen levels and hiofertilizers on cane yield, sugar yield and N uptake of Co 62175

Treatments	Cane yield t ha^{-1}	Sugar yield t ha^{-1}	N uptake kg ha^{-1}
Spacing (MAIN)			
0.6 ra	182.9	26.7	132.8
0.9 m	184.9	27.1	121.8
CD (0.05)	NS	NS	9.2
Nitrogen levels (kg ha^{-1}) x Biofertilizers (SUB)			
125	147.7	21.8	99.5
125 x *Azotobactor* sp.	151.6	22.3	107.5
125 x *Azospirillum* sp.	153.7	22.0	112.4
250	199.3	29.2	154.1
250 x *Azotobactor* sp.	203.3	29.2	151.5
250 x *Azospirillum* sp.	206.8	30.1	166.4
375	194.5	28.4	185.7
375 x *Azotobactor* sp.	198.3	29.5	162.5
375 x *Azospirillum* sp.	199.5	29.4	176.3
CD (0.05)	6.1	1.5	10.4
Means for N level (kg ha^{-1})			
125	151.0	22.0	106.5
150	203.2	29.5	157.3
375	197.4	29.1	174.3
CD (0.05)	3.5	0.8	9.2
Means for **biofertilizers**			
Control (Untreated)	180.5	26.5	140.5
Azotobactor sp.	184.4	27.0	146.4
Azospirillum sp.	186.7	27.2	151.7
CD(0.05)	3.5	NS	9.4
Interaction (MAIN x SUB)			
SEm.	3.0	0.7	2.3
CD(0.05)	NS	NS	NS
CV (%)	2.8	4.5	5.6

Table 2. Effect of spacings, nitrogen levels and biofertili/,ers on yield attributes of Co 62175

Treatments	Cane length cm	Cane diameter cm	Cane weight kg
Spacing (MAIN)			
0.6 m	250	2.68	1.84
0.9 m	254.0	2.73	1.90
CD (0.05)	NS	NS	NS
Nitrogen levels (kg ha^{-1}) x **Biofertilizers** (SUB)			
125	238.0	2.54	1.62
125x *Azotobactor* sp.	240.0	2.61	1.62
125x *Azospirillum* sp.	237.0	2.54	1.68
250	253.0	2.76	1.98
250x *Azotobactor* sp.	266.0	2.82	2.08
250x *Azospirillum* sp.	262.0	2.71	1.93
375	259.0	2.75	1.95
375 x *Azotobactor* sp.	260.0	2.78	2.00
375x *Azospirillum* sp.	254.0	2.74	2.00
CD (0.05)	19.0	0.31	0.23
Means for N level (kg ha^{-1})			
125	236.0	2.56	1.64
150	260.0	2.76	2.00
375	258.0	2.76	1.98
CD (0.05)	14.0	0.18	0.11
Means for **biofertilizers**			
Control (Untreated)	250.0	2.68	1.85
Azotobactor sp.	255.0	2.74	1.90
Azospirillum sp.	257.0	2.76	1.87
CD (0.05)	3.1	0.04	NS
Interaction (MAIN x SUB)			
SEm.	9.0	0.1	0.1
CD (0.05)	NS	NS	NS
CV (%)	6.3	6.6	8.8

the same trend to that of cane yield. Also, N levels influenced the progressive increase in N uptake by plants.

The species of N fixing bacteria i.e., *Azotobactor* sp. and *Azospirillum* sp. were equally effective in producing the cane yield over untreated plots (Table 1) due to improvement in growth and yield parameters (Misra and Naidu, 1990). Treating hiofertilizers improved cane yield at all levels of N application (Table 4). But, the highest yield difference between

Table 3. Effect of spacings, nitrogen levels and biofertilizers on quality indices of Co 62175

Treatments	Corrected brix %	Pol % juice	Reducing sugar %	Fibre %
Spacing (MAIN)				
0.6 ra	20.32	20.34	0.91	16.62
0.9 m	20.31	20.34	0.89	14.44
CD (0.05)	NS	NS	NS	NS
Nitrogen levels (kg ha ') x Biofertilizers (SUB)				
125	19.74	20.49	0.90	14.75
125x *Azotobactor* sp.	19.62	20.42	0.91	14.68
125x *Azospirillum* sp.	19.94	19.98	0.93	14.41
250	20.39	20.30	0.96	14.42
250 x *Azotobactor* sp.	20.46	20.02	0.88	14.65
250 x *Azospirillum* sp.	20.57	20.24	0.88	14.37
375	20.67	20.36	0.92	14.40
375 x *Azotobactor* sp.	20.65	20.81	0.86	14.52
375 x *Azospirillum* sp.	20.78	20.42	0.85	14.60
CD (0.05)	0.38	NS	NS	NS
Means for N level (kg ha^{-1})				
125	19.77	20.30	0.91	14.61
150	20.47	20.19	0.91	14.48
375	20.70	20.53	0.88	14.50
CD (0.05)	0.24	NS	NS	NS
Means for biofertilizers				
Control (Untreated)	20.27	20.35	0.93	14.52
Azotobactor sp.	20.24	20.42	0.88	14.62
Azospirillum sp.	20.43	20.22	0.89	14.46
CD (0.05)	NS	NS	NS	NS
Interaction (MAIN x SUB)				
SEm.	0.14	0.27	0.06	0.29
CD (0.05)	NS	NS	NS	0.90
CV (%)	1.69	2.23	10.24	2.31

treated and untreated was observed at the N level of 250 kg ha^{-1}. Conjunction of biofertilisers with N levels for improvement in the yield was also reported by Patil and Hapase (1981). However, data do not permit to infer that there can be reduction in N levels following biofertilization.

In conclusion, spreading cane variety Co 62175 responded better for 0.9 m spacing with optimum N rate of 250 kg ha^{-1}. The use of organic culture improved the yield at tested N levels.

Table 4. Difference of yield between treated and untreated bioagents at different N levels

N level kg ha^{-1}	Yield, t ha^{-1}		
	Treated with bioagents	Untreated	Difference
125	152.6	147.7	4.9
250	205.1	199.8	5.8
375	198.9	194.5	4.4

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REFERENCES

Abayomi, A. Y. 1987. Growth, yield and crop quality performance of sugarcane under different rates of application of N and fertilizers. *J. agric. Sci.* : 109-285

Alexander, A. G. 1985. *The Energy Cane Alternatives.* Elseiver Science Publications, Oxford

Jayabal, V. and Chockalingam, S. 1990. Effect of N, P and Mg on yield and quality of sugarcane. *Indian Sug.* 40 : 165-67

Misra, A. and Naidu, K. 1990. Effect of biofertilizers and their methods of application on N economy in sugarcane. *Indian J. Agron.* 35 : 120-125

Nandihalli, U. S. and Singh, J. N. 1982. The effect of non-spacing and degree of defoliation on yield and quality of sugarcane. *Indian J. agric. Sci.* 52 : 26-27

Patil, P.G. and Hapase, O. G. 1981. Nitrogen economy in sugarcane by use of *Azotobactor*. *Maharastra Sug. 6* : 29-35

Srinivasan, T. R. 1985. N management studies with biofertilizers on sugarcane. *Rep. Sugarcane Breeding Institute,* Coimbatore, p. 121

Sundara, B. 1989. Effect of row spacings and N levels on early maturing short duration varieties. *36th Proc. Deccan Sugar Technical Association,* Pune, p. 371-376