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SEED HYDROPRIMING–A NICE TOOL FOR ENHANCEMENT OF VIABILITY AND VIGOUR IN COWPEA

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SUMMARY

An effort was made to standardize the hydropriming technique in cowpea (var. CS-88) for which the equal weight of seed was soaked in three different volumes of water (half, equal and double the volume of seed weight) for five different durations of 1, 2, 4, 8 and 16 h. It was observed from this study that maximum germination (87.00%), faster speed of germination (16.80%), maximum vigour index-I (2539.10), field emergence index (9.74) and maximum seedling establishment (78.17%) with minimum electrical conductivity (1.03 mS/cm/seed) were observed in the seed which were soaked for 2 h in double the volume of water being sufficient to enhance the quality of cowpea seed. Hydropriming for 4, 8 and 16 h was observed to deteriorate the seed quality parameters.

Key words : Hydropriming, cowpea, seed quality, seed soaking, vigour, viability

Priming is the most important technique to improve rate of germination, seedling establishment, faster growth rate, early flowering, advancement of maturity, improve seedling vigour and growth, repair of cellular damage, weakening of barrier of embryo growth, increase protein synthesis and ultimately higher yield as compared to seed sown without priming. Hydropriming is a simple, economical and environment friendly seed priming technique in which seeds are soaked in water and dried before sowing to accomplish seed hydration (Soon *et al*., 2000). Although, a lot of studies have been conducted on hydropriming but reports on the benefits associated with hydropriming techniques in cowpea are missing and no comprehensive study has been made so far to find the most optimum technique for vigour enhancement in cowpea. Keeping in view the benefits of this technique, an effort was made to standardise the hydropriming technique in cowpea (var. CS-88) seeds.

MATERIALS AND METHODS

The seeds of cowpea (var. CS-88) were procured from the Department of GPB and the study was conducted in the laboratories and research farm of Department of Seed Science & Technology, CCS Haryana Agricultural University, Hisar during 2013.The initial seed moisture content (dry weight basis) was 9 per cent. Hydropriming was achieved using a weighed quantity of seeds (250 g) that was soaked in three different volumes of water (half, equal and double the volume of seed weight) in aerated tap water at room temperature for five different durations of 1, 2, 4, 8 and 16 h. The treated seeds were dried under fan until seed got the original moisture content. The treatments were evaluated by recording observations on standard germination test (ISTA, 2011), speed of germination (Maguire, 1962), vigour index-I (Abdul-Baki and Anderson, 1973), electrical conductivity (mS/cm/seed), field emergence index and seedling establishment (%). The data were analyzed in factorial CRD/RBD design to observe the effect of treatments over control.

RESULTS AND DISCUSSION

Significant differences were observed for all studied seed quality parameters which were influenced by the duration of soaking, volume of water used for soaking and this interaction. The study revealed that there was a significant improvement in germination percentage, speed of germination, vigour index-I, field emergence index & seedling establishment over control at 2 and 4 h soaking (Table 1). Hydropriming resulted in

TABLE 1
Effect of soaking duration and volume on seed quality parameters of cowpea

Soaking duration (h) (T)	Volume of water (V)							
	Half	Equal	Double	Mean	Half	Equal	Double	Mean
	Standard germination (%)				**Speed of germination**			
Control	72.33	72.33	72.33	72.33	13.12	13.12	13.12	13.12
1	80.00	82.33	83.33	81.89	14.16	14.47	14.55	14.39
2	85.33	87.00	87.00	86.44	16.21	16.62	16.80	16.54
4	77.00	73.00	70.00	73.33	13.69	13.36	12.73	13.26
8	73.33	58.67	42.67	58.22	13.44	12.12	8.37	11.31
16	69.33	38.33	24.67	44.11	12.86	7.67	5.32	8.62
C. D. (P=0.05)	V	T	V x T		V	T	V x T	
	1.18	1.66	2.88		0.06	0.09	0.15	
	Vigour index-I				**Electrical conductivity (mS/cm/seed)**			
Control	1711.73	1711.73	1711.73	1711.73	1.43	1.43	1.43	1.43
1	2034.47	2164.33	2243.20	2147.33	1.23	1.19	1.16	1.19
2	2359.03	2516.03	2539.10	2471.39	1.12	1.06	1.03	1.07
4	2001.67	1971.70	1910.47	1961.28	1.27	1.44	1.57	1.43
8	1785.40	1451.07	1047.18	1427.88	1.29	1.71	2.03	1.68
16	1556.37	865.50	562.54	994.80	1.55	2.04	2.37	1.99
C. D. (P=0.05)	V	T	V x T		V	T	V x T	
	36.09	51.04	88.41		0.04	0.06	0.10	
	Field emergence index				**Seedling establishment (%)**			
Control	7.41	7.41	7.41	7.41	66.33	66.33	66.33	66.33
1	8.34	9.03	8.98	8.78	75.17	77.83	78.17	77.06
2	9.27	9.39	9.74	9.46	80.50	82.50	83.83	82.28
4	8.01	7.09	6.93	7.34	72.00	67.00	65.00	68.00
8	7.02	6.56	5.72	6.43	68.33	57.17	36.33	53.94
16	6.94	5.49	4.62	5.68	64.00	31.50	21.50	39.00
C. D. (P=0.05)	V	T	V x T		V	T	V x T	
	0.09	0.12	0.21		1.24	1.76	3.05	

an improvement in germination from 72.33 (non-primed) to 87.00 per cent. But prolonged soaking of cowpea seeds (4 h & above) resulted in a decrease in germination, less than non-primed in most of the cases. Above 85 per cent germination could be achieved in all the volumes of water with 2 h soaking with maximum value (87.00%) in equal and double the volume of water followed by half volume (85.33%). The speed of germination was higher in 2 h soaking followed by 1 h soaking. Among the interactions, the speed was significantly higher than control (13-12) in 2 h soaking duration with maximum value with double the volume of water (16.80).

Among the duration, the mean value of vigour index-I was increased significantly due to hydropriming and the values were higher than control (1711.73) in 1, 2 and 4 h soaking. The maximum vigour index-I (2539.10) was observed in 2 h soaking with double the volume of water followed by equal volume (2516.03). The electrical conductivity was observed lowest in 2 h soaking of cowpea seed, whereas it was highest in 16 h soaking. The lowest value (1.03) was found in 2 h soaking with double the volume of water. Field emergence index was higher (9.74) in seeds soaked in double the volume of water for 2 h in comparison to the non-soaked seed (7.41). There was a decline after 2 h soaking and the lowest field emergence was observed in 16 h soaking. Overall, the seed quality resulted in the seedling establishment in the field. The highest seedling establishment was found in 2 h soaking in double the volume of water (83.83%) followed by equal water volume (82.50%). The soaking duration enhanced the seedling establishment up to 2 h of soaking, after that the seedling per cent started declining with increase in soaking duration.

Increase in vigour potential in the study was favoured by the results of Kaur *et al.* (2002) who reported that hydroprimed chickpea seeds increased three times vigour than control. The enhancement of the hydropriming treatments was due to the higher activities of amylase, invertase, sucrose synthatase and sucrose phosphate synthatase in the seedlings of hydroprimed chickpea seeds. The higher amylase activity in the shoots of hydroprimed seedlings increased the rapid hydrolysis of the shoot leading to more availability of glucose for shoot growth and which was confirmed by the low level of starch in shoots of primed seeds. It was also predicted that primed seed reduced the days requirement for germination from sowing. Imbibitional injury was first recognized by Powell and Mathews (1978) who predicted that it was due to higher rate of water imbibitions, the rapid inrush of water into embryonic cell of fast imbibing legume seeds caused physical disruption of the cell membrane.

It was concluded from the present study that both volume of water and duration of soaking were important in improving the vigour potential of cowpea seed. Two-hour soaking in double the volume of water was the best yielding highest percentage of germination, speed of germination, vigour index-I, field emergence index and seedling establishment with lowest electrical conductivity. The longer hours soaking resulted in degradation of seed quality which was supported by the lower value of standard germination, vigour index-I and other quality parameters studied with higher electrical conductivity.

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