Improvement in winter initiated Sugarcane (*Saccharum officinarum L.*) ratoon crop through agronomical manipulations under subtropical conditions

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ABSTRACT: To study the improvement in winter initiated sugarcane ratoon a field experiment was conducted during three consecutive years i.e. 2008-09 to 2010-11 at Norman E. Borlaug Crop Research Centre of Govind Ballabh Pant University of Agriculture & Technology, Pantnagar, Uttarakhand (India) having 8 treatments in randomized block design. Higher shoot population, NMC and Cane yield were recorded in the treatment of fresh sulphitation pressmud cake (SPMC) @ 20 ton/ha at the time of ratooning, which was closely associated with irrigation in planted cane crop 30 days before of ratooning and subsequent irrigations at 15 days interval during winter upto first week of February. Improvement in cane yield due to higher initial shoot population, NMC and CCS yield were also recorded in the treatment of 60 kg K2O/ha + Zn SO4 @ 25 kg/ha at 30 days before ratooning with irrigation water.

Key words: Winter initiated ratoon, SPMC, K2O, CCS yield.

In sub-tropical region sugarcane ratoon occupy almost 50 % area of sugarcane and produce 30-35 % sugarcane only. It means the productivity of sugarcane ratoon is far below than planted cane (850-1000 ton/ha). The ratooning behaviour of variety is the function of genotype and environment interaction (Mishra & Mathur, 1991). Millingan *et al.* (1992) also observed that it is not necessary that a good ratoon genotype will be a good ratooner, if grown in other situation. For good ratoon initiation it require temp. 22-25 ^{0}C which is available in the month of February/March in sub-tropics. Cane supply to sugar mills depends on the crushing duration in the season by sugar factories and some time farmers are enforced to supply the cane in the month of December/January. At that time (December/January) the temperature goes below and some time may reach upto 1 ^{0}C or 2 ^{0}C. Due to low temperature at the time of planted cane harvesting (ratoon initiation) most of the clumps (stubbles) may left without emergence and hence more gap in between two clumps occured and hence, the productivity of the ratoon goes down. As per estimate if the gaps are more than 15 %, the productivity of the ratoon will reduced. Singh and Kanwar (1990) also reported that low temperature stress induced dessiccate of subterranean buds, besides retarding nitrate reductase activity, protein synthesis and sprouting of buds, thereby creating a type of pseudo-dormancy in most of the buds. Singh *et al.* (1971) also noticed that the bud damage to greater extent and terminal buds also killed at low temperature. Considering the problems of poor emergence in early (winter initiated) ratoon and improvement in ratoon emergence at low temperature in the month of December-January. The present investigation was under taken.

MATERIALS AND METHODS

A field experiment to improve winter initiated ratoon was conducted during three consecutive years *i.e.* 2008-09 to 2010-11 at Norman E. Borlaug Crop Research Centre of Govind Ballabh Pant University of Agriculture & Technology, Pantnagar, Uttarakhand, India. Sugarcane plant crop variety Co Pant 8436 was planted in spring season (mid March) in all the three years. For the winter ratoon the plant crop was harvested in the month of January during all the three years. The minimum temperature was ranged between 7.9 ^{0}C to 9.5 ^{0}C during 2008-09, 4.9 ^{0}C to 7.5 ^{0}C during 2009-10 and 5.8 ^{0}C to 6.8 ^{0}C during 2010-11. Recommended package and practices were followed to raise the ratoon crop. Eight treatments *i.e.* Recommended practices (control), one irrigation in planted crop 30 days before ratooning and subsequent irrigations at 15 days interval during winter (upto 1st week of February), application of fresh sulphitation pressmud cake (SPMC) @ 20 ton/ha at ratooning, application of 60 kg K_2O/ha at 30 days of ratooning, intercropping of

Sesbania aculata as green manuring, soil application of $ZnSO_4$ @ 25 kg/ha before 30 days of ratooning along with irrigation water, application of 60 kg K_2O/ha + Zn SO_4 @ 25 kg/ha at 30 days before ratooning with irrigation water and application of 25 Zn SO_4/ha + SPMC fresh @ 10 ton/ha at ratooning were given. The soil of the experimental field was silty loam having organic carbon (1.12 %), available P_2O_5 (49.0 kg/ha) and available K_2O (240.0 kg/ha). pH of the soil was 7.5. Total rain fall in the month of January was 24.4 mm during 2010-11 and 3.8 mm during 2009-10 only. The experiment was conducted in randomized block design in three replications. Ratoon crop was harvested in the month of February (1st week to 2nd week) during all the three years. Data of three years for crop growth, cane yield and yield attributes was pooled and analyzed.

RESULTS AND DISCUSSION

Data given in (Table 1) revealed that initial number of clumps were similar in each treatment and statistically were non-significant. Net millable canes (NMC) were recorded highest in the treatment of 20 ton/ha SPMC (sulphitation press mud cake, fresh) which were significantly higher over rest of the treatments. Improvement in NMC in all the agronomical manipulation treatments was recorded significantly as compared to control. Higher NMC were reflected by higher number of shoots at 45 or 75 days after ratoon initiation. Number of shoots at 45 and 75 days after ratoon initiation were also higher in the treatment of 20 ton/ha SPMC (fresh) which were significantly higher over rest of the treatments at both the stages (45 and 75 DARI). Cane yield was recorded highest (73.5 ton/ha) in the treatment of SPMC (fresh) applied @ 20 ton/ha at ratoon initiation which was significantly higher over rest of the treatments. Sinha (2009) also reported the use of SPMC for the improvement of ratoon yield. Yadav (2008) also reported the positive effects of SPMC in increasing cane yield of ratoon because of higher availability of N, P, K, S & Zn in the soil. Improvement of cane yield, NMC and number of shoots at different stages of crop growth also noticed *i.e.* in the treatments of irrigation given 30 days before ratooning and subsequent irrigations were given at 15 days interval during winter (upto 1st week of February) and in the treatment 60 kg K_2O/ha + $ZnSO_4$ @ 25 kg/ha at 30 days before ratoon initiation followed by irrigation water. Lal & Singh (2008) found the positive effects of irrigation and use of $ZnSO_4$. Jha *et al*. (2009) advocated the importance of SPMC, K_2O @ 60 kg/ha and irrigation

Table 1: Growth and productivity of winter initiated ratoon influenced by various agronomical manipulated treatments (Pooled data of three years)

Treatments	No. of clumps (000/ha)	Shoot count at 45 DARI (000/ha)	Shoot count at 75 DARI (000/ha	NMC (000/ha)	Cane yield (t/ha)	Average cane weight (g)	Sucrose (%)	CCS yield (t/ha)
T1-Recommended practices (control)	14.2	37.8	59.7	60.6	58.3	993.3	16.5	6.6
T2- One irrigation in planted crop 30 days before ratooning and subsequent irrigation at 15 days interval during winter (upto 1st week of February)	19.9	49.6	74.2	72.8	71.5	1122.3	16.8	8.1
T3-Application of fresh sulphitation pressmud cake (SPMC) @ 20 ton/ha at ratooning	19.0	52.5	75.5	75.7	73.5	1139.0	16.3	8.3
T4-Application of 60 kg K_2O/ha at 30 days of ratooning	19.1	47.6	71.2	71.3	69.7	1107.3	16.6	7.9
T5- Intercropping of legume, Sesbania aculata in ratoon crop for green manuring	15.7	43.1	65.0	66.9	65.9	1040.7	16.4	7.7
T6-Soil application of $ZnSO_4$ @ 25 kg/ha before 30 days of ratooning along with irrigation water	16.2	44.7	67.1	70.1	66.9	1066.3	16.7	7.8
T7-Application of 60 kg K_2O/ha+Zn SO_4 @ 25 kg/ha at 30 days before ratooning with irrigation water	17.3	45.0	67.5	69.1	70.3	1101.3	16.9	8.1
T8-Application of 25 Zn SO4/ha + SPMC fresh @ 10 ton/ha at ratooning	16.2	44.7	67.5	67.9	65.2	1077.3	16.6	7.3
SEm ±	3.6	0.4	0.4	0.4	0.4	24.9	0.4	0.1
CD at 5%	NS	1.1	1.1	1.3	1.5	74.7	NS	0.4

water in improving the cane yield in winter initiated ratoon at Pusa (Bihar). Both the treatments produced significantly higher cane yield, NMC and number of shoots/ha (45 & 75 DAS) over control. Average cane weight was highest in the treatment of 20 ton/ha SPMC (fresh) applied at ratoon initiation which produced heavier cane significantly over rest of the treatments except treatment T_2 - (Irrigation given at 30 days before ratoon initiation and subsequent irrigation at 15 days interval during winter upto 1st week of February), Lal & Singh (2008) also reported the irrigation response given at 12 days $ZnSO_4$ @ 25 kg/ha, 30 days before ratooning with irrigation water, 25 kg $ZnSO_4$/ha + SPMC (fresh) @ 10 ton/ha at ratoon initiation. Highest CCS yield (8.3 ton/ha) was recorded in the treatment of 20 ton SPMC (fresh) applied at ratoon initiation, which was found significantly higher CCS yield over control, Intercropping with *Sesbenia aculata* (green manuring), $ZnSO_4$ @ 25 kg/ha at 30 days before ratooning with irrigation water), $ZnSO_4$ @ 25 kg/ha + SPMC (fresh) @ 10 ton/ha at ratooning). Significantly lower CCS yield (6.6 ton/ha) was recorded in control over rest of the treatments.

CONCLUSION

Winter initiated sugarcane may be improved by application of fresh sulfitation press mud cake (SPMC) applied @ 20 ton/ha at the time of ratoon initiation or irrigate the field in planted cane before 30 days of ratoon initiation and subsequent irrigation at 15 days interval during winter upto first week of February. Improvement in cane yield was also noticed in the treatment of 60 kg K_2O/ha + $ZnSO_4$ @ 25 kg/ha applied 30 days before ratoon initiaton with irrigation water.

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