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INFLUENCE OF SETT SIZE, SEED RATE AND SETT TREATMENT ON YIELD AND QUALITY OF SUGARCANE

DARPANA PATEL* AND RINKU PATEL
Main Sugarcane Research Station,
Navsari Agricultural University, Navsari - 396 450, Gujarat, INDIA
e-mail: darpana_srs@yahoo.com

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***Corresponding author**

ABSTRACT
A field experiment was conducted at Regional Sugarcane Research Station, Navsari, Gujarat (India) during 2008-09 to 2010-11 to study the influence of sett size, seed rate and sett treatment on yield, of sugarcane. The results of the experiment indicated that, planting of sugarcane with two bud sett found significantly superior in increasing number of millable canes (110250 ha^{-1}), cane yield (110.42 t ha^{-1}) as compared to three and single bud setts during all the three years of experimentation. The increase in cane yield was 6.86 % and 25.72 % in three and two bed setts respectively over single bud sett. Normal seed rate of 100 % of recommended buds ha^{-1} increased the number of millable canes ha^{-1}, cane yield (100.83 t ha^{-1}) and commercial cane sugar (ccs) yield (12.53 t ha^{-1}) significantly as compared to lower seed rate of 75 % of recommended buds ha^{-1}. Significant differences in cane yield, ccs yield and juice quality parameters were not observed due to sett treatment either with carbendazim @ 0.1 % alone or along with gibberellic acid @ 100 ppm for 15 minutes.

INTRODUCTION

Sugarcane is an important cash crop of India grown in an area of 5.09 million ha with an annual production of 357.67 million tones and the average yield is 70.3 t ha^{-1}. In Gujarat, it occupies an area of 2.02 lakh ha with the production of 141.77 lakh tones and productivity is 70.2 t ha^{-1} (ISMA, 2013). It is grown throughout the world for several years but the production and productivity is not sufficient to meet out the requirement of ever increasing population due to factors like climate, edaphic and anthropic. The establishment and yield of sugarcane depends upon number of setts, number of viable eyes and tillering which determines the final yield. Sugarcane is planted through setts for the establishment of commercial fields. In recent days, cost of production is becoming high due to increasing labour cost and other inputs including seed. In sugarcane cultivation, seed is one of the costlier input and accounts for nearly 25 % of the total operational cost in sugarcane. Under irrigated conditions, generally 40,000 three bud setts from 10 ton ha^{-1} of seed crop or top 1/3rd portion of healthy matured cane is recommended for sugarcane. Saving of seed material by changing type of seed material (sett size) and seed rate without any deleterious effect on plant stand may help in getting higher cane yield with lower cost of production. Hence the present investigation was carried out to reduce the cost of production through seed cane economy technologies.

MATERIALS AND METHODS

An experiment trial was conducted during the years 2008-09 to 2010-11 at Regional Sugarcane Research Station, Navsari, Gujarat state to study the influence of sett size, seed rate and sett treatment on yield quality of sugarcane. The soil of experimental site at Navsari was medium black, low in available nitrogen, medium in available potassium and higher in available potassium with 7.76 pH. The treatments consisted of three types of seed material viz., three bud sett, two bud sett and single bud sett; two seed rate viz., 100 % of recommended (50000 two eye bud ha^{-1}) and 75 % of recommended (37500 two eye bud ha^{-1}) buds ha^{-1} and two sett treatments viz., carbendazim @ 0.1 % for 15 minutes and carbendazim @ 0. 1 % + Gibberelic acid (GA) @ 100 ppm for 15 minutes.

Sugarcane (CoN 05071) was planted in furrow at 90 cm apart in randomized block design using factorial concept and replicated three times. Three, two and single budded healthy cane setts having viable buds were planted after sett treatment in different experimental plots. The crop was uniformly fertilized with recommended dose of 250 kg N, 125 kg P_2O_5 and 125 kg K_2O ha^{-1}. Urea, single super phosphate and muriate of potash were taken as sources of nitrogen, phosphorus and potassium, respectively. 100 % recommended dose of P_2O_5 (125 kg ha^{-1}) and K_2O (125 kg ha^{-1}) applied at the time of planting while nitrogen 100 % (250 kg ha^{-1}) applied in four splits among which 15 % of recommended dose of N (37.5 kg ha^{-1}) was applied at the time of planting and remaining 85 % of N was applied in three splits i. e. 30 %, 20 % and 35 % at 1.5 month, 3 and 5 month after planting respectively. In each year other recommended packages of practices were adopted as and when required by the crop. The crop was planted during December and harvested in January month during all

the three years of experimentation. The mean rainfall received during the crop growth period was 1836.8 mm (av. of three years). Commercial cane sugar (ccs) yield (t ha^{-1}) was calculated as: cane yield (t ha^{-1}) x ccs %/100. Whole cane samples were taken at the time harvest and cane juice was extracted with power crusher and juice quality was estimated as per method given by George (1963).

RESULTS AND DISCUSSION

Germination counts

Germination counts were recorded at 45th days after planting of different setts. The pooled data revealed that there was significant variation in germination percent observed due to different treatments (Table 1). Significantly higher germination percent was recorded with two budded setts (67.64 %) as compared to single budded sett (58.32 %) and three budded sett (62.59 %). Increase in germination per cent due to planting of two budded sett was 15.98 % and 8.08 % over single and three budded setts. Almost similar results were noticed by Singh et al. (2008) and Chitkala Devi *et al*. (2011).

Seed rate decreasing by 25 % of normal seed rate and sett treatment with carbendazim @ 0.1 % or carbendazim 0.1 % GA @ 100 ppm for 15 minutes did not improve the germination percent.

Number of millable canes (NMC) ha^{-1}

Seed size significantly influenced number of millable canes (Table 1). Planting of two bud setts gave significantly higher number of millable canes (110250 ha^{-1}) as compared to three bud sett (96417 ha^{-1}) and single bud setts (92000 ha^{-1}). This might be due to higher germination percent in two bud setts that in three and small seed size of single bud setts. These results are in conformity with the findings of Singh *et al*. (2008) and Chitkala Devi *et al*. (2011). Different seed rate did not improve the number of millable canes however higher number of millable canes was recorded with normal seed rate of 100 % of recommended buds ha^{-1} (50000 two eye bud ha^{-1}) as compared to seed rate of 75 % of recommended buds ha^{-1}. Sett treatment with carbendazim @ 0.1 % (99611 NMC ha^{-1}) or carbendazim @ 0.1 % + Gibberelic acid @ 100 ppm for 15 minutes (99500 NMC ha^{-1}) did not show any beneficial

Table 1: Percent germination, number of millable canes (NMC) and yield of sugarcane as influenced by sett size, seed rate and sett treatment (pooled of three years)

Treatment	Percent germination	NMC ha^{-1}	Cane yield (t ha^{-1})	CCS (t ha^{-1})
Sett size (no. of buds $sett^{-1}$)				
Three bud sett	62.59	96417	93.86	11.80
Two bud sett	67.64	110250	110.42	13.51
Single bud sett	58.32	92000	87.83	10.85
SEm ±	1.6	2021	4.25	0.56
CD (0.05)	4.5	5708	16.67	NS
Seed rate (No. of buds ha^{-1})				
100 % of recommended	63.27	100278	100.83	12.53
75 % of recommended	62.42	98833	93.91	11.56
SEm ±	0.5	1640	1.39	1.18
CD (0.05)	NS	NS	3.92	0.52
Sett treatment				
Carbendazim @ 0.1 % for 15 minutes	62.84	99611	96.76	12.04
Carbendazim @ 0.1 % + Gibberellic Acid (GA) @ 100 ppm for 15 minutes	62.86	99500	97.98	12.06
SEm ±	0.6	1618	1.38	0.18
CD (0.05)	NS	NS	NS	NS
Interaction	NS	B × S	B × S	S × F

Table 2: Quality of sugarcane as influenced by sett size, seed rate and sett treatment (pooled of three years)

Treatment	CCS %	Pol % juice	Purity %	Fibre %	Pol % cane
Sett size (no. of buds $sett^{-1}$)					
Three bud setts	12.59	17.90	92.07	14.67	13.48
Two bud setts	12.24	17.43	91.73	14.53	13.15
Single bud setts	12.38	17.61	91.85	14.89	13.22
SEm ±	0.13	0.17	0.13	0.18	0.12
CD (0.05)	NS	NS	NS	NS	NS
Seed rate (No. of buds ha^{-1})					
100 % of recommended	12.48	17.77	91.84	14.66	13.38
75 % of recommended	12.32	17.53	91.93	14.74	13.19
SEm ±	0.12	0.15	0.10	0.13	0.11
CD (0.05)	NS	NS	NS	NS	NS
Sett treatment					
Carbendazim @ 0.1 % for 15 minutes	12.46	17.73	91.93	14.70	13.35
Carbendazim @ 0.1 % + GA @ 100 ppm for 15 minutes	12.34	17.56	91.84	14.69	13.23
SEm ±	0.05	0.06	0.19	0.04	0.05
CD (0.05)	NS	NS	NS	NS	NS
Interaction	S × F	S × F	NS	B × F	S × F

effect on number of millable canes. These results are in conformity with Sogheir and Mohamed (2003) and Chitkala Devi *et al*. (2011).

Cane and sugar yield

Cane yield varied significantly due to sett size presented in Table 1. Planting of cane with two bud sett (110.42 t ha^{-1}) or three bud sett (93.86 t ha^{-1}) gave significantly higher cane yield than single bud setts (87.83 t ha^{-1}). This might due to improved germination percentage and number of millable canes in two and three bud setts. These results are in conformity with the findings of Geddaway *et al*. (2002), Sogheir and Mohamed (2003), Singh *et al*. (2008) and Chitkala Devi *et al*. (2011).

Sugar yield did not exhibit any superior effect due to various sett size however higher and lower sugar yield was recorded with two and single bud sett respectively.

The effect of seed rate on cane yield was found significant. The pooled data revealed that significantly higher cane and sugar yield was recorded with normal seed rate of 100 % of recommended bud ha^{-1} (100.83 t $ha^{-1}$and 12.53 t ha^{-1}, respectively) and proved superior to seed rate of 75 % of recommended bud ha^{-1} (93.91 t ha^{-1} and 11.56 t ha^{-1}, respectively). These results are in corroboration with the findings of Singh *et al*. (2008) and Chitkala Devi *et al*. (2011).

Sett treatment either with carbendazim @ 0. 1 % or carbendazim @ 0.1 % + Gibberelic acid @ 100 ppm for 15 minutes did not found to have significant effect on cane and sugar yield.

Juice quality parameters

Juice analyzed for different parameter at harvest of the crop (Table 2). The difference in all the juice quality parameters due to different treatments i. e. seed rate, sett size and sett treatment was found to be non significant. Almost similar results were also reported by Singh *et al*. (1996), Singh *et al*. (2008) and Chitkala Devi *et al*. (2011).

CONCLUSION

Keeping in view of the data presented, it can be concluded that in sugarcane cultivation two bud sett can be used as seed material for getting higher cane and sugar yield instead of three and single bud setts. Irrespective of sett size, normal seed rate of 100 % of recommended buds ha^{-1} gave higher cane yield compared to decrease in the seed rate of 25 % of normal (37500 buds ha^{-1}) seed rate. Sett treatment with carbendazim @ 0. 1 % alone or along with gibberelic acid @ 100 ppm for 15 minutes had no beneficial effect on germination of buds, cane or sugar yields.

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