Vol. XIX (1-2) 1982

EFFECTS OF THE MORPHOLOGICAL STAGE OF BUD DEVELOPMENT AND PHYSIOLOGICAL MATURITY OF THE SEED CANE ON ITS GERMINABILITY AND PRODUCTION POTENTIAL

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Differences in the seedling emergence due to the morphological stage of bud development on the seed cane were not large enough to cause any significant impact on the cane growth, its tonnage and sucrose content. Setts taken from four to five months old cane possessing two to three very small and thin internodes bearing nascent buds exhibited a field germinability upto 63 per cent. Physiologically mature seed cane though gave a relatively higher tonnage, but immature seed cane also possessed a fairly high yield potential.

INTRODUCTION

Sugarcane is the main source of sugar production in Pakistan, where it is grown on 823000 hectares with a cane production of over 32 million metric tons. Over 60 per cent of the total sugarcane area is in the Punjab which produces more than 70 per cent of the cane tonnage in the country. The crop occupies the field for about 9-12 months in this Province depending upon the early, mid season or a late variety. Again, about one-tenth of its production is used back as seed for the next crop which is not only a heavy drain on an average cane grower, but hardly gives 50 ± 10 per cent germination. This low germinability in sugarcane is one of the serious problems affecting its plant stand and consequently the yield.

One of the reasons of low germinability of the seed setts of this tropical crop grown under the arid conditions of Pakistan may be, that, not only the seed setts used are of varying degree of physiological maturity but also bear buds of different stages of morphological development. Bonazzi (1928), Clements (1940), Iyengar (1951) and Yusaf (1960) recognized variability in germinability of the buds and internodes located at different locations of the seed cane. Since the morphological stages of bud development and the physiological maturity of the internodes of individual seed canes vary, therefore, it was contemplated in this study to investigate the effects of the stage of bud development and physiological maturity of the seed cane of the seedling emergence and subsequent growth of the cane. It was also felt desirable to study

the viability of the seed setts obtained at stages during the growth and development of sugarcane plant.

MATERIALS AND METHODS

Variety Triton was selected for these investigations. In the first series double eyed Bulk setts bearing buds of different morphological stages of development and setts with stimulated and sprouted buds were planted on March 17, 1980 in 60-cm apart rows in quardruplicated micro plots each measuring 2.4 M × 2.5 M. Simultaneously in the second series, setts obtained from very immature cane (young tillers), relatively immature cane (medium thick) and fully mature cane (thick) were planted in replicated microplots. In the third series, normal planting was done in March and setts from this cane at regular monthly intervals commencing from four months after planting and lasting upto one year were planted. Randomized complete block design was used in each case and the crop was fertilized at 100-100 kg/hectare and watered when necessary to prevent it from the moisture stress. In the first two experiments seedling emergence and subsequent plant growth were observed, while in the third experiment only the viability of the seed setts based on their field germinability was determined. Standard procedures were adopted to take observations on the seedling emergence and the subsequent growth of the crop. Sucrose precentage was determined by Harows' dry lead acetate method of sugar analysis. Duncan's Multiple Range Test at 5 per cent probability was employed to test the significance of the treatment means (Steele and Torrie, 1960).

RESULTS AND DISCUSSION

The results presented in Table 1 show, that setts with stimulated buds gave a comparable seedling emergence to that obtained from the bulk setts (80 per cent), possessing buds of varying stages of morphological development. Setts with sprouted buds gave a relatively lower seedling emergence of 70 per cent. This is partly attributable to the suffocation of the sprouts which could not emerge from the soil. However, this difference in the seedling emergence was not large enough to cause any measurable effect on the yield of stripped cane per hectare as the yield and its components were not affected by the morphological stage of bud development on the seed setts. It is nevertheless interesting to observe that even this germination of the setts with sprouted buds was higher than that obtained by an average cane grower.

TABLE 1. *Effect of morphological stage of bud development on the seed cane on its germinability, yield and sucrose content*

	Treatments	Seedling Emergence %	Yield of Stripped Cane Tons/ha	Sucrose Content %
1.	Bulk setts with buds of different stages of morphological development	80.33 a (1)	63.47	19.10
2.	Setts with stimulated buds (Swollen but unsprouted)	81.04 a	61.90	18.77
3.	Setts with sprouted buds	69.89 b	64.15 N.S. (2)	19.31 N.S.

(1) Duncan's Multiple Range Test at 5% Probability. Any two means not sharing a letter in common differ significantly.

(2) Not significant at 5% level.

The setts taken from the developing cane at a regular interval of one month commencing from four months after planting and lasting upto one year showed a range in germinability (Table 2.) It was interesting to observe that two to three very small and thin internodes became visible about four to five months after seedling. Setts taken from this extremely immature cane bearing nascent buds possessed a field germinability upto 63 per cent. The germinability of the older cane ranged between 76 to 84 per cent with an average germinability of about 77 per cent. This variation in germinability of the older seed cane was attributable more to the prevailing temperature, relative humidity and the available soil moisture content during the period of seedling emergence in each case rather than to the age of the cane.

TABLE 2. *Effect of the age of seed cane on its germinability*

Age of Seed Cane (Months)	Field Germinability (Per cent)
4	55.4
5	62.9
6	84.3
7	38.9*
8	79.3
9	84.4
10	76.4
11	87.9
12	76.4

Comparable seedling emergence was obtained from the fully mature and relatively less mature seed cane (Table 3), while very immature seed cane gave comparatively lower seedling emergence of about 60 per cent, which again is comparable to that of the average cane grower. It was also interesting to observe that though the fully mature seed cane gave a relatively higher tonnage, but immature seed cane also possessed a fair yielding ability under the same habitat.

TABLE 3. *Effect of the stage of physiological maturity of seed cane on its germinability, yield and sucrose content*

Treatments	Seedling Emergence %	Yield of Stripped Cane Tons/ha	Sucrose Content %
Fully mature Cane (Thick Cane)	84.36 a(1)	48.61 a(2)	19.10
Relatively immature Cane (Medium Thick)	74.25 a	40.35 b	18.77
Very immature cane (Very thin cane from young tillers)	59.67 b	40 26 b	19.31 N S. (3)

(1), (2) Duncan's Multiple Range Test at 5% Probability. Any two means not sharing a letter in common differ significantly.
(3) Not significant at 5% level.

The sucrose contents of crop were not affected either by the stage of bud development or the physiological maturity of the seed cane. This could be due to the reason that none of these attributes could affect significant differences in the photosynthetic efficiency and the matabolic activities responsible for the synthesis of sucrose.

These observations suggest the feasibility of using 10-12 per cent of the immature cane at harvest as seed and selling the mature cane to the mills. This will not only bring more income to the farmer but increase sugar recovery percentage as mature canes are heavier and higher in sucrose content.

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