

Germination Response of Two Sugarcane Varieties to Ambient Temperature

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ABSTRACT

An investigation was conducted to study the germination response of two sugarcane varieties viz Isd 16 and L.Jaba-C to ambient temperature. Lower temperature showed an inhibition effect on germination of sugarcane buds. The speed and percentage of germination of both the varieties declined with decreasing ambient temperature. Different varietal response to ambient temperature was also observed. It is suggested from the results that planting of these two varieties must be completed by October when maximum/minimum temperature not below 29.9/17.9°C. However, plantation may be extended upto November with higher seed rate.

INTRODUCTION

In sugarcane cultivation, the ultimate yield mostly depends upon the successful germination of sugarcane buds. Many internal and external factors affect germination of which temperature is the most recognized important environmental factor affecting germination of sugarcane buds under field condition (Mukerji, 1979; Yang and Chen, 1980). Lower the temperature, slower the speed and rate of germination (Yang and Chen, 1980), and thus greater the chance of disease organisms having access to cuttings, resulting in higher mortality of buds (Humberts, 1963). The variable optimum/critical temperature for germination of sugarcane buds depending on their origin of development have been reported by Yamasaki and Takeshita (1938).

Since germination of sugarcane buds is extremely important to achieve higher yield through minimizing gaps and maximizing plant population, it is very needed to evaluate every advanced line regarding germination characteristics especially response to ambient temperature before releasing for commercial cultivation. The varieties Isd 16 and L.Jaba-C are two widely cultivated commercial varieties in Bangladesh. The former is known to be shy germinator especially during lower temperature. Although these varieties are widely cultivated, germination response to ambient temperature has not yet been evaluated. Therefore, the present investigation was undertaken to understand the germination response of these two sugarcane varieties to ambient temperature.

MATERIALS AND METHODS

The experiment was conducted during cropping seasons 1987-88 and 1988-89 at Sugarcane Research & Training Institute (SRTI) farm with two commercial varieties viz Isd 16 and L.Jaba-C. In each fortnight, a number of 200 two budded setts of each variety were planted starting from 1st September and continued upto 1st January. Germination percentage was recorded at an interval of 7 d starting from 7 d after planting and continued upto 42 d. The representative results of the investigation have

been presented and discussed here. Watering and other intercultural operations were done as and when required. Ambient temperature record was collected from Biometry and Statistics Department of SRTI and shown in Appendix-A.

RESULTS AND DISCUSSION

The results of the experiment have been presented in the Figures 1-5. The Figures showed that germination percentage gradually decreased as the ambient temperature lowered. This result agreed with the findings of Yang and Chen (1980) who reported that the rate of germination of sugarcane buds decreased as the temperature lowered. It is seen from the Figure 1 that germination percentage gradually increased, and recorded 47 and 63 percentage germination in the varieties Isd 16 and L.Jaba-C respectively at 42 d after planting in September (32.9/26.2°C.) planting. It is also seen that germination pattern is similar between the varieties tested. In October planting (32.5/22.3°C.) the germination pattern was found to be different between varieties (Fig. 2). In the variety L.Jaba-C, about 50 percentage germination was obtained within 14 d after planting, 58 percentage at 21 d after planting, and after that there was level off in a plateau. In the case of variety Isd 16 germination pattern was found similar to that of September planting, only difference, germination was recorded 40 percentage at 42 d after planting. When temperature further falls in November (29.9/17.9°C), germination was obtained around 27 and 36 percentage with a lag phase in germination upto 14 and 21 d after planting in Isd 16 and L.Jaba-C respectively, and then there was linear increase in germination (Fig. 3). In December (26.6/14.7°C) and in the January (22.3/9.6°C) planting, germination was recorded around 10 and 30 percentage with a lag phase like November planting in the varieties

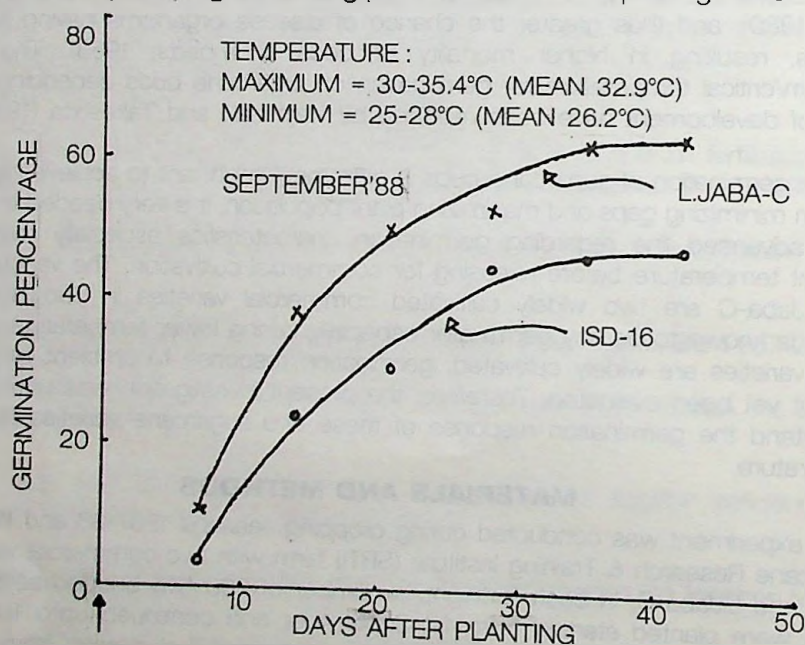


Figure 1. Germination response of two sugarcane varieties to ambient temperature (September).

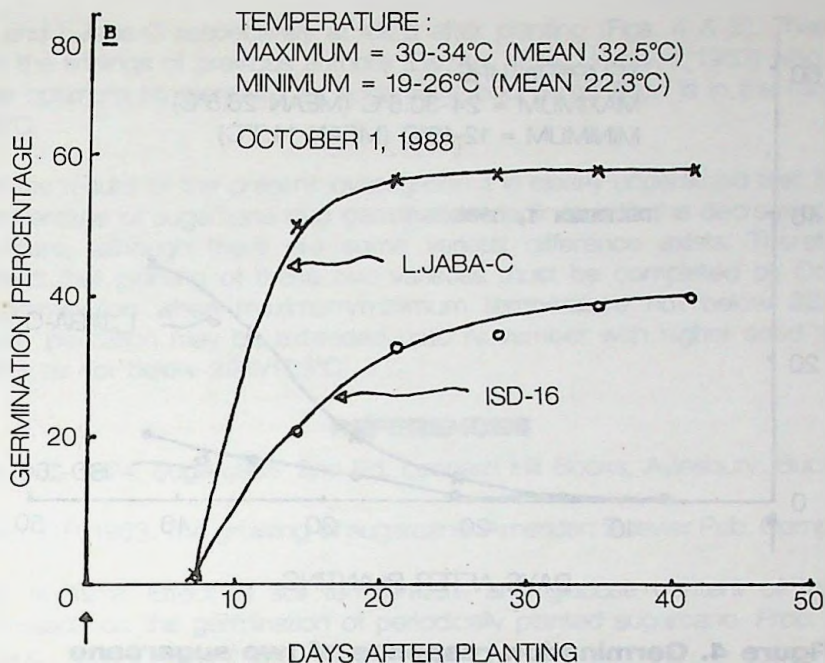


Figure 2. Germination response of two sugarcane varieties to ambient temperature (October).

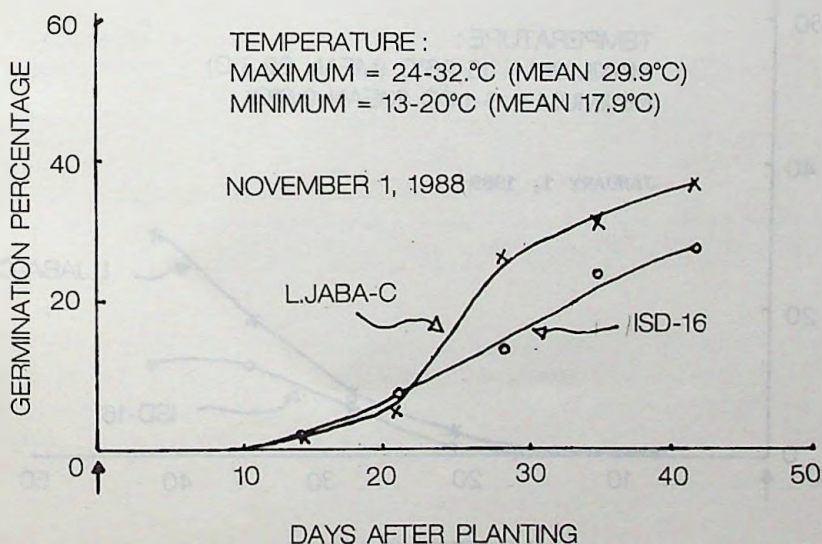


Figure 3. Germination response of two sugarcane varieties to ambient temperature (November).

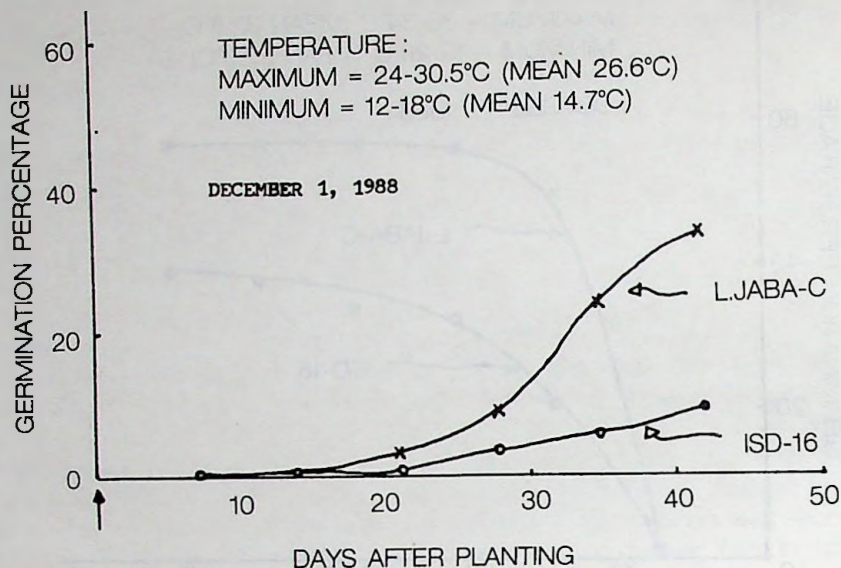


Figure 4. Germination response of two sugarcane varieties to ambient temperature (December).

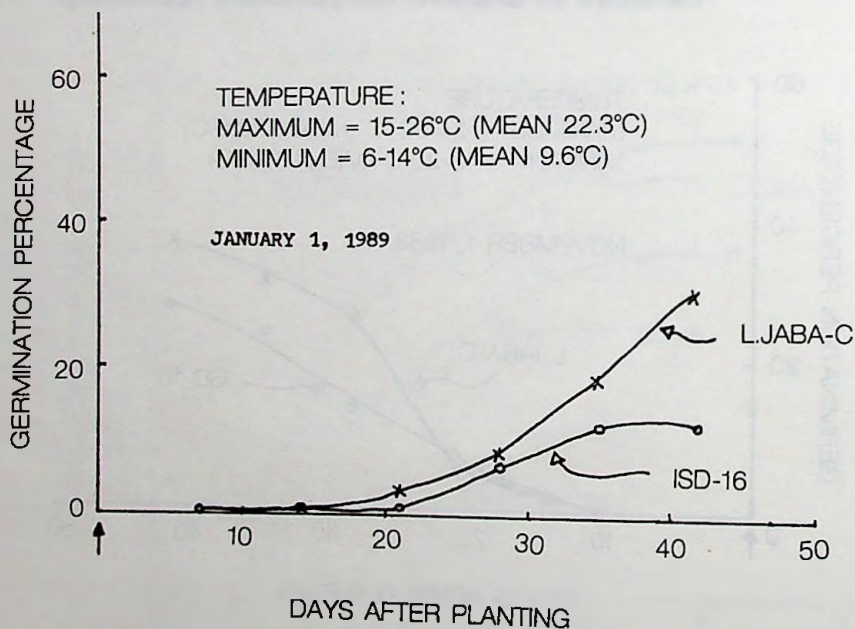


Figure 5. Germination response of two sugarcane varieties to ambient temperature (January).

Isd 16 and L.Jaba-C respectively at 42 d after planting (Figs. 4 & 5). These results confirm the findings of previous authors (Barnes, 1974; Humbert, 1963) who reported that the optimum temperature for sugarcane bud germination is in the range of 32 and 38°C.

From the results of the present investigation it is clearly understood that the speed and percentage of sugarcane bud germination declines with the decreasing ambient temperature, although there are some varietal difference exists. Therefore, it is suggested that planting of these two varieties must be completed by October for good germination when maximum/minimum temperature not below 32.5/22.3°C. However, plantation may be extended upto November with higher seed rate when temperature not below 29.9/17.9°C.

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Appendix-A**Daily maximum and minimum temperature.**

Day	Sept '88		Oct '88		Nov '88		Dec '88		Jan '89	
	Max°C	Mini°C	Max°C	Mini°C	Max°C	Mini°C	Max°C	Mini°C	Max°C	Mini°C
1	33.5	27.0	33.5	25.0	30.5	20.5	24.5	18.0	25.0	14.0
2	31.5	26.5	33.0	24.5	30.5	20.5	31.0	25.0	13.0	26.5
3	31.0	26.0	34.5	25.0	30.0	20.0	28.0	22.0	13.0	27.0
4	33.0	26.0	34.0	26.5	31.5	20.0	27.5	15.0	23.5	11.0
5	32.0	27.0	34.0	24.0	30.5	21.0	29.0	16.0	24.0	11.5
6	31.0	24.0	31.5	25.0	30.0	20.0	28.0	17.0	25.0	11.0
7	32.0	25.0	32.0	23.5	29.5	18.5	27.0	17.0	25.5	13.0
8	31.0	26.0	33.5	21.0	31.0	18.5	26.5	16.5	25.5	13.0
9	31.0	24.0	32.5	21.0	32.5	18.5	26.5	16.0	24.5	14.5
10	31.0	25.0	33.0	21.0	31.0	19.0	26.5	16.0	22.5	12.5
11	30.0	25.5	33.5	23.0	31.5	17.5	28.0	15.0	20.0	8.0
12	35.0	27.0	33.0	25.0	31.5	18.5	28.5	15.0	20.5	5.5
13	31.5	27.0	33.5	24.5	30.5	17.0	26.0	15.0	20.0	6.0
14	33.0	26.5	32.5	25.0	31.0	18.0	26.0	14.5	21.0	8.5
15	33.5	27.0	32.5	23.0	30.0	16.0	26.0	14.0	21.5	7.5
16	31.5	27.0	32.5	22.0	30.0	16.0	25.0	13.5	16.5	7.5
17	32.0	26.5	32.5	21.5	30.0	16.0	25.5	13.0	17.0	11.0
18	33.0	27.0	33.5	24.0	29.5	16.0	25.5	13.0	15.5	7.5
19	34.5	28.0	31.0	23.0	30.0	17.0	25.0	14.0	15.0	7.0
20	33.0	25.5	31.5	21.5	33.0	18.5	24.0	15.0	15.0	8.0
21	34.0	27.0	30.5	21.5	30.0	18.0	27.0	15.0	23.0	8.0
22	33.0	27.0	32.5	21.0	31.0	17.0	25.5	13.0	23.0	9.5
23	33.0	26.0	31.0	21.5	31.0	17.0	26.5	13.0	22.5	8.5
24	34.0	25.5	32.5	21.0	29.0	17.0	26.0	12.5	24.0	9.0
25	35.5	26.5	31.5	20.0	29.5	16.5	30.5	12.5	24.0	9.0
26	35.0	26.5	32.0	20.0	28.0	13.0	27.5	13.0	24.5	8.0
27	34.5	26.5	32.0	19.0	29.0	16.5	27.5	14.5	25.5	8.0
28	35.5	27.0	32.5	19.0	25.0	19.0	25.0	13.5	24.0	8.5
29	33.5	24.5	32.5	20.0	29.0	18.0	24.0	23.5	24.5	8.5
30	34.0	26.0	32.0	19.0	24.0	19.0	24.5	14.0	24.5	8.0
31	—	—	32.0	19.5	—	—	25.0	12.5	25.0	10.0
Mean	32.7	26.2	32.5	22.3	29.9	17.9	26.6	14.7	22.3	9.6