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SHORT COMMUNICATION

EFFECTS OF SEED RATE, SETT SIZE AND SEED TREATMENT ON SPRING PLANTED SUGARCANE

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Abstract

Seed is the major input and about 80q/ha seed sett is required to plant sugarcane. Cost of cultivation is enhanced with any increase in seed rateof sugarcane whichultimately reduces the net returns of farmers. Hence, there is a need to reduce the seed rate for achieving higher returns per unit area. Keeping this point in mind, three experiments were conducted to study the effects of sett size (three, two and single budded), seed rate (100 and 75% of recommended seed rate of 1,50,000 buds/ ha) and seed treatment (carbendazim 0.1% for 15 min or carbendazim 0.1% + gibberellic acid 100 ppm for 15 min) on spring planted sugarcane during 2008-09, 2009-10 and 2010-11 at Punjab Agricultural University, Regional Station, Faridkot. Results indicated better cane yield in two and three budded setts as compared to single budded setts. Gibberellic acid treatment for 15 min had negative effect on sugarcane germination which, in turn, had impact on cane yield. Higher cane yield in 100% recommended seed rate was observed only when three budded setts were used.Whereas in case of single and two budded sets, the cane and sugar yieldswere at par inboth 100 and 75% recommended seed rate indicating scope for saving the seed cane using two budded seed setts.

Key words: Sugarcane, seed rate, sett size, seed treatment, cane yield

Sugarcane (*Saccharumsp. h*ybrid complex) is a highly management responsive crop. During the peak growth period, it can produce around half a tonne of dry matter per hectare per day, which is rarely observed in any other crop (Yadav1991). Being a C4 plant, physiologically it is one of the most efficient converters of solar energy into sugar among the cultivated plants.Sugarcane is vegetatively propagated through stem cuttings andstalk population is one of the most important components governing the cane yield which can be increased by adjustingthe plant density. Furthermore, a healthy and uniform crop stand is a fundamental pre-requisite for high cane yield. Instead of whole cane, setts are commonly used for planting sugarcane to reduce apical dominance observed in whole-stalk planting (Orgeron et al. 2007). From agronomic point of view, not only seeding density but also optimum plant population is crucial for sugarcane production. Seeding density directly affects the number of stalks, stalk length and stalk diameter which are positively associated with cane yield per unit area (Nazir et al. 1999). Bashir et al. (2000) have also reported a positive relationship between seeding density and plant population of sugarcane. The crop is highly prone to insects, pests and diseases attack after the setts are planted which can lead to poor germination. The basic purpose of seed treatment is to protect the setts from insects, pests and diseases so as to retain higher germination. Even after selecting disease resistant varieties, the setts must be treated with fungicides as a preventive measure against seed

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borne diseases. Since seed is the major input and about 80 quintal seed settsare needed to plant sugarcane in one hectare, any exercise leading towards reduction in seed rate will be highly effective in cutting the cost onseed to reduce cost of cultivation and improving returns of farmers. At present, no studies are available that show the quantitative effects of changes in sett size under varied seed rates and seed treatment. Keeping these points in view, field experiments were conducted from 2008-09 to 2010-11 at Punjab Agricultural University Regional Station, Faridkot, on the effects of seed rate, sett size and seed treatment on spring planted sugarcane.

Three field experimentswere conducted in the *kharif* season during 2008-09, 2009-10 and 2010-11 at Research Farm of Punjab Agricultural University, Regional Research Station, Faridkot, Punjab ($30^0$40'N and $74^0$44'E), a typical representative of South-Western zone (Zone IV). The soil of the experimental field was loamy in texture, slightly alkaline (pH 8.2), normal EC (0.41 m dS/m), medium in OC (0.44%),medium in available P (15.0kg/ha) but high in available K (555kg/ha). The experiment was conducted in factorial randomized block design with three factors i.e. sett size (three, two and single budded setts), seed rate (100 and 75% of recommended seed rate of 1,50,000 buds/ha) and seed treatment [carbendazim (0.1%) for 15 min or carbendazim (0.1%) + gibberellic acid (100 ppm) for 15 min].Rainfall received during the crop seasons was 590, 428 and 432 mm in 2008-09,2009-10 and 2010 -11, respectively. Sugarcane variety, CoJ 88 was planted on 19.03.2008, 17.02.2009 and05.03.2010 during the study period. Other production and protection measures were applied as per the package of practices recommended by Punjab Agricultural University. The data of three years were pooled and statisticallyanalyzed as per the standard procedure proposed by Cheema and Singh (1991).

Sett size: Growth of sugarcane was significantly affected by different size of sugarcane setts. Germinationin two budded setts was onpar with that of three budded setts (31.6 and 32.2%, respectively) but significantly higher than single budded setts (25.1%) (Table 1).Poor germination of single-budded sett may be due to loss of moisture from cut ends on either side. Since moisture status of setts control the germination, longer setts are expected to have better chances of improved germination due to better moisture content (Shrikhande and Gahlot, 1960). The number of tillers in three budded setts was onpar with two budded setts but significantly higher than single budded setts. Number of millable canes in two budded setts was on par with three buddedsetts but higher than single budded setts. Since the variety CoJ 88 has long internodes,the two budded setts had sufficient sett length and more carbohydrates in it to be utilized for sprouting. The stalk length in three and two budded setts was on par but significantly higherthansingle budded setts. Sett size did not affect the stalk girth and single cane weight significantly. Cane yieldsin three and two budded setts planting weresignificantly higher (64.7 and 64.9 t/ha) than single buddedsetts planting (48.1 t/ha). According to Chand et al. (2011) double budded setts produced higher cane and sugar yield than single budded setts. Use of single budded setts for planting has been significantly reduced in sugarcane (Singh et al. 2009). The plants arising from single-bud setts also lackedvigour and had loweryield as compared to those from three-budded setts. Thus the preference fortwo and threebudded setts over singlebudded setts was partly based on germination capacity and partly on initial vigour of the germinated plants and cane yield. Commercial cane sugar (CCS) % and CCS yield (t/ha)were also higher in three and two buds setts planting over single budded setts planting.

Seed rate: The germinationwas not significantly affected by seed rate. Ehsanullahet al. (2011) also observed non-significant differences in germination% with seeding densities. Significantly more number of tillers was recorded by using recommended seed rate compared to lower seed rate. Improvement in number of millable canes was also significantly more

Table 1. Effect of different treatments on growth, yield and yield attributes of sugarcane at Faridkot, Punjab (pooled mean of 3 years)

Treatments	Germi-nation (%)	Tillers (000/ha)	NMC (000/ha)	Stalk length (cm)	Stalk girth (cm)	Single cane wt. (g)	Cane yield (t/ha)	CCS (%)	CCS (t/ha)
Sett size									
Three budded	31.6	136.2	91.5	174	2.55	891	64.7	13.41	8.67
Two budded	32.2	141.5	95.2	171	2.55	865	64.9	13.41	8.70
Single budded	25.1	87.5	71.0	156	2.62	842	48.1	13.14	6.28
LSD (5%)	1.2	6.1	3.7	7	NS	NS	2.4	0.18	0.36
Seed rate (Buds/ha)									
1,50,000	30.0	128.7	89.6	168	2.59	860	61.6	13.31	8.20
1,12,500	29.3	114.7	82.2	167	2.56	872	56.9	13.32	7.56
LSD (5%)	NS	4.9	3.1	NS	NS	NS	2.0	NS	0.29
Sett Treatment									
F_1	31.3	127.9	90.7	169	2.57	873	62.3	13.32	8.29
F_2	28.0	115.5	81.2	165	2.57	859	56.2	13.32	7.47
LSD (5%)	0.9	4.9	3.1	NS	NS	NS	2.0	NS	0.29

F_1: Soaking seed setts in carbendazim 0.1%; F_2: Soaking seed setts in carbendazim 0.1% + gibberellic acid 100 ppm for 15 min

under recommended seed rate which was in agreement with the findings of Ehsanullah et al (2011). Stalk length, girth and cane weight were not significantbut the cane yield was significantly influenced by seed rate. Cane yield was higher in recommended seed rate (61.6 t/ha) than 75% seed rate (56.9 t/ha) due to significantly higher number of tillers/ha. Seed rate had no effect on CCS% but CCS (t/ha) was significantly higher at recommended seed rate. Sharar et al (2000) had also observed that higher seeding density of 1,00,000 setts/ha had improved CCS compared with the seeding density of 75,000 setts/ha. Increase in cane yield with increasing planting rate was also reviewed by Rice (1981).

Higher cane yield with recommended seed rate was observed only when three budded setts were used. In case of single and two budded setts, the cane and sugar yield in 100% recommended seed rate were at par with 75% seed rate (Tables 2 and 3). Yield levels were low with single bud setts at both the seed rates. At 75% seed rate, two buddedsetts were better than three budded setts. Same was the case for sugar yield (Table 3) indicatinga possibility of seed saving with single and two budded seed setts.

Seed treatment: The setts of sugarcane treated with fungicides showed significant effect on seed germination. Germinationwas significantly higher when the setts were soaked in carbendazim @ 0.1% for 15 min as compared to soaking setts in carbendazim @ 0.1% + gibberellic acid 100 ppm for 15 min. Same was the case for number of tillers and millable canes. Stalk length, girth and cane weight were found to be non-significant. Soaking seed setts in carbendazim @ 0.1% for 15 min produced significantly higher cane yield (62.3 t/ha) than soaking setts in carbendazim @ 0.1% + gibberellic acid 100 ppm for 15 min (56.2 t/ha), owing to

Table 2. Cane yield (t/ha) as influenced by sett size and seed rate (pooled mean of 3 years)

Seed rate(Buds/ha)	Sett size			Mean
	Three budded	Two budded	Single budded	
1,50,000	69.6	66.1	49.3	61.7
1,12,500	59.9	63.8	46.9	56.9
Mean	64.8	65.0	48.1	
LSD (5%)				
Sett size	2.4			
Seed rate	2.0			
Sett size x Seed rate	3.5			

Table 3. Sugar yield (CCS t/ha) as affected by sett size and seed rate (pooled mean of 3 years)

Seed rate(Buds/ha)	Sett size			Mean
	Three budded	Two budded	Single budded	
1,50,000	9.29	8.85	6.46	8.20
1,12,500	8.05	8.54	6.10	7.56
Mean	8.67	8.70	6.28	
LSD (5%)				
Sett size	0.36			
Seed rate	0.29			
Sett size x Seed rate	0.51			

significantly more germination and number of tillers/ ha (Table 1). CCS % was found to be non-significant for fungicide treatments.

Conclusion

Two and three budded setts performed significantly better than single budded setts. Gibberellic acid treatment for 15 min had negative effect on sugarcane germination andyield. Higher cane yield in 100%recommended seed rate was observed when three budded seed setts were used. In two and single budded setts, the cane and sugar yieldswere on par in 100 and 75% of recommended seed rate.

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