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EFFECT OF HALOGENATION TREATMENT ON VIABILITY MAINTENANCE AND CROP PRODUCTIVITY IN BAJRA CO 7

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ABSTRACT

Bajra seeds cv. CO 7 treated with iodine based halogen formulation at 3 g kg^{-1} (dry and slurry), packed separately in cloth bag and polylined cloth bag and stored under ambient condition for 10 months along with thiram treated at 4 g kg^{-1} and control revealed that the halogenated seeds maintained high germination (80%), seedling vigour and field emergence (75%) upto 8 months in both polylined cloth bag and cloth bag, respectively. Thiram treated seeds did store only for 4 and 2 months with 75% germination in the above containers.

Evaluation of the above seeds in a field trial upheld the superiority of halogenated seeds (slurry treatment) with increase in plant height (35%), number of leaves (63%), productive tillers (67%) and seed yield (28%) over the control. The yield recorded by the thiram-treated seeds was less by 10 per cent compared to halogenated seeds.

KEY WORDS: Bajra, Halogenation, Chlorine, Iodine

Seed is a biological entity and deterioration is inevitable beyond harvest until next planting. Maintenance of high germination and vigour during this period is very important in any seed programme. Good seed storage practices, therefore, are basic requirement in seed industry. The present study was aimed at identifying an effective seed treatment and a feasible packaging material for safe storage of bajra seeds under ambient conditions. The treated and stored seeds were evaluated for productivity six months after storage.

MATERIALS AND METHODS

Seeds of bajra cv. CO 7 dried to 8 per cent moisture content were treated with iodine based halogen formulation (dry and slurry) containing 2 mg iodine in 3 g of $CaCo_3$ and chlorine based halogen formulation containing $CaOCl_2$, $CaCo_3$ and *Albizzia amara* leaf powder in 5:4:1 ratio at 3 g kg^{-1} and thiram at 4 g kg^{-1} and stored along with control seeds. Both dry and slurry treated seeds were kept air tight in 700 guage polyethylene bag for 4-5 days. Subsequently the seeds were packed in cloth bag (C_1) and polylined cloth bag (C_2) separately and stored under ambient condition (25.1°C and 95.2% RH) for 8 months.

The treatments were

T_0 - Control

T_1 - Thiram (dry) at 4 g kg^{-1}

T_2 - Thiram (slurry) at 4 g kg^{-1}

T_3 - Chlorination (dry) at 3 g kg^{-1}

T_4 - Chlorination ((slurry) at 3 g kg^{-1}

T_5 - Iodination (dry) at 3 g kg^{-1}

T_6 - Iodination (slurry) at 3 g kg^{-1}

Seed quality was evaluated initially and subsequently at bimonthly interval using the following parameters. The germination test was carried out with 25 x 4 seeds adopting modified roll-towel method (Dharmalingam, 1988). The vigour index was calculated following the formula of Abdul-Baki and Anderson (1973).

Field experiment was conducted six months after the storage of seeds during November 1996 under irrigated condition. The recommended package of practices was adopted uniformly for all the treatments. The trial was laid out in FRBD with 14 treatments and three replications. Data on plant height and number of productive tillers were

recorded 65 DAS. After harvest and cleaning, seed yield was recorded treatment-wise and the plot yield was computed to hectare and the data were statistically analysed.

RESULTS AND DISCUSSION

The results revealed that seed treatments, particularly halogenation conferred an invigoration effect to the seeds in a short time. The halogen treated seeds maintained the germination percent above the minimum seed certification standard (75% percent) upto 8 months in both the containers as against 4 and 2 months in thiram treated and control seeds. The untreated seeds stored in C_1 and C_2 suffered a germination loss of 24 and 17 per cent, respectively over 8 months of storage. Among the treatments, the slurry treated seeds with iodine or chlorine recorded the highest

Table 1. Effect of Seed treatments, containers and period of storage on *Germination* (%) of Bajra cv. Co 7

	C_1						C_2				Mean
	P_0	P_2	P_4	P_6	P_8	P_{10}	P_2	P_4	P_6	P_8	P_{10}	(T)
T_0	81	77	63	59	57	81	77	71	65	70	
	(63.79)	(61.00)	(52.23)	(50.18)	(48.73)	(63.79)	(61.00)	(57.41)	(53.43)	(56.84)	
T_1	83	80	76	72	69	82	78	73	70	76	
	(65.26)	(63.43)	(60.33)	(58.06)	(56.16)	(64.52)	(61.68)	(58.72)	(56.78)	(60.54)	
T_2	84	82	77	72	68	83	79	74	69	76	
	(66.42)	(64.52)	(61.00)	(58.06)	(55.54)	(65.26)	(62.37)	(59.34)	(56.16)	(60.96)	
T_3	84	83	80	79	75	83	81	80	78	80	
	(66.03)	(65.65)	(63.07)	(62.74)	(59.67)	(65.68)	(63.79)	(63.07)	(62.03)	(63.52)	
T_4	85	84	82	81	80	85	83	83	83	83	
	(66.81)	(66.03)	(64.92)	(63.80)	(63.08)	(66.81)	(65.65)	(65.72)	(65.32)	(65.35)	
T_5	85	84	80	80	78	85	82	81	78	81	
	(67.22)	(66.03)	(63.45)	(63.07)	(61.68)	(67.21)	(64.89)	(63.83)	(62.03)	(64.38)	
T_6	86	84	83	80	78	85	85	85	79	83	
	(67.61)	(66.42)	(65.26)	(63.45)	(62.03)	(67.21)	(67.31)	(67.25)	(62.72)	(65.47)	

C Mean $C_1 = 75$ (60.31) $C_2 = 78$ (61.76)

P Mean $P_0 = 84$ (66.16) $P_2 = 83$ (65.25) $P_4 = 79$ (62.63) $P_6 = 77$ (61.04) $P_8 = 74$ (58.95)

CD (P=0.05) T 0.58, P 0.54, C 0.31, TP 1.43, TC 0.82, PC 0.76

(Figures in parentheses are arc sine values)

T_0 - Control ;

T_1 - Thiram (dry) @ 4 g kg^{-1}

T_2 - Thiram (slurry) @ 4 g kg^{-1}

T_3 - Chlorination (dry) @ 3 g kg^{-1}

T_4 - Chlorination (slurry) @ 3 g kg^{-1}

T_5 - Iodination (dry) @ 3 g kg^{-1}

T_6 - Iodination (slurry) @ 3 g kg^{-1}

Table 2. Effect of Seed treatments, containers and period of storage on *Vigour Index* of Bajra cv. Co 7

	C_1					C_2				Mean
	P_0	P_2	P_4	P_6	P_8	P_2	P_4	P_6	P_8	(T)
T_0	2641	2307	1703	1490	1254	2484	2199	1921	1622	1958
T_1	2764	2512	2194	1956	1711	2628	2415	2154	1911	2299
T_2	2798	2576	2253	1973	1693	2678	2457	2213	1942	2287
T_3	2802	2648	2373	2157	1885	2706	2532	2377	2215	2411
T_4	2852	2676	2464	2214	2027	2771	2627	2499	2368	2500
T_5	2860	2672	2396	2167	1965	2789	2579	2423	2227	2453
T_6	2898	2705	2484	2200	1997	2801	2695	2563	2292	2515

Mean C_1 = 2134 C_2 = 2329

Mean P_0 = 2802 P_2 = 2640 P_4 = 2384 P_6 = 2165 P_8 = 1936

CD (P=0.05)	T	P	C	TP	TC	PC
	27.23	25.21	14.56	66.72	38.52	35.66

T_0 - Control ;

T_1 - Thiram (dry) @ 4 g kg^{-1} T_2 - Thiram (slurry) @ 4 g kg^{-1}

T_3 - Chlorination (dry) @ 3 g kg^{-1} T_4 Chlorination (slurry) @ 3 g kg^{-1}

T_5 - Iodination (dry) @ 3 g kg^{-1} T_6 - Iodination (slurry) @ 3 g kg^{-1}

germination of 83 per cent followed by 81 per cent for the seeds dry dressed with chlorine based formulation (Table 1). The seeds stored in C_2 recorded higher seedling length compared to C_1. The rate of deterioration was also manifested by the loss accrued in vigour index for C_1 and C_2 seeds (Table 2).

The crop raised from halogenated seeds, particularly iodine treatment, showed superiority over other treatments registering the maximum plant height of 154.4 cm followed by chlorinated seeds (148.1 cm) with 6 productive tillers per plant as against 5 for thiram and untreated seeds. The seeds stored in C_2 showed an edge over C_1 (Table 3).

The iodinated seeds recorded significantly higher yield (3984 kg ha^{-1}) followed by chlorinated seeds (3727 kg ha^{-1}). The lowest yield was recorded by control seeds (3111 kg ha^{-1}). The increase in seed yield was 28 and 14 per cent higher for iodination treatment as compared to control and thiram treated seeds respectively. The significant interaction between treatments and containers broughtout the superiority of halogenation treatment and that of polylined cloth bag over the rest (Table 3).

The results of the study involving halogenation treatment (iodine and chlorine based) and fungicide (thiram) as dry and slurry treatments to the fresh seeds of cv. CO7 and stored in cloth bag and polylined cloth bag under ambient condition for 8 months were significant. The mode of action of iodine in viability maintenance might be due to its effect on unsaturated fatty acids component of lipo-protein membranes. Free radical reactions and lipid peroxidatin are believed to be involved in the disruption of cell membranes leading to senescence and death (Pal and Basu, 1988 in rice). The halogenation treatment for harvest fresh seeds was highly effective in paddy

Table 3. Effect of Seed treatments and containers on plant height (cm) at 65 DAS number of productive tillers plant^{-1}, seed yield plot^{-1} (kg) and seed yield ha^{-1} (kg) of Bajra cv. Co 7

	Plant height at 65 DAS (cm)			No. of productive tillers			Seed yield plot^{-1} (kg)			Seed yield ha^{-1} (kg)		
	C_1	C_2	Mean	C_1	C_2	Mean	C_1	C_2	Mean	C_1	C_2	Mean
T_0	104.7	112.3	108.5	4	5	5	2.44	2.53	2.48	3050	3171	3111
T_1	130.3	136.0	133.2	5	5	5	2.56	2.69	2.62	3208	3367	3288
T_2	138.7	141.7	140.2	5	5	5	2.71	2.88	2.79	3396	3600	3498
T_3	144.7	145.7	145.2	6	6	6	2.97	2.98	2.97	3721	3733	3727
T_4	150.0	152.0	151.0	6	6	6	3.06	3.16	3.11	3829	3946	3888
T_5	152.7	155.0	153.9	6	6	6	3.02	3.18	3.10	3775	3979	3877
T_6	153.0	156.7	154.9	7	7	7	3.04	3.33	3.18	3800	4167	3984
Mean	139.2	142.8		6	6		2.82	2.91		3540	3709	

CD (P=0.05)

T	C	TC	T	C	TC	T	C	TC	T	C	TC
2.81	1.50	3.97	1.18	NS	1.67	0.083	0.044	0.117	32.88	17.57	46.50

T_0 - Control ;

T_1 - Thiram (dry) @ 4 g kg^{-1}

T_2 - Thiram (slurry) @ 4 g kg^{-1}

T_3 - Chlorination (dry) @ 3 g kg^{-1}

T_4 - Chlorination (slurry) @ 3 g kg^{-1}

T_5 - Iodination (dry) @ 3 g kg^{-1}

T_6 - Iodination (slurry) @ 3 g kg^{-1}

(Ravichandran and Dharmalingam, 1994 ; Nair, 1996) and true with the present experiment also. The results also revealed the superiority of polylined cloth bag which were moisture resistant.

The results of the field experiment on plant height and productive tillers showed an increase of 35 and 67 per cent for iodinated seeds over control. The grain yield was also significantly higher by 28 per cent. These results are in confirmation with the findings of Chitra (1995) in cotton and Nair (1996) in paddy. Higher productivity of halogenated seeds could be attributed majorly to its effect on maintenance of seed vigour rather than viability. In conclusion, the iodinated bajra seeds packed in polylined cloth bag could maintain high level of vigour and viability with high yield potential upto 8 months under ambient condition combined

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