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SHORT COMMUNICATION

Effect of Intersettling Spacing on Sugarcane Yield and Quality

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An experiment was conducted with 5ft inter row spacing to find out optimum inter settling spacing for polybag planting during preseason season of 2001-2002 at Vasantdada Sugar Institute's farm at Manjari. The results indicated that the cane yield was significantly increased by 17.48 t/ha in 60 cm inter settling spacing as compared to control (106.65 t/ha) in five feet wider row spacing. The significant rise in sucrose content in the juice leads to significant rise in CCS % in 5 ft inter row spacing with 60 cm inter settling spacing (14.25) as compared to two budded set planting (13.37). The multiple regression analysis showed that contribution of germination / survival percent is highest (81.33%) followed by tiller ratio at 120 DAP (64.49%) and plant population at harvest (62.49%) for the cane yield.

Keywords: Sugarcane, intersettling spacing, yield prediction model, cane yield and juice quality

Sugarcane is the main cash crop of Maharashtra, holds a prominent position in the acreage of the state, while in productivity Maharashtra is next to Tamil Nadu. Sugarcane yield has declined from 83.3 tonnes /ha (2000-01) to 61.8 tonnes/ha (2002-03). One of the reasons for decline in yield is due to planting of preseasonal sugarcane immediately after harvest of the kharif crop without proper land preparation due to time limitations. This also leads to poor germination and plant population resulting in low yields. This can be avoided if polybag settlings of 6 weeks age are prepared just before harvest of the kharif crop and transplanted allowing sufficient time for land preparation as well as improving germination at the same time. This type of planting also reduces the seed requirement by 50 to 60 percent than that of conventional sett planting. The other advantages are reduced water requirement during nursery stage. However, the optimum spacing for transplanted settlings needs to be worked out. With this view present studies have been carried out in variety CoC 671.

An experiment was conducted during preseason season of 2001-2002 at Vasantdada Sugar Institute's farm to study the optimum inter settling spacing in polybag transplanted settling in sugarcane cultivation. One budded polybag settlings of CoC 671 were raised in the month of September and transplanted in the field at various spacing in third week of October. The experiment was designed in randomized block design with four replications and the net plot size was 6 m x 4 rows. Five feet wider row spacing method was adopted for planting/transplanting. The crop was subjected to normal agronomical and irrigation practices. The treatments are - two budded set planting at the time of settling transplanting i.e. control (T_1), Settling transplanting at 45 cm spacing (T_2), Settling transplanting at 60 cm spacing (T_3), Settling transplanting at 75 cm spacing, (T_4), Settling transplanting at 90 cm spacing (T_5)

The observations *viz.* settling survival/germination percent were recorded at 45 days after planting/transplanting, tiller count, was recorded at 120 days crop age. The growth observations and yield attributes were recorded at harvest. The juice analysis was carried out by the method of Spencer and Meade (1964) at the time of harvest.

Biometric observations

The data on biometric observations viz., germination percent and tiller ratio is presented in Table 1.

Significantly low germination percent was recorded in two budded set planting (control – 63.50 %) as compared to the survival percent in various inter settling spacing. The settling survival percent was ranged between 96-98.25 %. Joshi *et al.* (1999) have recorded survival % of polybag plantlets up to 98-100%.

The tiller ratio was ranged from 5.03 to 6.79. Significant increase in tiller ratio was found in 45 (5.91), 60 (6.63), 75 (6.39)

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Table 1: Effects of inter settling spacing of polybag planting on biometric and growth parameters

Treatments	Germination / Survival % at 45 DAP	Tiller ratio at 120 DAP	Total Height (cm)	Millable cane Height (cm)	Girth (cm)	LA (cm^2)	LAI
T_1 Two budded sett planting – Control.	63.50	5.03	250.25	197.50	8.12	8985.01	1.999
T_2 Settling planting at 45 cm.	96.00*	5.91*	249.75	196.50	8.11	9246.17	2.054
T_3 Settling planting at 60 cm.	98.00*	6.63*	260.50	206.75	9.37*	9424.44*	2.09*
T_4 Settling planting at 75 cm.	97.75*	6.39*	266.75*	214.0*	10.05*	9861.43*	2.15*
T_5 Settling planting at 90 cm.	98.25*	6.79*	253.0	200.0	9.97*	8956.42*	1.989
S. E.	1.284	0.22	5.34	5.61	0.24	167.40	0.037
C. D. at 5 %	3.95	0.47	11.63	12.22	0.52	363.89	0.080

* Significantly superior over control.

and 90 cm (6.79) inter settling spacing. Increase in tiller ratio under polybag method as compared to sett planting was also reported by Thirunavukkarasu *et al.* (1997) and by Joshi *et al.* (1993, 1998 and 1999).

Growth of Sugarcane

Significant rise in total height was observed with 75 cm inter settling spacing (266.75 cm) as compared to control (250.25 cm), while rest of the treatments were at par with control. The millable height ranges from 196.50 cm to 214.00 cm. Significantly highest millable height was noted in 75 cm inter settling spacing (214.00 cm) as compared to control (197.50 cm). In 45 cm inter settling spacing lowest millable height was recorded (196.50 cm).

The cane girth was significantly increased as inter settling spacing increases. Significantly superior cane girth was recorded in 75 cm (10.05 cm), 90 cm (9.97 cm) and 60 cm inter settling spacing (9.37 cm) as compared to control (8.12 cm). Among the treatments, lowest cane girth was noted in 45 cm

Table 2: Effect of inter settling spacing of polybag planting on yield and yield attributing characters

No.	Treatment	Cane yield (t/ha)	Plant Population ('000/ha)	CCS %	Sugar yield (t/ha)
T_1	Two budded sett planting - Control.	106.65	97.96	13.37	14.26
T_2	Settling planting at 45 cm.	118.75*	99.13	13.62	16.17*
T_3	Settling planting at 60 cm.	124.13*	106.04	14.25*	17.69*
T_4	Settling planting at 75 cm.	119.96*	101.35	13.92	16.70*
T_5	Settling planting at 90 cm.	116.29*	98.92	13.84	16.09*
	S.E.	3.49	2.67	0.39	0.31
	C. D. at 5%	7.60	5.81	0.84	0.95

* Significantly superior over control.

Table 3: Correlation and contribution of biometric observations, growth parameters, plant population and sugar yield (t/ha) with cane yield

Parameters	Correlation coefficients (r) with Cane yield / ha	Contribution to cane yield (%)
Germination/survival at 45 DAP	0.9018*	81.33
Tiller ratio at 120 DAP	0.8031	64.49
Plant population / ha	0.7905	62.49
Total Height at harvest (cm)	0.5963	35.56
Millable height at harvest (cm)	0.5575	31.08
Girth (cm)	0.5006	25.06
Leaf area (cm^2)	0.6160	37.94
Leaf area index	0.6645	44.16
Sugar yield (t/ha)	0.9886	-
$Y = -3.7861 + (0.43284\ X_1) - (3.6432\ X_2) + (1.0339\ X_3)$	0.9999	99.99

* Significantly superior at 5 %.

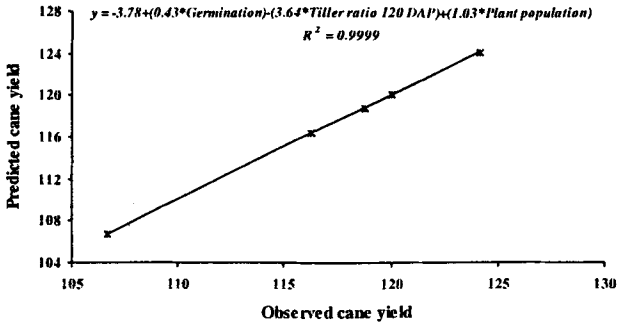

Fig 1: Relationship of cane yield based on regression equation and observed cane yield.

inter settling spacing (8.11 cm). The increase in cane girth may be due to more inception of solar radiation by the crop canopy due to the availability of more sunlight and space to the foliage. This might have resulted into more photosynthesis.

Significantly highest leaf area was recorded with settling transplanted at 75 cm spacing (9861 cm^2/m^2) followed by 60 (9424 cm^2/m^2) and 90 cm (8956 cm^2/m^2) inter settling spacing as compared to control (8985 cm^2/m^2). Significant increase in leaf area index was noticed with 90 cm inter settling spacing (2.15) followed by 75 cm spacing (2.09) as compared to control (1.99).

Yield and yield attributes

Highest plant population was recorded with 60 cm inter settling spacing (106.04 '000/ha). Therefore said increase in cane population with settling transplanting over sett planting might be contributed by higher settling survival percent than that of germination percent in the sett planting.

The cane yield ranged between 106.65 t/ha - 124.13 t/ha. Significantly highest cane yield was recorded with 60 cm spacing (124.13 t/ha) over control (106.65 t/ha). This significant rise in cane yield with settling transplanting as compared to control was mainly contributed by significant rise in millable cane height, cane girth and cane population.

Significantly highest commercial cane sugar content (14.25 %) was noted with 60 cm inter settling spacing as compared to two budded set planting i.e. control (13.37 %). Remaining treatments were at par with each other. Thirunavukkurasu *et al.* (1997) reported that the rise in sugar recovery was mainly attributed because of more physiological age of polybag planted crop as compared to sett planted crop and due to simultaneous and healthy growth of tillers.

The germination /survival percentage (CC=0.9018), tiller ratio (CC=0.8031) and plant population (CC=0.7905) had a strong positive correlation with cane yield and germination/ survival was significant at 5% level. Individually germination/ survival contributed 81.33%, tiller ratio 64.49 % and plant population 62.49 % to the cane yield. Lakshmikantham *et al.* (1970) reported that the plant population at harvest per unit area exhibited a high and positive correlation (r = 0.85) with ultimate cane yield. The leaf area index, leaf area, total height, millable height and girth at harvest showed low degree positive correlation with cane yield and they contributed individually in the range of 25.06 % to 44.16 % to the cane yield. Sugar yield (t/ha) was highly positively correlated with cane yield (CC=0.9886) and cane yield contributed 97.74 % to sugar yield (t/ha).

A regression equation was developed with parameters having very high correlations and r^2 value. Germination %, tiller ratio and plant population were taken for developing a model by multiple regression technique. The equation is given below:

$$Y = -3.78 + (0.43\,X_1) - (3.64\,X_2) + (1.03\,X_3)$$

Where,

X_1 = Germination, X_2 = Tiller ratio 120 DAP

X_3 = Plant population

The equation has multiple correlation coefficient of 0.9999 and is significant at 1 % level. The validation of the model was done and it contributes 99.99 % to the cane yield.

Sugarcane planting by polybag settling was found beneficial in 5 feet inter row spacing as there was improvement in cane yield to the tune of 13.13 t/ha. Among the various inter settling spacing tried in the experiment, settling transplanted at 60 cm spacing was found optimum as it resulted in highest rise in cane yield than all other spacings. The multiple regression analysis showed that contribution of germination / survival percent is highest (81.33%) followed by tiller ratio at 120 DAP (64.49%) and plant population at harvest (62.49%) for the cane yield.

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