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SHORT COMMUNICATION

# Effect of Method and Density of Planting on Growth and Yield of Late Planted Sugarcane

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**Field experiments were conducted at Sugarcane Research Station, Jalandhar during 1998-99 and 1999-00 to study the effect of method and density of planting on germination, growth and yield of late planted sugarcane. Five methods of planting viz. planting under proper soil moisture condition followed by (f.b.) planking (P1); planting in dry soil f.b. planking and irrigation (P2); planting in furrows, covering the seed sets with 2 cm soil layer f.b. irrigation and blind hoeing (P3); Same as in P3 but no soil covering (P4); and Irrigation in furrows and then planting in furrows (P5) were kept in main plots, and three levels of planting density i.e. 90, 60 and paired rows of 60:30 cm row spacing (constituting a seed rate of 37,500, 56,250 and 75,000 three budded set/ha, respectively) in sub plots. The experiment was laid out in split-plot design with three replications. The sugarcane cv. CoJ 84 was planted on April 22, 1998 and April 14, 1999 during 1st and 2nd year of experimentation. The results indicated that, on an average, the per cent germination was maximum (53.0%) under P3 though at par to P1 (50.1%) and P4 (49.0%) but significantly better than under P2 (28.8%) and P5 (36.2%). Paired row (60:30 cm) planting recorded the maximum germination (47.1%) which was higher by 10.0 and 15.0% than under 90 and 60 cm planting, respectively. The cane yield during 1st year was maximum under P3 (53.4 t/ha) and it was at par to P4 (52.1 t/ha) and p1 (50.1 t/ha) but significantly higher than P2 (38.0 t/ha) and P5 (35.4 t/ha). During the 2nd year also, the yield under P3 was maximum (55.6 t/ha) but at par to P1 (52.3 t/ha) only. Among the density of planting, on an average, planting in paired rows of 60:30 cm increased the cane yield by 14.0 and 16.8 per cent compared to 90 and 60 cm row spacing, respectively; cane yield under 90 and 60 cm spacing was at par. These results concluded that under late sown conditions, planting in furrows, covering the setts with 2 cm soil layer f.b. irrigation and blind hoeing and planted in paired rows (using 75,000 three budded setts/ha), was the most beneficial method of planting.**

**KEYWORDS** : Sugarcane, planting methods, growth, yield, late planted sugarcane

The optimum time of planting of sugarcane in sub-tropical India is February-March and the cane productivity declines by 30 to 50 per cent if planting is delayed upto the end of April or early May (Yadav and Singh, 1997). Late planting of sugarcane, however, during April or May after harvesting of wheat has become very common practise among the farmers having assured irrigation facilities under Sub-tropical sugarcane belt, especially in Punjab, Haryana and Western Uttar Pradesh. The summer/late planted crop suffers from poor germination due to quick loss of moisture owing to higher unfavorable temperature prevailing during germination phase. Apart from huge amounts of seed material, such partial germination results in wide gaps in the field, lesser plant density and reduces yield. Soil moisture is a major factor that limits germination (Dhawan *et al.*, 1997). Applying irrigation between planting and germination is undesirable as it causes crust formation of upper layers of soil, which prevents seedling emergence. Thus there is a need to devise a method of planting which can conserve sufficient soil moisture around the cane setts for better germination and growth of late planted crop.

One of most important component governing the cane yield is stalk population which can be increased by adjustment in planting density/geometry (Prasad *et al.*, 1979). Sugarcane, in general, is planted in single rows spaced at 75 cm. However, the beneficial effect of planting of sugarcane in paired rows compared to planting in single rows has been reported in India (Yadav *et al.*, 1997) and in Pakistan (Bajelan and Nazir, 1993). Hence, there is a need to manipulate the plant geometry/density under late planted sugarcane in order to increase its productivity.

In the light of above, the present study was undertaken to find out the suitable method and density/ geometry of planting for enhancing the germination, growth and yield of late planted crop.

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The field experiments were conducted during 1998-99 and 1999-2000 at Sugarcane Research Station, Jalandhar on a sandy loam soil testing low in available N (220 kg/ha), available P (8.5 kg/ha) and in available K (117 kg/ha). Five methods of planting viz. planting under proper soil moisture condition followed by (f.b.) planking (P1); planting in dry soil f.b. planking and irrigation (P2); planting in furrows, covering the seed sets with 2 cm soil layer f.b. irrigation and blind hoeing (P3); Same as in P3 but no soil covering (P4); and irrigation in furrows and then planting in furrows (P5) were kept in main plots, and three levels of planting density i.e. 37,500 (D1), 56,250 (D2) and 75,000 (D3) three budded sets/ha planted at 90, 60 and paired rows of 60:30 cm, respectively, in sub plots. The experiment was laid out in split-plot design with three replications. The sugarcane cv. CoJ 84 was planted on April 22, 1998 and April 14, 1999 during 1st and 2nd year of experimentation. Recommended package of practices were followed for successful raising of the crop. Cane crop was observed for germination, tillering and number of millable canes at appropriate stages, while cane yield, juice quality and CCS% were observed at the time of harvest. The crop was harvested on February 25, 1999 and January 17, 2000 during 1st and 2nd year of experimentation.

**Effect of method of planting**

The results indicated that, on an average, the per cent germination was maximum (53.0%) under P3 though at par to P1 (50.1%) and P4 (49.0%) but significantly better than P2 (28.8%) and P5 (36.2%) (Table 1). Covering the seed sets with 2 cm soil layer after planting in furrows f.b. irrigation and blind hoeing probably conserved sufficient soil moisture around the cane setts which resulted in better germination. The crop planted with P3 and P4 method also recorded significantly higher number of tillers/unit area over the other methods of planting during both the years except during 1st year when these treatments were at par with P1 and P5 (Table 1). The population of millable canes was also significantly higher under P3 and P4 method of planting over the other three methods (Table 2). Higher germination under these methods resulted in greater number of tiller and millable canes (Dhawan *et al.*, 1997).

The cane yield during 1st year was maximum under P3 (53.4 t/ha) and it was at par to P4 (52.1 t/ha) and P1 (50.1 t/ha) but significantly higher than P2 (38.0 t/ha) and P5 (35.4 t/ha) (Table 2). During the 2nd year also, the yield under P3 was maximum (55.6 t/ha) but at par to P1 (52.3 t/ha) only. The increased cane yield under P3 was attributed to higher germination which increased the number of tillers resulting into more number of millable canes which ultimately increased the cane yield. Due to poor germination, the number of millable canes were significantly reduced under P2 and P5 which decreased the cane yield markedly compared to other treatments. On an average, planting the cane setts in furrows, covering with 2 cm soil layer, f.b. irrigation and blind hoeing increased the cane yield by 6.4 per cent compared to the recommended method of planting i.e. planting under proper soil moisture condition f.b. planking. The cane quality in terms of sucrose, purity and CCS per cent was higher under P3, though, the differences among various treatments were statistically non-significant (Table 3). Similar results on cane quality were also observed (Anonymous, 1998).

The results concluded that for getting higher yield

**Table - 1 : Influence of method and density of planting on germination and number of tillers**

| Treatments | Germination (%) | | | No. of tillers (90 DAS) (000/ha) | | |
|---|---|---|---|---|---|---|
| | 1998-1999 | 1999-2000 | Mean | 1998-1999 | 1999-2000 | Mean |
| **Method of planting** | | | | | | |
| P1 | 47.6 | 52.6 | 50.1 | 91.9 | 100.7 | 95.8 |
| P2 | 22.6 | 35.1 | 28.8 | 82.0 | 88.6 | 85.3 |
| P3 | 49.8 | 56.2 | 53.0 | 97.3 | 112.4 | 104.8 |
| P4 | 45.7 | 52.2 | 48.9 | 106.4 | 117.9 | 112.1 |
| P5 | 34.4 | 38.1 | 36.2 | 94.0 | 92.9 | 93.4 |
| CD at 5% | 4.5 | 5.1 | - | 15.3 | 6.0 | - |
| **Planting density/geometry** | | | | | | |
| D1 | 37.8 | 43.8 | 40.8 | 83.8 | 99.5 | 91.7 |
| D2 | 39.8 | 42.1 | 40.9 | 93.3 | 98.4 | 95.8 |
| D3 | 43.5 | 50.7 | 47.1 | 105.8 | 109.4 | 107.6 |
| CD at 5% | 3.5 | 3.9 | - | 6.7 | 4.7 | - |
| CD interaction | NS | NS | - | NS | NS | - |

Table - 2 : Influence of method and density of planting on millable cane population and cane yield

| Treatments | Millable cane population (000/ha) | | | Cane yield (t/ha) | | |
|---|---|---|---|---|---|---|
| | 1998-1999 | 1999-2000 | Mean | 1998-1999 | 1999-2000 | Mean |
| **Method of planting** | | | | | | |
| P1 | 83.5 | 80.6 | 82.0 | 50.1 | 52.3 | 51.2 |
| P2 | 63.4 | 65.8 | 64.6 | 38.0 | 43.1 | 40.5 |
| P3 | 89.0 | 92.2 | 90.6 | 53.4 | 55.6 | 54.5 |
| P4 | 86.9 | 90.5 | 88.7 | 52.1 | 48.2 | 50.1 |
| P5 | 78.4 | 71.0 | 74.7 | 35.4 | 38.8 | 37.1 |
| CD at 5% | 5.3 | 3.7 | - | 6.1 | 5.2 | - |
| **Planting density/geometry** | | | | | | |
| D1 | 75.4 | 76.8 | 76.1 | 44.0 | 45.7 | 44.8 |
| D2 | 82.4 | 79.3 | 80.8 | 43.8 | 44.5 | 44.1 |
| D3 | 86.5 | 87.0 | 86.7 | 50.8 | 52.5 | 51.6 |
| CD at 5% | 6.8 | 8.7 | - | 5.3 | 4.1 | - |
| CD interaction | NS | NS | - | NS | NS | - |

Table - 3 : Cane quality as influenced by method and density of planting

| Treatments | Sucrose (%) | | | CCS (%) | | | Purity (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1998-99 | 1999-00 | Mean | 1998-99 | 1999-00 | Mean | 1998-99 | 1999-00 | Mean |
| **Method of planting** | | | | | | | | | |
| P1 | 17.1 | 18.7 | 17.9 | 11.6 | 12.9 | 12.2 | 84.8 | 87.9 | 86.3 |
| P2 | 17.3 | 18.5 | 17.9 | 11.8 | 12.7 | 122.2 | 85.6 | 87.6 | 86.6 |
| P3 | 17.3 | 19.2 | 18.2 | 11.9 | 13.2 | 12.5 | 86.4 | 88.1 | 87.3 |
| P4 | 17.1 | 18.9 | 18.0 | 11.6 | 13.1 | 12.3 | 86.0 | 88.8 | 87.4 |
| P5 | 16.9 | 18.8 | 17.8 | 11.5 | 13.0 | 12.2 | 85.8 | 88.5 | 87.1 |
| CD at 5% | NS | NS | - | NS | NS | - | NS | NS | - |
| **Planting density/geometry** | | | | | | | | | |
| D1 | 17.2 | 18.9 | 18.1 | 11.7 | 13.0 | 12.3 | 85.9 | 87.5 | 86.7 |
| D2 | 16.9 | 18.9 | 17.9 | 11.5 | 13.1 | 12.3 | 86.0 | 88.1 | 87.1 |
| D3 | 17.3 | 18.8 | 18.1 | 11.8 | 12.9 | 12.3 | 85.2 | 87.7 | 86.5 |
| CD at 5% | NS | NS | - | NS | NS | - | NS | NS | - |

from the late planted cane the crop should be planted in furrows, covering the setts with 2 cm soil layer f.b. irrigation and blind hoeing.

## Effect of density/geometry of planting

Germination was significantly higher when sugarcane was planted in paired rows compared to planting in single rows of 90 and 60 cm apart during both the years (Table 1). The tiller production (Table 1) and population of millable canes (Table 2) increased significantly with increase in the density of planting. The crop planted in paired rows recorded significantly higher number of tillers compared to the crop planted in single rows of 90 and 60 cm during both the years. The number of millable canes under the paired rows was at par with 60 cm row planting but significantly higher than the crop planted at 90 cm row spacing. Srivastava *et al.* (1997) also reported the beneficial effect of paired row planting on production of tillers and millable canes over planting in single rows.

The crop planted in the paired rows of 60:30 cm by using 75,000 three budded sets/ha produced

significantly higher cane yield compared to other treatments (Table 2). The increased cane yield under the paired rows was attributed to increase in planting density and better distribution of crop plants due to which the crop enjoyed favorable environment for its growth which resulted in higher number of millable canes under paired rows resulting into increased cane yield. It indicated that by changing the planting pattern from single to paired rows, on an average, additional cane yield of 6.8 and 7.5 t/ha was obtained over 90 and 60 cm row spacing, respectively. The cane yield under the planting densities of 37,500 (spaced at 90 cm) and 56,250 (spaced at 60 cm) three budded sets/ ha was at par indicating that the planting density at these rates was not sufficient to exert their differential influence on the cane yield. The cane quality, however remained unaffected by the planting density/geometry (Table 3). These results are in line with the earlier studies conducted by Phogat *et al.* (1989), Singh *et al.* (1994) and Yadav *et al.* (1997) who also reported higher cane yield under paired row planting.

The results concluded that paired row (60:30 cm) planting by using 75,000 three budded setts/ha is better over planting in single rows, either at 90 cm using 37,500 three budded setts/ha or at 60 cm using 56,250 three budded setts/ha.

Our results concluded that under late sown conditions, planting in furrows, covering the setts with 2 cm soil layer f.b. irrigation and blind hoeing and planted in paired rows (using 75,000 three budded setts/ ha), was the most beneficial method of planting.

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