

Seed Treatments for Enhancement of Germination and Field Emergence in Cotton

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Poor stand establishment is a major constraint to crop production in the arid tropics. Germination and post-germination growth may be adversely affected by high temperature, low water potential or soil crushing [1-4]. Rapid germination and emergence is an important determinant of successful establishment. Hybrid cotton is a high value seed.

Wheeler *et al.* [5] showed the effect of seed quality on cotton yield. They observed that a yield increase of 35 per cent can be achieved by the use of better quality seeds over poor quality seeds, whereas a yield increase of about 13 per cent was achievable by using quality seed over an average commercial seed of medium quality. There was a direct correlation between the field emergence and yield in cotton. Therefore, a range of pre-sowing treatments for example, priming, film coating, treatment with pesticides, bioactive chemicals or nutrients have been suggested to achieve higher planting value of seed and to ensure better productivity [6-11].

Toselli and Casenave [9] reported that hydropriming accelerated germination, as compared to untreated cotton seeds. The present experiment was conducted to compare different seed enhancement treatments for improving the field emergence in cotton.

One lot each of high, medium and low vigour seed of cotton hybrid i.e. high vigour seed lot of hybrid NCH-744 (germination 89%) and those of medium (82%) and low vigour (54%) seeds of

the hybrid NCH-996, were taken for studying the effect of seed enhancement treatments as described below:

No.	Treatment	Dose
T1	Polykote + Thiram	4 ml/kg + 2.5g/kg
T2	Polykote + Thiram + Imidachloprid	4 ml/kg + 2.5/kg + 2.5 g/kg
T3	Royalflo	3 ml/kg of seed
T4	Hydropriming	25°C for 16h (1:2W/V)
T5	Hydropriming + Thiram	2.5 g/kg
T6	Halogen	2.5 g/kg
T7	Control	-

Details of the chemicals

Thiram 75% WS (Crop chemicals)

Polykote TM (Crompton)

Imidachloprid (Gaucho, Bayer Ind.)

Royalflo (Liquid thiram 40%, Crompton)

Halogen powder (Hitron)

The treated seeds along with the control were tested for germination as per ISTA, [12], seedling dry weight (at final count) and field emergence.

Field emergence of the seed lots (in soil beds) was recorded in the net house of the Division of

Seed Science and Technology, IARI, New Delhi during *kharif* 2006. For each treatment, three replications of two rows of 1m each were prepared in the net house. Three replications of 100 seeds were drawn from each seed lot. The entries were randomized within each replication. Fifty seeds were sown in two rows of 1m length each, keeping row to row distance of 15cm. The depth of sowing was kept 5-6cm. After 15 days of sowing the number of seedlings emerged in each row were counted. The mean of the replications was taken as the per cent field emergence.

There was significant difference in the field emergence values for different enhancement treatments. Though, the germination of the high and medium seed vigour lot was different, they both recorded similar field emergence values. This could be the reflection of the genetic difference between the two hybrids, NCH-744 being a faster growing genotype than NCH-96.

In case of high vigour seeds, significant enhancement in field germination was seen in case of polykote + thiram (T1) and Royalflo (T3) treatments. Hydropriming (T4) recorded only a marginal non-significant increase over control.

In the medium vigour seed lots, treatment with Royalflo (T3) recorded highest increase in field emergence, followed by hydropriming + thiram (T5) and halogen treatment (T6), respectively.

In the low vigour seed lots, emergence was expectedly very poor, ranging from 29 per cent in hydropriming + thiram treatment (T5) to 49 per cent in Royalflo (T3) and polykote + thiram (T1) treatments, which showed marginally significant increase. This was followed by polykote + thiram + Gaucho (T2) (Table 1).

Thus, overall, Royalflo treatment was most effective in enhancing the field emergence of cotton seed lots, whereas the efficacy of other treatments were highly variable among the three seed lots. Though the effect of priming was not dramatic with respect to field emergence, significant improvements in seedling dry weight were seen in all three seed lots. Hydropriming (T4) showed significant improvement in seedling growth upon germination in all lots, followed by polykote + thiram (T1). Treatments with polykote + thiram + Gaucho (T2) in high and low vigour seed lots and Royalflo (T3) and hydropriming + thiram (T5) in medium vigour seed lot,

Table 1. Effect of seed enhancement treatments on field emergence and seedling dry weight of high, medium and low vigour cotton seed lots

Treatments/vigour	Field emergence (%)			Seedling dry weight (mg)		
	Seed lot			Seed lot		
	High	Medium	Low	High	Medium	Low
T1	80.80*(53.92)	72.00(46.07)	49.33(29.57)	4.93*	4.71*	3.00*
T2	72.00(46.07)	71.33(45.52)	46.00(27.40)	4.87*	4.11	3.30*
T3	83.33*(56.46)	82.00*(55.11)	49.33*(29.57)	4.41	4.58*	2.45
T4	75.33(48.90)	75.33(48.90)	37.33(21.93)	5.35*	5.43*	3.51*
T5	70.66(44.98)	80.00*(53.15)	29.33(17.06)	4.81	5.15*	2.73
T6	74.66(48.32)	77.33*(50.67)	35.33(20.69)	4.56	4.28	2.93
T7	74.00(47.75)	71.33(45.52)	44.00(26.11)	4.35	3.93	2.40
Mean	75.82(49.48)	75.61(49.27)	41.52(24.61)	4.74	4.59	2.90
C.D. at 0.05 P	5.33	5.67	5.79	0.51	0.58	0.55

respectively were also effective. Basu [13] reported that mid storage hydration treatment can significantly slow down deterioration in the medium vigour seed lots, whereas the effect was marginal or absent in the seeds of very high and very low vigour seed lots.

The improvement in field emergence due to Royalflo may be attributed to its thiram base. The improvement in the field emergence due to thiram application has been observed in cotton and soybean by Vijaykumar *et al.* [10] and Muthuraj *et al.* [14]. The improvements in seedling dry weight due to hydropriming may be due to metabolic advancement, which results in rapid and uniform germination upon post-priming sowing [15-17]. The results of this study were in agreement with the findings of Tosseli and Casenave [9].

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