

Standardization of Dosages of Sulphuric Acid and Duration for Delinting of Cotton Hybrid DCH-32 Seeds

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ABSTRACT The seeds of DCH-32 hybrid cotton were subjected to delinting by using different quantity of H_2SO_4 (60, 80, 100 and 120 ml/kg of seed) with different duration (2, 4, 6, 8, 10, 12 and 14 min). The delinting of hybrid cotton seeds with the dosage of 100 ml H_2SO_4 per kg of seed treated for 10 min was better, as the fuzz removal was complete and the seeds recorded higher germination with other quality parameters.

Key words: Delinting, sulphuric acid, dosages, hybrid cotton

Production of hybrid cotton seeds of high germinability is always a problem because of attack of insects like pink bollworm, which damages the seeds and makes it unfit for sowing. Because of the presence of fuzz on the seed coat, it becomes difficult to remove the damaged, diseased and immature seeds during grading, which results in poor germination. The presence of fuzz also cause hindrance in operations like processing, sowing etc., apart from reducing the seed germination due to low moisture absorption resulting in a poor plant stand [1]. Removal of the fuzz from the seed coat (delinting) facilitates better seed grading and seed germination. It is commonly practiced by treating seeds with concentrated acids or gases besides mechanically removing the lint. The mechanical delinting is more laborious and time consuming [2]. The gas (fume) delinting is practically not being used presently as large quantity of seed is required each time. Hence, acid delinting with H_2SO_4 is commonly used for delinting of cotton seed on commercial scale. Though, concentrated acid removes the fuzz, it may also damage the seed coat, resulting in poor seed quality and storability. Therefore, there is a need to generate scientific data on proper concentration and duration for delinting of cotton seed without affecting the seed quality.

MATERIALS AND METHODS

The experiment was conducted in the laboratory of National Seeds Project, University of Agricultural Sciences, Dharwad. The study was undertaken to standardize the dosage of H_2SO_4 and duration for delinting of cotton seeds. The seeds of DCH-32 cotton hybrid were delinted by using different quantity of H_2SO_4 (60, 80, 100 and 120 ml/kg of seeds) with varied duration (2, 4, 6, 8, 10, 12 and 14 min.).

One kilogram of DCH-32 cotton hybrid seeds were taken in small plastic bucket. The concentrated sulphuric acid (commercial; specific gravity 1.84) with different doses as per the treatments was added to the seeds and stirred constantly for different periods. Afterwards these seeds were neutralized with two per cent lime water and washed further for four to five times with tap water. After final washing the lighter seeds were removed by water flotation method and the good seeds (sinkers) were dried to nine per cent moisture content. Observation on germination (%), seedling dry weight (mg), seedling vigour index, electrical conductivity ($ds\ m^{-1}$), and 100-seed weight (g) were recorded. The germination test was conducted as per ISTA procedure [3]. The vigour index of seedling was calculated by multiplying

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germination percentage with the total seedling length [4].

RESULTS AND DISCUSSION

The results indicate significant influence of dosage of H_2SO_4 and delinting time of fuzz removal and seed quality parameters.

The 100-seed weight was significantly higher with 60 ml H_2SO_4 (8.52 g). The test weight decreased with the increase in the dosage of H_2SO_4 , because of complete removal of fuzz from seed coat by the higher doses of the acid (Table 1).

Table 1. 100-seed weight (g) as influenced by dosages of sulphuric acid and delinting duration

Delinting duration (T)	Dosages (D)				Mean
	D ₁ (60 ml)	D ₂ (80 ml)	D ₃ (100 ml)	D ₄ (120 ml)	
T ₁ - (2 min)	9.05	8.68	8.87	8.65	8.81
T ₂ - (4 min)	8.97	8.65	8.65	8.41	8.67
T ₃ - (6 min)	8.38	8.68	8.57	8.65	8.57
T ₄ - (8 min)	8.58	8.54	8.57	8.55	8.56
T ₅ - (10 min)	8.56	8.38	8.40	8.10	8.40
T ₆ - (12 min)	8.51	8.12	8.15	8.18	8.24
T ₇ - (14 min)	8.19	8.14	8.19	8.01	8.09
Mean	8.60	8.47	8.42	8.40	8.46

	S.E.m.±	CD (0.05)
T	0.01	0.02
D	0.01	0.02
TxD	0.02	0.04

The dosage of 100 ml of H_2SO_4 per kg of cotton seed recorded significantly higher seed germination (78.1%). Further increase or decrease in dosage of H_2SO_4 reduced seed germination (Table 2). Significantly lower germination was observed with a dosage of 60 ml (74.2%). Similar results were also observed with respect to other seed quality parameters. Significantly higher dry weight of seedlings (53.07 mg), and vigour index (2956) were recorded with 100 ml of H_2SO_4 compared to other dosages (Tables 3 & 4). The electrical conductivity increased with increase in the concentration of H_2SO_4 . Significantly lower (1.391 dSm^{-1}) and higher (2.108 dSm^{-1}) electrical conductivity was observed with 60 ml and 120 ml of H_2SO_4 , respectively (Table 5). The decrease in germination and other seed quality parameters with lower concentration of H_2SO_4 was due to the incomplete

Table 2. Germination (%) as influenced by dosages of sulphuric acid and delinting duration

Delinting duration (T)	Dosages (D)				Mean
	D ₁ (60 ml)	D ₂ (80 ml)	D ₃ (100 ml)	D ₄ (120 ml)	
T ₁ - (2 min)	67.3 (55.12)	70.3 (56.98)	75.6 (60.40)	81.7 (64.67)	73.7 (59.15)
T ₂ - (4 min)	72.7 (58.50)	75.7 (60.47)	78.8 (62.58)	80.6 (63.87)	76.9 (61.27)
T ₃ - (6 min)	71.7 (57.86)	74.5 (59.67)	81.5 (64.52)	77.8 (63.89)	76.4 (60.94)
T ₄ - (8 min)	74.8 (59.87)	77.6 (61.75)	83.6 (66.11)	80.5 (63.79)	79.2 (62.87)
T ₅ - (10 min)	75.7 (60.47)	83.5 (66.03)	89.7 (71.23)	82.6 (65.35)	82.9 (65.57)
T ₆ - (12 min)	80.5 (63.79)	77.3 (61.55)	72.7 (58.50)	68.8 (56.04)	74.9 (59.93)
T ₇ - (14 min)	76.6 (61.07)	71.1 (57.48)	64.6 (53.49)	59.8 (50.65)	68.8 (55.55)
Mean	74.2 (59.54)	75.8 (60.53)	78.1 (62.10)	75.9 (60.60)	76.0 (60.67)

	S.E.m.±	CD (0.05)
T	0.06	0.19
D	0.04	0.14
TxD	0.12	0.39

Note: Figures in parentheses are arc sine transformed values

Table 3. Vigour index as influenced by dosages of sulphuric acid and delinting duration

Delinting duration (T)	Dosages (D)				Mean
	D ₁ (60 ml)	D ₂ (80 ml)	D ₃ (100ml)	D ₄ (120 ml)	
T ₁ - (2 min)	2443	2629	2986	3100	2788
T ₂ - (4 min)	2793	2835	2960	3192	2945
T ₃ - (6 min)	2775	2812	3236	3123	2987
T ₄ - (8 min)	2839	3050	3194	3043	3032
T ₅ - (10 min)	2918	3361	3660	3230	3291
T ₆ - (12 min)	2978	2868	2635	2288	2689
T ₇ - (14 min)	5696	2353	2125	1875	2251
Mean	2771	2839	2956	2816	2845

	S.E.m.±	CD (0.05)
T	31	89
D	30	84
TxD	44	126

Table 4. Dry weight of seedling (mg) as influenced by dosages of sulphuric acid and delinting duration

Delinting duration (T)	Dosages (D)				Mean
	D ₁ (60 ml)	D ₂ (80 ml)	D ₃ (100 ml)	D ₄ (120 ml)	
T ₁ - (2 min)	44.33	46.30	48.00	51.66	47.57
T ₂ - (4 min)	44.36	46.06	52.33	52.40	48.78
T ₃ - (6 min)	46.10	48.29	54.33	53.21	50.48
T ₄ - (8 min)	48.06	50.03	56.40	53.85	52.08
T ₅ - (10 min)	50.93	51.76	58.93	50.80	53.10
T ₆ - (12 min)	51.66	52.23	54.60	43.80	50.57
T ₇ - (14 min)	51.43	49.06	46.96	38.20	46.41
Mean	48.12	49.10	53.07	49.13	49.85

	S.Em.±	CD (0.05)
T	0.60	1.00
D	0.46	0.75
TxD	1.20	2.00

removal of fuzz from the seed coat, which inturn have hindered the seed germination and seedling growth, because of low absorption of moisture by the seed coat [1]. The acid delinting facilitates separation of immaturred, insect and disease affected seeds, thus upgrading the seed quality [5]. Higher doses of H₂SO₄ reduced the seed quality because of its adverse effect on seed coat leading to depletion in seed nutrients apart from killing the embryo itself [2]. This adverse effect of higher doses of H₂SO₄ on seed coat has been reflected interms of increased electrical conductivity of the seed leachate with increase in doses of sulphuric acid.

The delinting duration of ten minutes recorded significantly higher seed quality parameters viz., germination (82.9%), dry weight of seedling (53.10 mg) and vigour index (3291). Further increase or decrease in duration reduced seed quality significantly. The test weight of the seed decreased with advancement of delinting time, whereas, electrical conductivity increased with increase in delinting duration. The reduction in seed quality parameters with lower duration was due to lesser exposer of the seeds to the acid leading to

Table 5. Electrical conductivity (dSm⁻¹) as influenced by dosages of sulphuric acid and delinting duration

Delinting duration (T)	Dosages (D)				Mean
	D ₁ (60 ml)	D ₂ (80 ml)	D ₃ (100 ml)	D ₄ (120 ml)	
T ₁ - (2 min)	1.166	1.303	1.451	1.642	1.391
T ₂ - (4 min)	1.328	1.246	1.648	1.857	1.520
T ₃ - (6 min)	1.460	1.584	1.543	1.717	1.576
T ₄ - (8 min)	1.340	1.327	1.623	1.868	1.539
T ₅ - (10 min)	1.441	1.496	1.662	1.845	1.611
T ₆ - (12 min)	1.787	1.873	1.867	1.979	1.877
T ₇ - (14 min)	1.792	1.981	2.313	2.347	2.108
Mean	1.473	1.544	1.730	1.894	1.660

	S.Em.±	CD (0.05)
T	0.053	1.151
D	0.040	0.110
TxD	1.106	NS

incomplete removal of the fuzz from the seed coat. Ten minutes duration facilitated complete removal of the seed coat without damaging the seed. It has also facilitated the separation of immature, infested and diseased seeds, thus upgrading the seed quality. The increase in duration reduced the seed quality due to increased damage to the seed coat [2]. The electrical conductivity of the seed leachate increased with increase in duration thus indicating the damage to the seed coat.

The interaction between dosage of H₂SO₄ and delinting duration were also significant with respect to seed quality parameters. Significantly higher seed germination (89.7%), seedling dry weight (58.93 g) and vigour index (3660) were observed with the dosage of 100 ml H₂SO₄ and 10 min delinting duration. This might be due to better delinting coupled with removal of light, immature and small seeds during delinting and rapid absorption of moisture as a result of increased permeability of seed coat [6].

In conclusion, removal of fuzz from the cotton seeds is necessary in order to improve the planting value of the seed. The lower dosages of sulphuric acid and lesser exposer time of the seed to the acid resulted in incomplete removal of fuzz, whereas, higher doses and longer duration damaged the seed coat. Thus, the seeds delinted

with 100 ml of H_2SO_4 per kg for 10 min. is suggested for higher seed quality parameters with better removal of fuzz without affecting the seed coat.

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