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SHORT COMMUNICATION

Invigouration Treatment for Improving Germination of Sugarcane True Seed

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True seed (fluff) of Sugarcane clones Co 8353, ISH 69, Co 7622, ISH 21, J 155 and Co 7807 were defuzzed using a defuzzing machine and cleaned. After three months, the seeds were given invigouration treatment with water as well as Sodium phosphate (dibasic)@10^{-4} M conc. and Potassium phosphate (dibasic)@10^{-4} M conc. for 2, 4, 6, 8, 10, 12 and 24 hr. Untreated seed was kept as control. In the laboratory germination test, observations on number of germinants, dry matter production and seedling vigour were taken. The beneficial effects of seed invigouration treatment through hydration and dehydration were pronounced in terms of improved germination, dry matter production and vigour.

KEYWORDS : Sugarcane, trueseed, defuzzing, germination test, seed invigouration, hydration-dehydration, soaking-drying, seed treatment

Sugarcane is an asexually propagated crop and gives very low seed set even under ideal conditions. Sugarcane true seed (fluff or fuzz) loses its germinability quickly (Rao, 1980). Hence it is very important to preserve or enhance the germination potential of the fluff, so that the requisite genetic variability for varietal development is maximised for any cross combination.

Often differences in the vigour are reflected in the rate, uniformity and level of emergence, particularly in less than optimum conditions. So high vigour seeds emerge rapidly and uniformly, where as low vigour seeds tend to emerge slowly over a longer period of time or frequently fail to germinate. Seed invigouration treatments developed over a number of years (Heydecker and Coolbear, 1977) have frequently involved the hydration of seeds either from osmotic solutions (Heydecker *et al.*, 1973) or from water or inorganic chemicals (Basu and Dasgupta, 1978). These treatments have resulted in increased rate and uniformity of germination and improved seedling growth (Rajendra Prasad, 1983). The present study was taken up to examine the effect of soaking-drying treatment on sugarcane defuzzed true seed.

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The experiment was carried out at Seed Technology Laboratory, Sugarcane Breeding Institute, Coimbatore. Open pollinated collections of seed fluff from Sugarcane clones Co 8353 (V_1), ISH 69 (V_2), Co 7622 (V_3), ISH 21 (V_4), J 155 (V_5) and Co 7807 (V_6) constituted the material for study. The fluff was defuzzed using a prototype-defuzzing machine developed by the second author. (Anon, 1991), cleaned, dried to 7% moisture content and packed in 1000-gauge polythene bags. After three months, the seeds were given the treatments viz., soaking in double the volume of distilled water (T_1), Sodium phosphate (dibasic) @10^{-4} M conc. (T_2) and Potassium phosphate (dibasic) @ 10^{-4} conc. (T_3) for 2(H_2), 4(H_4), 6(H_6), 8(H_8), 10(H_{10}), 12(H_{12}) and 24(H_{24}) hrs. After soaking, the water was decanted and the seeds were dried initially in shade and subsequently in sunlight back to its original moisture content. The control (T_0) Seeds were not given this soaking-drying treatment but were dried along with treated ones. Seed germination for 0.1 g of defuzzed seed was tested using Petri dish method (Rajendra Prasad and Tripathi, 1999) with absorbent cotton wool as the medium. Observations were recorded for number of germinants as well as dry matter production (mg) for ten seedlings (Anon., 1993). Vigour Index (Abdul-Baki and Anderson, 1973) was calculated and data were statistically analysed.

Sugarcane true seed was classified as an 'orthodox' seed (Roberts, 1984) and seed

deterioration is faster under ambient conditions. Germinability and vigour are two important facets of seed quality. In the present study, highly significant differences were observed in the number of germinants recorded in the germination test due to hydration-dehydration treatments, duration of soaking and varieties. Soaking the seed in water (19.2/0.1g) or antioxidants viz. Potassium Phosphate (dibasic) (18.0/0.1g) and Sodium phosphate (dibasic) (17.4/0.1g) improved the number of germinants (Table 1) significantly as compared to untreated ones (9.6/0.1g). Increase in germination could be possible as a result of advancement of germination whereby the radicle extended during hydration, retained viability during drying and resumed growth at a more advanced stage when set to germinate.

One of the most visible symptoms of reduced vigour of seed is the slowing down of germination process. The invigouration treatments given to three-month-old Sugarcane true seed proved to be effective towards maintenance of viability and vigour. Soaking duration ranging from 6-10 hr. had significantly increased the germinability. J155 (22.2/0.1g) responded most to hydration-dehydration treatment. Similar results were obtained by Rajendra Prasad (1983) in Sorghum and Yogalakshmi (1995) in rice. Increased enzymatic activity, free radical quenching and reorganization of bio organelle could be attributed for maintaining the viability of treated seeds (Dey and Mukherjee, 1986).

Highest dry matter production (Table 2) was recorded in Co 8353 (5.3 mg/10 seedlings). The hydration-dehydration treatments, though not significantly, registered more dry matter production than untreated ones reflecting better physiological efficiency as revealed by Dharmalingam (1990) in rice.

Vigour Index (VI) (Germination × Dry matter production) (Table 3) was the highest in Co 8353 (86.2/0.1g), Water treatment (83.9/0.1g) and soaking for 10 hr. (78.7/0.1g). All the treatments registered significantly better values for Vigour Index in all the varieties as compared to untreated control. It is plausible that improved vigour might be due to toning and retention of integrity of cell membrane, maintenance of physical stamina and physiological activity after hydration-dehydration treatment (Rajendra Prasad, 1983 and Yogalakshmi, 1995). As regards the role of Sodium phosphate (dibasic) as well as Potassium phosphate (dibasic), they are supposed to act as anti-oxidant synergists and therefore would have shown an indirect controlling effect on the free radical chain reaction.

Soaking-drying of Sugarcane defuzzed true seed with water or anti-oxidants like Sodium phosphate (dibasic) 10^{-4}M or Potassium phosphate (dibasic)@ 10^{-4}M conc. increased the germination, dry matter production and vigour by significantly reducing the physiological deterioration as compared to control.

Table - 1 : Number of germinants/0.1g of seed as influenced by soaking-drying treatment, hours of soaking and varieties in Sugarcane true seed

-	T_0	T_1	T_2	T_3	V_1	V_2	V_3	V_4	V_5	V_6	H-Mean
H_2	9.6	14.3	16.8	17.4	12.5	17.1	12.1	11.6	19.0	14.8	14.5
H_4	9.6	19.3	19.1	15.8	15.4	16.1	13.8	12.8	19.4	18.3	15.9
H_6	9.6	20.8	20.7	20.2	15.9	15.8	15.0	14.3	24.9	21.0	17.8
H_8	9.6	19.7	20.7	18.6	17.6	17.8	12.3	12.4	24.3	13.5	17.1
H_{10}	9.6	22.8	18.7	21.0	19.5	18.6	14.3	15.6	22.4	17.8	13.0
H_{12}	9.6	18.4	21.2	16.8	17.1	19.4	12.9	12.6	21.9	15.0	16.5
H_{24}	9.6	19.3	18.7	16.0	14.9	13.8	12.4	10.5	23.8	19.1	15.9
T_0	-	-	-	-	9.5	11.0	7.5	10.5	11.0	8.0	-
T_1	-	-	-	-	20.8	17.9	14.7	14.2	25.4	22.4	-
T_2	-	-	-	-	18.4	17.2	16.9	13.7	28.3	21.3	-
T_3	-	-	-	-	15.9	21.6	14.4	12.9	23.7	19.4	-
T-Mean	9.6	19.2	17.4	18.0	-	-	-	-	-	-	-
V-Mean	-	-	-	-	16.1	16.9	13.4	12.0	22.2	17.8	-

	Clones (V)	Treatment (T)	Hours. of soaking (H)	V × T	V × H	T × H
CD at 5%	1.37**	1.14**	1.50**	2.79**	3.69**	3.01**

**Highly significant: NS - Non Significant

Table - 2 : Dry matter production (mg) as influenced by soaking-drying treatment, hours of soaking and varieties in Sugarcane true seed

	T_0	T_1	T_2	T_3	V_1	V_2	V_3	V_4	V_5	V_6	H-Mean
H_2	4.1	4.6	4.2	3.8	4.3	4.3	4.3	5.1	3.3	3.8	4.1
H_4	4.1	4.3	4.4	3.9	5.4	3.9	4.6	4.5	2.8	4.0	4.2
H_6	4.1	4.0	4.6	4.3	5.0	4.6	4.6	4.1	3.4	3.8	4.3
H_8	4.1	4.8	3.7	4.6	5.8	4.1	4.3	4.1	3.3	4.3	4.3
H_{10}	4.1	4.3	4.4	4.7	5.4	4.8	4.5	4.4	3.5	3.8	4.4
H_{12}	4.1	3.8	4.3	4.2	5.8	4.3	3.8	3.9	3.4	3.5	4.1
H_{24}	4.1	4.3	3.7	4.4	5.4	2.5	4.4	4.9	3.0	3.6	4.1
T_0	-	-	-	-	5.5	3.0	5.5	4.5	2.0	4.0	-
T_1	-	-	-	-	5.5	3.9	4.1	4.4	3.9	4.1	-
T_2	-	-	-	-	5.3	4.8	3.9	4.1	3.7	3.3	-
T_3	-	-	-	-	4.8	5.1	3.8	4.8	3.3	3.8	-
T-Mean	4.1	4.3	4.2	4.3	-	-	-	-	-	-	-
V-Mean	-	-	-	-	5.3	4.2	4.3	4.4	3.2	3.8	-

	Clones (V)	Treatment (T)	Hours. of soaking (H)	V × T	V × H	T × H
CD at 5%	NS	0.46**	NS	0.93**	NS	NS

**Highly significant; NS - Non Significant

Table - 3 : Vigour Index as influenced by soaking-drying treatment, hours of soaking and varieties in Sugarcane true seed

	T_0	T_1	T_2	T_3	V_1	V_2	V_3	V_4	V_5	V_6	H-Mean
H_2	39.5	60.8	72.3	64.4	53.3	77.0	54.1	60.9	63.8	57.5	61.3
H_4	39.5	85.1	83.8	61.4	83.4	67.9	62.5	58.5	56.4	76.0	67.4
H_6	39.5	83.1	95.3	85.1	79.1	75.8	60.5	59.3	88.8	83.0	75.7
H_8	39.5	72.0	77.8	87.1	98.8	80.0	52.6	51.4	82.3	79.5	74.1
H_{10}	39.5	103.4	77.2	92.7	105.0	90.5	54.6	67.4	84.4	70.3	78.7
H_{12}	39.5	74.1	95.6	69.5	103.4	89.0	45.8	46.1	78.8	55.0	69.7
H_{24}	39.5	80.8	63.3	70.3	79.5	52.5	55.4	51.0	75.5	67.0	63.5
T_0	-	-	-	-	52.0	35.0	37.0	46.5	22.0	44.0	-
T_1	-	-	-	-	115.5	73.0	68.6	60.8	96.3	89.1	-
T_2	-	-	-	-	99.9	83.1	67.4	56.9	106.3	72.3	-
T_3	-	-	-	-	77.4	113.2	51.4	61.2	77.8	73.6	-
I-Mean	39.5	83.9	81.1	75.8	-	-	-	-	-	-	-
V-Mean	-	-	-	-	86.2	76.1	56.2	56.4	75.7	69.8	-

	Clones (V)	Treatment (T)	Hours. of soaking (H)	V × T	V × H	T × H
D at 5%	9.67**	7.89**	10.44**	19.31**	NS	NS

**Highly significant; NS - Non Significant

Seed invigouration treatments could effectively be used for maintaining the quality in terms of vigour and viability of old or stored sugarcane seeds in a breeding programme.

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