Studies on seed economy and sett treatment in spring planted Sugarcane (*Saccharum officinarum* L.) in sub-tropical India

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ABSTRACT : A field experiment for three consecutive years *i.e.* 2008-09, 2009-10 and 2010-11 was conducted at Norman E. Borlaug Crop Research Center of Govind Ballabh Pant University of Agriculture & Technology, Pantnagar to explore the possibility of seed cane economy in sugarcane to be planted in subtropical condition. Eighteen treatments consisting of three sett size (one, two and three budded), two seed rates (90,000 and 1,20,000 buds/ha) and three sett treatment (carbendazim 0.1 %, carbendazim 0.1 % + gibberalic acid (100 ppm) along with no sett treatment) were laid out in Factorial Randomized block design (R.B.D.) with three replications. Except length of the cane, cane yield, girth of the cane, millable canes, shoot population, available sugar % and CCS yield were significantly higher in two budded sett over three or single bud. Cane yield was highest in 1,20,000 buds/ha seed rate but there was no significant difference between 1,20,000 or 90,000 buds/ha. Available sugar and CCS (commercial cane yield) were not influenced due to seed rate either 1,20,000 buds/ha or 90,000/ha. Highest cane yield and other yield attributes (shoot population, NMC, cane length, cane girth were highest in carbendazim (0.1 %) treated seed material over carbendazim (0.1 %) + gibberalic acid (100 ppm) or no sett treatments. Germination % was not influenced due to sett size or seed rate but significantly higher germination was recorded in seed treated with carbendazim (0.1 %) over GA_3 + carbendazim (0.1 %) or no sett treatment.

Key words: Corbendazim, Gibberellic acid, Setts, Spring cane

Sugarcane (*Saccharum officinarum* L.) is one of the important commercial crop of India. Low average productivity of sugarcane in India is a serious concern for low sugar production. Besides, huge quantity (13-15 %) of sugarcane is utilized for seed at the cost of commercial cane. It becomes essential to increase sugarcane production and productivity to meet the sugar requirement in the country. However, due to enormous pressure of food, fiber crops, urbanization and industrialization. There will be hardly any space left to expend the area under sugarcane crop and therefore, there is only way to meet the sugar requirement to raise the productivity and economize seed cane. Transfer of disease through propagated seed is another problem. Among important disease red rot is the main problem of tropical as well as sub-tropical regions (Kumar *et al*., 2010). Generally, farmers used poor quality seed with high sett rate which results in poor germination, cane production and this is the wastage of commercial cane. Planting of cane without sett treatment resulted in poor sprouting of buds and less plant population. In this direction, seed cane economy through suitable sett size, seed rate and seed treatment play a vital role increasing productivity. Different sett size *viz*. One, two and three budded etc. have received attention to the farmers and researchers from time to time (Yadav *et al.* 2013). The germination of buds may be improved by breaking of the dormancy by treating the seed setts with gibberalic acid. Srivastava *et al.* (1981) reported that sprouting of buds may enhanced by the treatment with Indole butyric acid (IBA). 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, seed rate and sett treatment

MATERIALS AND METHODS

A field experiment was conducted for three consecutive years *i.e.* 2008-09 to 2010-11 at Norman E. Borlaug Crop Research Center of Govind Ballabh Pant University of Agriculture & Technology, Pantnagar, Uttarakhand (India). Experimental site was humid sub-tropic with hot and dry summers, situated at 29 ^{0} N latitude, 79.5 ^{0} E longitude and 243.8 meter altitude above mean sea level. The experiment was laid out in factorial randomized block design with eighteen (18) treatments. The treatments consisted of three sett size (one, two and three budded), two seed rate (90,000 and 1,20,000 buds ha^{-1}). Three sett treatments (carbendazim 0.1 %, carbendazim 0.1 % + gibberalic acid (100 ppm)

along with no sett treatments). All the treatments (18) combinations were replicated three times. Seed setts of variety Co Pant 90223 were planted in mid March during all the three years and harvested in mid March to last March next year.

The crop was raised with recommended package and practices. The setts (one, two or three budded) were treated with fungicide (carbandazim) and gibberalic acid (GA_3) for 15 minutes prior to planting. Furrows 20 cm deep were opened at 75 cm apart with the help of tractor mounted ridger. The setts were planted in furrow using seed rate as per treatment. The soil of experimental field was silty clay loam, rich in organic carbon (1.05 %), low in available N (223.6 kg ha^{-1}), rich in total Phosphorus (49.5 kg ha^{-1}) and medium in available Potassium (243.0 kg ha^{-1}). The soil was of neutral pH (7.4) and bulk density was 1.34 mg m^{-3}. One pre sowing irrigation was given prior to field preparation.

RESULTS AND DISCUSSION

Data given in Table - 1 revealed that germination percentage was improved and was significantly higher in the treatment of carbendazim 0.1 % over rest of the treatments. However germination percent was reduced significantly when seed setts were treated with GA_3 + carbendazim. Some more scientists also observed antagonistic effects of carbendazim + GA_3 on germination (Anon, 2010). Singh and Goswami (2003) also observed the higher germination and cane yield with the treatment of carbendazim. Gohil and Vala (2003) also reported the higher germination in carbendazim treated setts might be attributed to low mortality owing to control of diseases and infection. Among different sett sizes, two budded setts recorded higher shoot population at 180 DAP which was significantly higher over either one or three budded setts. Significantly lowest shoot population was recorded in one budded setts. The higher buds/ha (1,20,000) produced significantly higher shoot population over 90,000 buds/ha at 180 days stage of crop growth. Significantly higher population in carbendazim (0.1 %) treated setts was found significantly higher over either no sett treatment or treated with carbendazim + GA_3. The higher millable canes (000/ha) were reflected by all the three characters *i.e.* two bud sett, 1,20,000 buds/ha and treated with carbendazim (0.1 %) over one or three buds, 90,000 buds/ha and seed treatment with carbendazim + GA_3 or no sett treatment, respectively. However, NMC were non-significant in between 1,20,000 buds/ha and 90,000 buds/ha. Ramesh (1997)

Table1: Effect of sett size, seed rate and sett treatment on growth, cane yield and CCS yield of spring planted cane (Pooled analysis of three years data)

Treatments	Germination (%)	Shoot population (000/ha)180 DAP	Millable Cane (000/ha)	Length of cane (cm)	Girth of cane (cm)	cane yield (t/ha)	Available sugar (%)	CCS yield (t/ha)
Sett size								
3 bud sett	35.3	126.9	98.0	306.9	8.31	74.5	11.5	8.3
2 bud sett	34.6	135.4	104.4	301.4	8.82	76.6	11.8	8.6
1 bud sett	35.7	121.9	88.8	293.2	8.56	68.8	11.2	7.7
SEm ±	0.7	1.3	1.7	2.9	0.11	0.6	0.06	0.09
CD at 5%	NS	4.0	5.0	8.9	0.32	1.8	0.18	0.27
Seed rate/ha								
S_1 - 1,20,000 buds/ha	35.8	130.2	97.8	309.3	8.02	74.5	11.2	8.2
S_2 - 90,000 buds/ha	35.2	125.2	96.3	298.0	8.46	72.5	11.1	8.1
SEm ±	0.5	1.1	1.3	1.4	0.10	0.5	0.02	0.08
CD at 5%	NS	3.0	4.0	4.13	0.30	1.5	NS	NS
Seed treatment								
T_1 - Carbandazim (0.1%)	39.2	131.6	99.1	309.0	9.21	74.5	11.2	8.3
T_2 - Carbandazim + Gibberalic acid (100ppm)	33.5	125.4	95.1	299.8	8.47	70.7	11.2	8.0
T_3 - No Sett treatment	34.2	118.3	88.2	291.6	8.09	66.0	9.6	7.9
SEm ±	0.6	1.1	0.2	2.7	0.15	1.0	0.01	0.01
CD at 5%	1.8	3.0	0.6	8.2	0.42	3.0	0.03	0.03

NS- Non Significant

also reported the similar results. Significantly higher yield was recorded in two bud setts over one or three budd setts, cane yield was non-significant in between 1,20,000 buds/ha or 90,000 buds/ha. Improvement in cane yield was noticed with the carbendazim (0.1 %) treated setts. Cane yield was significantly higher in treatment of carbendazim (0.1 %) over no sett treatment and carbendazim + GA_3 (100 ppm) treated setts. Antagonistic effect was also reported when GA_3 was used with carbendazim by many workers from North West India. (Anon, 2010). Higher cane yield in two budded setts 90,000 buds/ha and setts treatment in carbendazim was the results of higher NMC, Cane length and cane girth. Yadav *et al.* (2013) also observed the similar results in these treatments. Two budded setts produced more girth in cane which was significantly higher over three or one buds setts. Length of the cane was highest in three buds setts. However, there was no significant difference in between three or two buds setts. Commercial cane sugar yield was also highest in two budded setts which produced significantly higher CCS yield than three bud sett. CCS yield could not be influenced due to seed rate (1,20,000 or 90,000 budds/ha). CCS yield was significantly higher in carbendazim treated setts over either no sett treatment or carbendazim + GA_3 treated setts.

Available sugar percentage was also follow the similar trend and found significantly higher in two budded setts over three or one bud setts. Available sugar was also recorded higher in carbendazim treated setts over either no treatment or carbendazim + GA_3 treated setts.

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