

Germination Response to Ambient Temperature in Raising Sugarcane Settlings

M.A. Hossain, S. Ali and M.A.S. Miah

Sugarcane Research & Training Institute,
Ishurdi, Pabna, Bangladesh.

ABSTRACT

An experiment was conducted to study germination response to ambient temperature in raising sugarcane settlings. The highest germination was recorded in single-budded setts planted in polybag. Higher germination was obtained in single-budded setts compared to two-budded setts planted in soil bed. Temperature directly affected both rate and speed of germination, and minimum temperature should not be below 20°C for good germination. Rate and speed of germination decreased as the ambient temperature dropped. Varietal difference exists on rate of germination but not in speed of germination. The variety L.Jaba-C was found relatively cold tolerant compared to variety Isd-16. Therefore, it may be suggested to use single-budded setts especially in polybag and the variety L.Jaba-C during cold period for higher germination.

INTRODUCTION

Germination of sugarcane buds under field condition is affected by many internal and external factors (Mukerjee, 1979; Yang and Chen, 1980; Miah *et al.*, 1988). Temperature is the most important external factor affecting germination. Lower the temperature, lower the rate, and slower the speed of germination (Yang and Chen, 1980) and thus greater the chance for disease organism having access to cuttings resulting higher mortality of buds (Humbert, 1968; Barnes, 1974). The optimum temperature for good germination ranges between 32 to 38°C (Humbert, 1968; Barnes, 1974). The authors observed that maximum and minimum temperature should not be below 32.5 and 22.5°C respectively under Bangladesh climatic condition (Miah *et al.*, 1988). The authors also observed that minimum temperature is more important than maximum temperature. To overcome the damaging effect of lower temperature, and to increase sugarcane yield, it was felt necessary to raise sugarcane settlings at nursery beds for transplanting to the main field, instead of placing setts directly to the field. In our previous report, it has been shown the germination response of two budded setts of sugarcane varieties Isd-16 and L.Jaba-C at soil bed nursery (Miah *et al.*, 1988). In the present investigation, four methods of raising settlings have been studied.

MATERIALS AND METHODS

An experiment was carried out at Sugarcane Research and Training Institute, (SRTI) farm with two commercial sugarcane varieties such as Isd-16 and L.Jaba-C. The treatments were as follows :-

T₁ = Single-budded setts planted in polythene bag (Polybag).

T₂ = Two-budded setts planted in soil bed horizontally.

T₃ = Single-budded setts planted in soil bed horizontally (SB-horizontal).

T₄ = Single-Budded setts planted in soil bed vertically (SB-vertical).

In each fortnight, a set of 200 buds of each variety in each treatment was planted starting from first July, and continued upto 15th February. Germination percentage was recorded at an interval of 7d starting from 7d after planting until obtaining maximum percentage of emergence. Similar soil moisture level and other growth factors were maintained during the whole experimental period. Ambient temperature data were collected from Biometry and Statistics Division of SRTI, and presented in the figures 1-2.

RESULTS AND DISCUSSION

Results obtained on rate of germination in different methods of raising settlings of varieties Isd-16 and L.Jaba-C have been presented in the Figures 1 & 2. It is seen from the figures that the highest germination was obtained in polybag method of raising settling where single-budded setts were planted vertically in polybag followed by single-budded setts planted in soil bed vertically and horizontally. The lowest germination was obtained in two-budded setts planted horizontally in soil bed upto 15th September in the variety Isd-16, which in L.Jaba-C remained the lowest throughout the germination period. These figures also show that germination percentage decreased in both varieties as the temperature did fall. Similar results were shown in our previous reports (Miah *et al.*, 1988; Matin *et al.*, 1988). Where lower germination was recorded as temperature did fall and varietal response to temperature also existed. Variety L.Jaba-C was found relatively tolerant to lower temperature compared to Isd-16. Similar reports were also published elsewhere (Parthasarathy, 1972). It is also reported that germination is affected due to its position on stalk, and number of buds used in each sett (Clements, 1940; Hossain *et al.* 1982; Matin *et al.* 1988). These authors obtained better germination from setts taken from top portion of stalks. In our previous studies we have shown that younger buds are always superior over aged buds. Clements (1940) reported single-budded setts give better germination compared to three-budded setts. In the present investigation the lowest germination was also recorded from two-budded setts. The germination was obtained from single-budded setts planted either in polybag or in soil bed probably due to elimination of "top dominance" effects of auxin hormone. Similar view was published by Lakshmikantham (1983) who eliminated top dominance effects by cutting cane into setts having single bud per sett. However, in case of variety Isd-16 higher germination was obtained in two-budded soil bed compared to single-budded sett planted in the soil bed after 15th September, and the reason is not clearly understood.

The results of the present investigation shows that temperature has positive effect on both rate and speed of germination. So as the temperature was fallen, rate and speed of germination were also decreased (Figures 1—4). This result agrees with our previous findings (Miah *et al.*, 1988; Matin *et al.*, 1988 and Yang and Chen 1980). In these reports it was shown that rate of germination of sugarcane buds decreased and more days required to start as well as to obtain maximum germination as the temperature comes down. The highest germination (upto 98%) was obtained from 1st July to 15th September planting when minimum temperature was above 20°C and as the temperature fallen, the germination was also dropped reaching the lowest

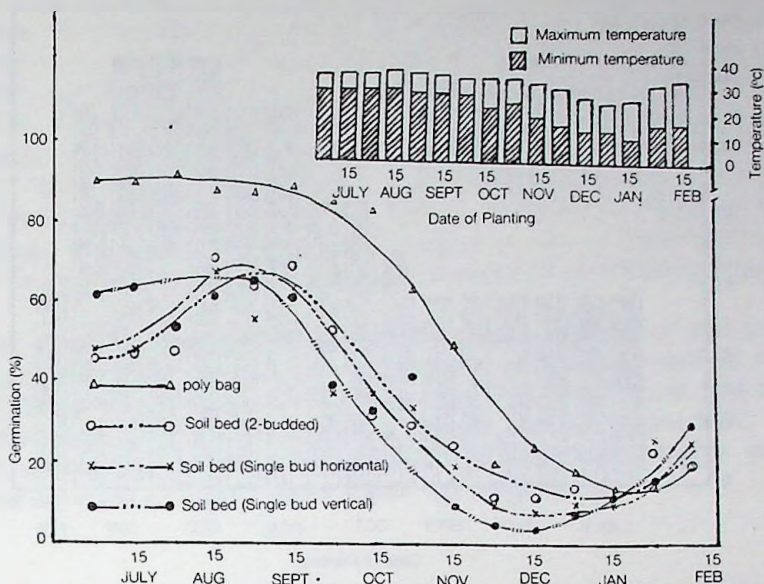


Figure 1. Effect of ambient temperature on germination of sugarcane variety Isd-16.

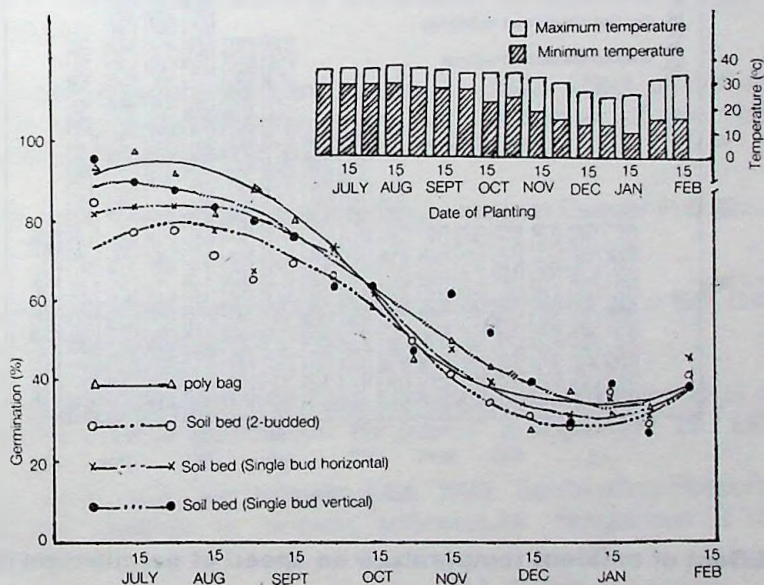


Figure 2. Effect of ambient temperature on germination of sugarcane variety L.J.C.

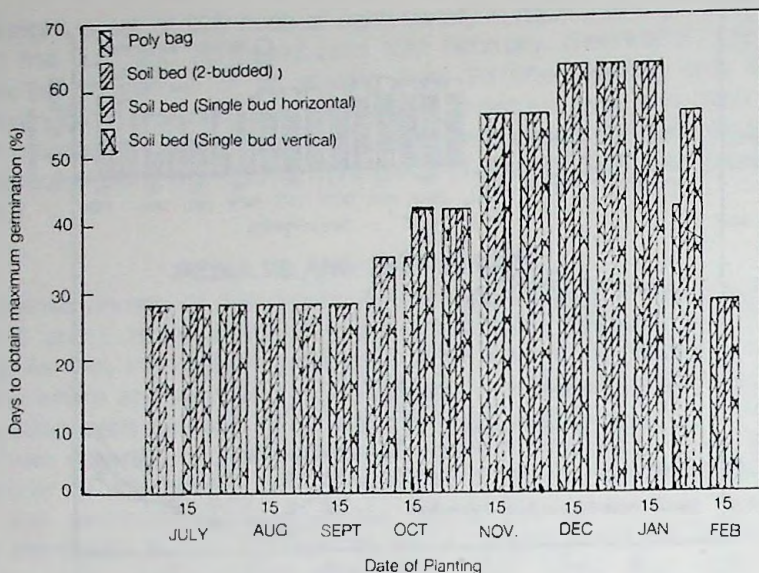


Figure 3. Effect of ambient temperature on speed of germination of sugarcane variety Isd-16

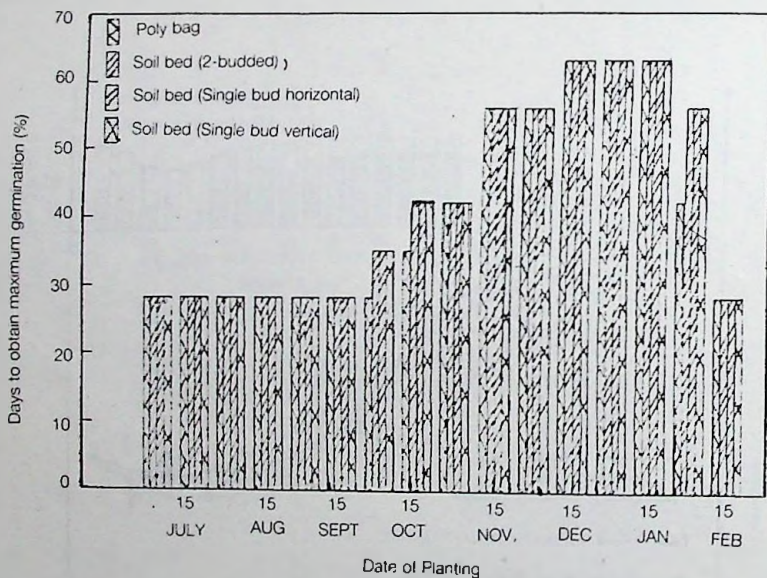


Figure 4. Effect of ambient temperature on speed of germination of sugarcane variety L.J.C.

level in both the varieties in the month of January when temperature went below 20°C. However, varietal difference in rate of germination exists, and higher germination was recorded in the variety L.Jaba-C compared to the variety Isd-16. This result also coincided with our previous report as well as results published elsewhere (Barnes, 1974; Humbart, 1968; Thuljaram *et al.*, 1983; Miah *et al.*, 1988; Matin *et al.*, 1988). These authors showed optimum temperature range for good germination is in between 32 to 38°C. In Bangladesh, good germination was obtained when maximum/minimum temperature was not below 32.5/22.3°C (Miah *et al.*, 1988). Although varietal difference was recorded in respect of rate of germination but there was not found any varietal difference in respect of speed of germination (Figures 1-4).

The results show that germination is affected due to method of sett preparation and its planting. The single-budded sett preparation and polybag method of settlings raising may give better germination. Temperature directly affects both rate and speed of germination, and minimum temperature should not be below 20°C for good germination. The variety L.Jaba-C is relatively cold tolerant and higher germination can be obtained using L.Jaba-C under lower temperature.

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