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ffect of seed treatments and containers on the maintenance of germination nd seedling vigour of COPH 2 pigeonpea hybrid and its parental eeds in storage

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Abstract : In the storage study, COPH 2 pigeonpea hybrid and its parental seeds dried to 8 per cent moisture, treated with chlorine based halogen mixture (calcium oxychloride:calcium carbonates:arappu leaf powder (*Albizia amara*) @ 5:4:1 ratio) @ 3 g kg^{-1} of seeds and packed in high density polyvinyl bag maintained higher germination and seedling vigour during storage than control and carbaryl + bavistin treatments. Seeds of female parent could be stored safely upto 15, male parent for 24 and hybrid for 21 months, which indicated that male parent is a good storer, female parent is a poor storer and the hybrid behaved intermediary between male and female parents.

Keywords : COPH 2 pigeonpea hybrid and its parents, Seed treatments, Storage containers, Vigour and viability.

itroduction

Pigeonpea (*Cajanus cajan* (L.). Millsp.) ccupies an unique place for its use as seed nd food grains. It is commonly known as digram or arhar or tur, and one of the very mportant protein rich legume crops in India. he of the most important basic needs for igher productivity is quality seed characterised higher viability and vigour (Yaklich *et al.* 79). These two characters cannot be maintained storage especially in legumes, because they pidly deteriorate under ambient storage condition. uring storage, qualitative and quantitative losses pto 8.3 per cent have been reported in India. hlorine based halogen has been reported to ench the free radicals to prolong the storage fe of seeds (Basu, 1993).

laterials and Methods

The storage study was conducted with s CO 5 (female parent), ICPL 83027 (male rent) and COPH 2 pigeonpea hybrid at the epartment of Seed Science and Technology, mil Nadu Agricultural University, Coimbatore. wo treatments were given to the seeds *viz.* logen mixture @ 3g kg^{-1} of seed and bavistin 2 g + carbaryl 200 mg kg^{-1} of seed. The chlorine based halogen formulation was prepared by mixing the analytical quality of calcium oxychloride ($CaOCl_2$), dehydrated calcium carbonate ($CaCO_3$) and finely powdered dry arappu (*Albizia amara*) leaf powder in an air tight container at 5:4:1 ratio and allowed to impregnate for seven days before use. The treated seeds along with control were packed in cloth bag and high density polyvinyl bag separately and stored under ambient conditions prevailing at Coimbatore (26'C and 75% RH). Then, the seed samples were evaluated initially before storage and subsequently at tri-monthly intervals upto 24 months to assess the germination (ISTA, 1999) root and shoot length and vigour index (Abdul-Baki and Anderson, 1973). The collected data were analysed statistically as per the method of Panse and Sukhatme (1978).

Results and Discussion

In the present investigation, among the treatments, halogen treatment was able to maintain higher germination throughout the period of storage. The germination recorded after 24 months of storage by the seeds treated with halogen

Table 1. Influence of seed treatments, containers and period of storage on germination of COPH 2 pigeonpea hybrid and its parental seeds

Genotypes treatments	Cloth bag					HDPV bag			
	Months after storage								
	0	15	21	24	Mean	15	21	24	Mean
MS CO 5									
Control	96 (78.46)	63 (52.54)	55 (47.87)	51 (45.57)	61 (51.35)	67 (54.94)	60 (50.77)	56 (48.45)	71 (57.42)
Halogen mixture @ 3 g kg^{-1}	96 (78.46)	72 (58.05)	65 (53.73)	61 (51.53)	77 (61.34)	75 (60.00)	68 (55.55)	65 (53.73)	79 (62.79)
Bavistin 2 g + Carbaryl 200 mg kg^{-1}	96 (78.46)	69 (56.17)	63 (52.54)	57 (49.02)	74 (59.34)	72 (58.02)	65 (53.73)	63 (52.54)	77 (61.34)
Mean	96 (78.46)	67 (54.94)	60 (50.77)	56 (48.45)	71 (57.42)	70 (56.79)	63 (52.54)	60 (50.77)	75 (60.00)
ICPL 83027									
Control	100 (90.00)	78 (62.03)	71 (57.42)	65 (53.73)	81 (64.16)	80 (63.43)	73 (58.69)	69 (56.17)	83 (65.65)
Halogen mixture @ 3 g kg^{-1}	100.00 (90.00)	87 (68.87)	83 (65.65)	81 (64.16)	90 (71.57)	90 (71.57)	85 (67.21)	83 (65.65)	92 (73.57)
Bavistin 2 g + Carbaryl 200 mg kg^{-1}	100.00 (90.00)	83 (65.65)	78 (62.03)	75 (60.00)	87 (68.87)	86 (68.03)	80 (63.43)	78 (62.03)	89 (70.63)
Mean	100.00 (90.00)	81 (64.16)	76 (60.67)	71 (57.42)	85 (67.05)	84 (66.42)	78 (62.03)	74 (59.34)	87 (68.86)
COPH 2									
Control	97 (75.93)	71 (57.42)	63 (52.54)	61 (51.35)	75 (60.00)	74 (59.34)	65 (53.73)	63 (52.54)	77 (61.34)
Halogen mixture @ 3 g kg^{-1}	97 (75.93)	76 (78.46)	70 (59.79)	68 (95.55)	82 (64.90)	81 (64.16)	75 (60.00)	72 (58.02)	85 (67.21)
Bavistin 2 g + Carbaryl 200 mg kg^{-1}	97 (75.93)	77 (59.34)	71 (54.94)	67 (53.73)	81 (62.72)	80 (62.03)	73 (56.79)	70 (55.55)	83 (64.30)
Mean	97 (75.93)	74 (59.34)	68 (95.55)	64 (53.63)		77 (61.34)	70 (56.79)	67 (54.94)	
Grand mean	97 (75.93)	74 (59.34)	68 (95.55)	64 (53.63)		77 (61.34)	70 (56.79)	67 (54.94)	
CD (P=0.05)	T 0.230	G 0.178	C 0.146	P 0.309	TG 0.399	CP 0.437	TC 0.326	TP 0.691	GC 0.252
	GP 0.535	GCT 0.564	GCP 0.757	GTP 1.197	CTP 0.977	GCTP 1.693			

ible 2. Influence of seed treatments, containers and period of storage on root length (cm) of COPH 2 pigeonpea hybrid and its parental seeds

Genotypes treatments	Cloth bag					HDPV bag			
	Months after storage								
	0	15	21	24	Mean	15	21	24	Mean
IS CO5									
ontrol	17.0	13.9	13.1	12.4	14.5	14.2	13.0	12.8	14.7
alogen mixture @ 3 g kg^{-1}	17.5	15.0	14.0	13.7	15.4	14.7	13.8	13.4	15.3
avistin 2 g + Carbaryl 200mg kg^{-1}	17.4	14.5	13.5	13.1	15.0	15.1	14.3	14.0	15.6
lean	17.2	14.2	13.3	12.9	14.8	14.6	13.6	13.3	15.1
CPL 83027									
ontrol	17.0	13.9	13.1	12.4	14.5	14.2	13.0	12.8	14.7
logen mixture @ 3 g kg^{-1}	17.4	15.4	14.4	14.0	15.7	16.1	14.4	15.0	16.3
vistin 2 g + Carbaryl 200mg kg^{-1}	17.5	15.6	14.7	14.3	16.0	15.7	14.1	14.7	16.1
an	17.3	14.9	14.1	13.7	15.4	15.7	13.8	14.5	16.0
PH 2									
ntrol	17.0	13.9	13.1	12.4	14.5	14.2	13.0	12.8	14.7
logen mixture @ 3 g kg^{-1}	17.3	15.4	15.3	14.0	15.6	15.8	15.1	14.7	16.1
vistin 2 g + Carbaryl 200mg kg^{-1}	17.4	15.0	15.1	13.8	15.4	15.6	14.7	14.4	15.9
an	17.2	14.7	15.2	13.4	15.1	15.4	14.5	14.1	15.7
nd mean	17.2	14.9	14.1	13.7		15.2	14.0	14.0	
D (P=0.05)	T	G	C	P	TG	CP	TC	TP	GC
	0.025	0.019	0.016	0.033	0.043	0.047	0.035	0.074	0.027
	GP	GCT	GCP	GTP	CTP	GCTP			
	0.057	0.060	0.081	0.128	0.104	0.181			

ible 3. Influence of seed treatments, containers and period of storage on shoot length (cm) of COPH 2 pigeonpea hybrid and its parental seeds

Genotypes treatments	Cloth bag					HDPV bag			
	Months after storage								
	0	15	21	24	Mean	15	21	24	Mean
IS CO5									
ontrol	18.9	16.0	15.3	14.8	16.5	16.6	15.7	15.1	16.9
alogen mixture @ 3 g kg^{-1}	19.3	17.2	16.5	16.0	17.6	17.7	17.0	16.3	18.0
avistin 2 g + Carbaryl 200mg kg^{-1}	19.1	17.0	16.2	15.7	17.4	17.5	16.6	16.0	17.7
lean	19.1	16.7	16.0	15.5	17.1	17.2	16.3	15.7	17.5
CPL 83027									
ontrol	21.0	17.7	17.2	16.7	18.5	18.0	17.4	17.0	18.8
alogen mixture @ 3 g kg^{-1}	21.3	19.2	18.3	17.8	19.6	19.3	18.5	18.1	19.7
avistin 2 g + Carbaryl 200mg kg^{-1}	21.2	18.5	17.5	17.1	19.0	18.7	18.0	17.8	19.3
lean	21.1	18.2	17.5	17.1	18.9	18.5	17.8	17.5	19.1
COPH 2									
ontrol	20.3	16.5	15.4	15.1	17.3	16.9	15.7	15.4	17.5
alogen mixture @ 3 g kg^{-1}	20.6	17.8	16.8	16.4	18.4	18.1	17.1	16.7	18.6
avistin 2 g + Carbaryl 200mg kg^{-1}	20.4	17.5	16.4	16.0	18.1	17.7	16.8	16.5	18.4
lean	20.4	17.3	16.2	15.8	17.9	17.4	16.4	16.2	18.1
rand mean	20.2	17.4	16.6	16.1		17.7	16.8	16.5	
D (P=0.05)	T	G	C	P	TG	CP	TC	TP	GC
	0.044	0.034	0.028	0.059	0.077	0.084	0.063	0.133	0.049
	GP	GCT	GCP	GTP	CTP	GCTP			
	0.103	0.109	0.146	0.230	0.188	0.326			

Table 4. Influence of seed treatments, containers and period of storage on vigour index of pigeonpea hybrid COPH 2 and its parental seeds

Genotypes treatments	Cloth bag					HDPV bag			
	Months after storage								
	0	15	21	24	Mean	15	21	24	Mean
MS CO5									
Control	3748	3611	3569	3533	3629	3621	3576	3540	3639
Halogen mixture @ 3 g kg^{-1}	3750	3636	3592	3568	3655	3648	3601	3581	3663
Bavistin 2 g + Carbaryl 200mg kg^{-1}	3746	3628	3585	3560	3647	3638	3592	3569	3655
Mean	3747	3623	3580	3549	3641	3634	3588	3559	3650
ICPL 83027									
Control	3750	3638	3601	3577	3657	3646	3596	3572	3658
Halogen mixture @ 3 g kg^{-1}	3752	3655	3618	3603	3673	3662	3623	3610	3679
Bavistin 2 g + Carbaryl 200mg kg^{-1}	3748	3650	3615	3599	3669	3658	3618	3602	3673
Mean	3749	3646	3611	3589	3665	3654	3612	3595	3669
COPH 2									
Control	3751	3621	3573	3558	3751	3632	3583	3567	3649
Halogen mixture @ 3 g kg^{-1}	3750	3642	3618	3581	3750	3653	3611	3595	3669
Bavistin 2 g + Carbaryl 200mg kg^{-1}	3748	3632	3612	3572	3748	3641	3603	3588	3651
Mean	3746	3629	3603	3568	3746	3641	3599	3580	3655
Grand mean	3747	3633	3598	3580		3643	3633	3573	
CD (P=0.05)	T	G	C	P	TG	CP	TC	TP	GC
	7.49	8.62	8.62	8.62	16.98	15.01	17.64	18.27	17.41
	GP	GCT	GCP	GTP	CTP	GCTP			
	22.95	20.42	25.64	25.13	26.02	45.70			

mixture @ 3 g kg^{-1} of seed and stored in high density polyvinyl bag was 65, 83 and 72 per cent in female parent, male parent and hybrid respectively. While they were 61, 81 and 68 per cent in the seeds stored in cloth bag. The results revealed that halogen treated seeds could store better in high density polyvinyl bag than cloth bag, The same treatment and containers proved successful for the hybrid and its parents. However, there was a significant difference among them for storage ability. The results indicated that male parent was better storer than female parent and hybrid (Table 1).

Tappel (1973) indicated that the loss of membrane function may be one of the basic reason for senescence in biological system, which involves free radical chain propagation reaction and lipid peroxidation. Reaction of iodine with accessible carbon-carbon double bonds (C=C) would stabilize them and render them much less susceptible to peroxidative and free radical reactions. Rudrapal and Basu (1981) suggested that stabilization of unsaturated fatty acid components of lipoprotein membranes by halogen treatment possibly reduced lipid peroxidation and free radical reactions. The superior performance of halogenation in storage is supported by Rudrapal and Basu (1981) in mustard, Rudrapal and Nakamura (1988) in eggplant and radish, and Vasantha (1995) in COPH 1 hybrid pigeonpea. Compared to control, the seeds treated with bavistin and carbaryl was also proved better for safer storage of COPH 2 pigeon hybrid and parents. Higher germination in bavistin + carbaryl treated seeds might be due to antifungicidal property of bavistin and antiinsecticidal property of carbaryl. This result is in good agreement with the findings of Paramasivam (1990) in peas, Sujatha (1994) in cowpea and blackgram, and Gupta *et al.* (1999) in mungbean.

Seedling length, dry matter production and vigour index are the best indicator of seedling vigour. In the present study, halogen

ated seeds recorded the highest root (15.8) and shoot (18.7 cm) length and vigour dex (3667) than rest of the treatments, when ored in high density polyvinyl bag. Whereas same treatment in cloth bag recorded the west vigour values of 3584. The seeds of ale parent performed better than female parent d hybrid with respect to seedling vigour intenance in storage. Deterioration of seedling gour in stored seeds was associated with weakening cell membrane (Heydecker, 1972). This is good agreement with the results of the present dy. Nakka *et al.* (1999) in soybean and anthi (2001) in cowpea, also reported similar ults.

Thus, it is concluded that pigeonpea seeds ated with chlorine based halogen mixture 3 g kg^{-1} of seed and stored in high density lyvinyl bag could maintain the minimum d certification standard of 75 per cent germination to 15 months in female parent, 24 months male parent and 21 months in hybrid.

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