Madras Agric. J., 100 (7-9): 713-716, September 2013
https://doi.org/10.29321/MAJ.10.001389

Effect of Sett Size, Seed Rate and Sett Treatment on Yield Attributes and Productivity of Spring Sugarcane in Subtropical India

R.D. Yadav, Dheer Singh and Amit Bhatnagar*
Department of Agronomy
G.B. Pant University of Agriculture and Technology
Pantnagar - 263 145, Uttarakhand

A field experiment was conducted during spring 2009 at Govind Ballabh Pant University of Agriculture and Technology, Pantnagar to explore the possibility of seed cane economy in spring planted sugarcane. Eighteen treatments consisting of three sett size (one, two and three budded), two seed rates (90,000 and 120,000 buds ha^{-1}) and three sett treatment (carbendazim (0.1%), carbendazim (0.1 %) + gibberellic acid (100 ppm) and no sett treatment) were laid out in factorial RBD with three replications. Two budded setts resulted in significantly higher yield attributes but remained at par with one bud sett for cane length and with three budded setts for number of internodes per cane, number of millable cane and individual cane weight. One budded sett being at par with two budded sett attained significantly more cane girth. The cane yield was also significantly higher (71.2 t ha^{-1}) in two budded sett that was 2 and 12.1 % more than three and one budded sett, respectively. High seed rate exhibited significantly more cane length and number of millable canes ha^{-1} but average cane weight was significantly higher in low seed rate (90,000 buds ha^{-1}). Cane yield did not decrease due to reduction in seed rate. Sett treatment with carbendazim prior to planting proved better in terms of yield attributes and cane productivity.

Key words: Spring sugercane, carbendazim, gibberellic acid, seed rate, sett, yield

The low average productivity of sugarcane (*Saccharum officinarum* L.) in India is a serious concern for low sugar production. Besides, huge quantity of sugarcane is utilized for seed at the cost of commercial cane. In order to meet the sugar requirement in the country, it becomes essential to increase sugarcane productivity and area under cultivation and make more availability of cane for crushing by reducing the seed requirement. However, due to enormous pressure from food and fibre crops, there will be hardly any space left to expand the area under sugarcane crop and therefore, the only way available is to raise the productivity and economize seed cane. Farmers use poor quality seed with high sett rate which results in poor cane production and wastage of commercial cane. Planting of cane without sett treatment also results in poor sprouting of buds and less plant population. In North India, the farmers generally plant the cane in spring season (February-March) as they do not want to sacrifice *rabi* crops particularly wheat. The productivity of spring planted sugarcane in North India is 25- 30 per cent lower than autumn and covers an area of about 70-80 per cent (Rana *et al.,* 2006). In order to increase the productivity of spring sugarcane, optimum number of millable canes and cane weight owing to desired shoot population need due attention. In this direction seed cane economy through suitable sett size, seed rate and sett treatment play a vital role in increasing productivity. Different sett sizes *viz.*, one budded, two budded and three budded etc. have received attention of researchers from time to time from crop growth point of view. Since sugarcane crop posses the trait of tillering, lower seed rate i.e. number of buds per unit area may compensate for high requirement of seed cane. A number of diseases in sugarcane limit the productivity which can be controlled by sett treatment with suitable fungicide. Singh (1998) observed higher cane productivity owing to sett treatment with fungicides. The germination of buds may be improved by breaking of the dormancy, if setts are treated with hormone such as gibberellic acid. Shrivastava *et al.* (1981) reported that sett treatment with indole butyric acid enhanced the sprouting of buds. They also noticed that sett treatment with gibberellic acid gave significantly higher stalk population. Therefore, keeping above facts in view, the present investigation was conducted to study the effect of seed cane economy on productivity of sugarcane through reduction in sett size and seed rate and sett treatment.

*Corresponding author email: bhatnagaramit75@gmail.com

Materials and Methods

Field experiment was conducted during spring 2009-10 at Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India. The experimental site is a humid subtropic with hot and dry summers and is situated at 29°N latitude, 79.5°E longitude and of 243.8 m altitude above the

mean sea level. The soil of experimental field was silty clay loam, rich in organic carbon (1.05%), low in available nitrogen (223.6 kg ha^{-1}), rich in total phosphorus (49.5kg ha^{-1}), medium in available potassium (243 kg K ha^{-1}) and neutral in reaction (pH 7.4) with bulk density of 1.34 Mg m^{-3}. The experiment was laid out in factorial randomized block design with eighteen treatments. All the treatments were replicated thrice. The treatments consisted of three sett size (one, two and three budded), two seed rate (90,000 and 120,000 buds ha^{-1} (recommended)) and three sett treatment (carbendazim (0.1%), carbendazim (0.1%) + gibberellic acid (100 ppm) and no sett treatment). The variety CoPant 90223 was planted on March 14, 2009 and harvested on February 15, 2010. The crop was nourished with 150 kg Nitrogen, 60 kg P_2O_5 and 40 kg K_2O ha^{-1}. Half dose of nitrogen and full amount of phosphorus and potassium was applied in furrows at the time of planting and remaining nitrogen was top dressed in two equal splits in the last week of May and June. As per treatment the seed canes were cut into three bud, two bud and single bud sett pieces and were dipped in carbendazim and/or gibberellic acid (GA) solution for 15 minutes prior to planting. The furrows at 20 cm depth were opened at 75 cm apart with the help of tractor mounted ridger. The setts were planted in furrows using seed rate as per treatment. The crop was raised following recommended agronomic practices.

Results and Discussion

Yield attributes in general, shoot population in particular increased up to 180 days after planting (DAP) and declined thereafter irrespective of the treatments (Table1). Among different sett sizes, medium size two budded sett recorded significantly higher shoot population at all the growth stages, however was at par with three budded sett at 210 DAP. Significantly lower shoot population was noted in one budded sett. The high mortality of shoots in one bud sett resulted in lower shoot population. Owing to initial more number of buds, seed rate of 120,000 buds ha^{-1} produced significantly more shoot population than 90,000 buds ha^{-1} at all the growth stages. Similar findings were reported by Srivastava and Ranwa (1994). Setts treated with carbendazim resulted in significantly higher shoot population while significantly lower value was recorded with no sett treatment. Low mortality of shoots due to sett treatment was responsible for more shoot population. These results are in close agreement with findings of Kalaimani and Giridharan (2001).

Table 1. Shoot population, cane length, cane girth and number of internodes per cane as influenced by sett size, seed rate and sett treatment.

Treatment	Cane length (cm)	Cane girth (cm)	No. of internodes per cane
Sett size			
3 budded	185.4	8.6	17.8
2 budded	189.9	9.0	17.9
1 bud	188.0	9.1	17.5
S.Em.±	1.2	0.06	0.1
CD (P=0.05)	3.6	0.2	0.3
Seed rate (buds ha^{-1})			
120,000	190.8	8.9	18.1
90,000	184.8	8.9	17.4
S.Em.±	1.0	0.05	0.1
CD (P=0.05)	3.0	NS	0.3
Sett treatment			
Carbendazim	192.9	9.2	18.3
Carbendazim+GA	187.5	8.9	17.7
No sett treatment	183.0	8.6	17.2
S.Em.±	1.2	0.06	0.1
CD (P=0.05)	3.6	0.2	0.3

Two budded sett recorded significantly more cane length and number of internodes per cane but remained at par with one budded sett for cane length and with three budded sett for number of internodes per cane. The reduction in sett size to one bud sett led to significantly higher cane girth but was statistically similar to two budded sett. There was a trend of reduction in number of millable canes and enhancement in average cane weight with shortening of sett size. Three budded sett being at par with two budded sett attained significantly higher number of millable canes (100.9 thousand ha^{-1}) that was 14.1 thousand ha^{-1} more than single bud sett. More millable canes in two and three budded sett might be ascribed to higher shoot population. Domini and Plana (1991) also reported that in higher bud density cane height and plant population increased. The smallest size of sett produced significantly heavier cane (720 g) but did not differ with two budded sett statistically. The less number of millable canes in one bud sett planting faced less competition for growth factors and thus might assimilate the photosynthates effectively and thus turn in to more individual cane weight.

Planting at high seed rate of 120,000 buds ha^{-1} recorded significantly more cane length, number of internodes per cane and number of millable canes. More number of millable canes under 120,000 buds ha^{-1} was as a result of initial high shoot population owing to high seed rate. Owing to high shoot population keen competition for light among plants might have helped in increasing cane length. Singh *et al*. (1996) also observed more number of internodes and cane length with higher seed rate. The average cane weight was significantly increased by 7 per cent with reduction in seed rate from 120,000 buds to 90,000 buds ha^{-1}. Proper utilization of space, nutrient, water, sun light, etc. and less competition in low seed rate probably helped in increasing cane weight.

Sett treatment with carbendazim showed significantly higher value of all the yield attributes studied. Disease free crop under sett treatment with carbendazim might have resulted in better yield attributes (Gohil and Vala, 2003). Low mortality and high shoot population in setts treated with

carbendazim may be ascribed to significantly more number of millable canes. Similar results were also reported by Shukla and Lal (2003).

Yield

Crop raised with two budded sett exhibited significantly higher cane, green top, trash and biological yield (71.2, 15.7, 8.0 and 95.0 t ha^{-1}, respectively). There was 2 and 12.1 % higher cane yield in two budded sett than three and one budded sett, respectively (Table 2). Higher cane yield in two budded sett might be attributed to better yield attributes viz., cane length, cane girth and number of millable canes. Similar observations were also reported by Ramesh (1997).

Reduction in seed rate from 120,000 to 90,000 buds ha^{-1} increased the crop yield but such increase was not significant for cane and biological yield. The results are in the conformity with the findings of Singh and Singh (2001) who also observed no significant differences in cane yield due to reduction in seed rate.

Table 2. Effect of sett size, seed rate and sett treatment on number of millable canes, cane weight and yield of sugarcane.

Treatment	No. of millable canes (000 ha^{-1})	Cane weight (g)	Yield (t ha^{-1})			
			Cane	Green top	Trash	Biological
Sett size						
3 budded	100.9	681	69.8	14.8	7.6	92.4
2 budded	100.3	694	71.2	15.7	8.0	95.0
1 bud	86.8	720	62.6	14.4	7.5	84.5
S.Em.±	0.7	9	0.4	0.2	0.1	0.5
CD (P=0.05)	2.2	27	1.2	0.7	0.3	1.5
Seed rate (buds ha^{-1})						
120,000	98.8	675	67.8	14.6	7.5	90.1
90,000	93.2	722	68.0	15.4	7.9	91.1
S.Em.±	0.6	7	0.3	0.2	0.1	0.4
CD (P=0.05)	1.8	22	NS	0.6	0.3	NS
Sett treatment						
Carbendazim	102.3	722	71.5	15.6	7.8	94.3
Carbendazim+GA	95.3	694	68.9	15.1	7.7	92.2
No sett treatment	90.4	680	63.2	14.2	7.6	85.3
S.Em.±	0.7	9	0.4	0.2	0.1	0.5
CD (P=0.05)	2.2	27	1.2	0.7	NS	1.4

Sett treatment with carbendzim achieved significantly higher cane and biological yield that was 2.6 and 8.3 and 2.1 and 9.0 t ha^{-1} more than carbendzim+GA and no sett treatment, respectively. Green top yield was also significantly higher in carbendzim treatment but remained at par with carbendzim + GA. Trash yield did not vary significantly owing to sett treatment, however numerically maximum value was with carbendzim. Significantly higher cane yield in carbendazim might be ascribed to more number of millable canes and average cane weight. Singh and Goswami (2003) also observed that sett treatment with carbendazim resulted in significantly more yield. It is noteworthy that sett treatment with carbendazim+GA was inferior to carbendazim alone with respect to yield attributes and cane yield. It revealed antagonistic effect of GA on carbendazim. Many researches from north west India also reported lower sugarcane yield in sett treatment with carbendzim + GA as compared to carbendzim alone (Anon., 2010).

Productivity of spring sugarcane in subtropical parts of India may be increased by planting of two budded setts and by using lower seed rate of 90,000 buds ha^{-1}. Sugarcane setts should be treated with carbendazim (0.1 %) before planting.

References

Anonymous, 2010. AICRP Sugarcane project report 2009-10. Project number AS 60. pp. 70-85.

Domini, M.E. and Plana, R. 1991. Effect of planting density on sugarcane stalk and yield. *Sugarcane Abstract*. **3:** 21.

Gohil, V.P. and Vala, D.G. 2003**.** Fungicide against sugarcane wilt (*Fusarium moniliforme* Sheld) under pot conditions. *J. Physiological Res.,* **16:** 137-141.

Kalaimani, T. and Giridharan, S. 2001**.** Effect of pressmud on the control of sugarcane sett rot caused by *Ceratocystis paradoxa* Moreau. *Indian Sugar*. **50:** 863-865.

Ramesh, P. 1997**.** Effect of planting geometry and method of planting on yield components, yield, quality and water use of sugarcane (*Saccharum officinarum*). *Indian J. Agron.,* **42:** 389-391.

Rana, N.S., Kumar, S., Saini, S.K. and Panwar, G.S. 2006**.** Production potential and profitability of autumn sugarcane based intercropping system as influenced by intercrops and row spacing, *Indian J. Agron.* **51:** 31-33.

Shrivastava, A.K., Yadav, R.L., Singh, K., Kacker, N.K. and Singh, M. 1981. Stubble sprouting in sugarcane under sub-tropical conditions: Influence of growth

regulating substances. In: Proc. *National seminar* on Ratoon Management, I.I.S.R., Lucknow, March 14-15, pp. 100-105.

Shukla, S.K. and Lal, M. 2003**.** Effect of sett size, planting method and soil moisture regime on growth and yield of sugarcane. *Indian J. Agric. Sci.,* **73:** 534-537.

Singh, A. and Singh, R.B. 2001. Effect of agronomic practices on the productivity of late planted sugarcane. *Crop Res.,* **21:** 123-125.

Singh, S.K.P., Singh, S.S., Sinha, U.P. and Singh, A.K. 1996**.** Effect of spacing, seed rate and nitrogen on growth, yield and quality of sugarcane (*Saccharum officinarum* L.) *Indian J. Agron.,* **4:** 119-121.

Singh, S.N. 1998. Effect of sett treatment with fungicides and heat therapy on whip smut and yield of sugarcane. *Cooperative sugar.* **29:** 779-780.

Singh, S.N. and Goswami, G.P. 2003. Management of sugarcane wilt disease caused by *Fusarium moniliforme* through chemical and physical sett treatment *Cooperative Sugar.* **34:** 381-384

Srivastava, S.N.L. and Ranwa, R.S. 1994**.** Effect of seed cane and sett rate on growth and yield of sugarcane. *Indian J. Agron.,* **39:** 173-174.

Received: March 15, 2013; Accepted: August 20, 2013