

## Optimization of Hydropriming Techniques for Cowpea Seed Invigoration

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**ABSTRACT** Many presowing treatments are reported to improve seed invigoration in vegetable crops. An investigation was carried out to optimize the hydropriming techniques for vigour enhancement in cowpea (variety Anaswara) seeds by standardizing the durations of priming and volume of water to be used. Highest germination percentage (100), speed of germination (24.9), vigour index-1 (3540) and vigour index-2 (8.8) were observed when the seeds were soaked in double the volume of water for 2 h. Increase in germination and vigour in this treatment was due to the highest initial germination, maximum dry matter production and minimum number of days required for 50 per cent germination. Hydropriming for 8, 16 and 32 h (prolonged soaking) resulted in lower values in almost all the parameters and it can be considered as over priming. This study proved the importance of duration of soaking and volume of water in cowpea seed invigoration.

**Key words:** Hydropriming, Invigoration, Cowpea seeds

Seed vigour enhancement treatments have proven to be very effective to achieve rapid and uniform seed germination of several vegetable species [1]. Hydropriming is a simple, economical and environment friendly type of seed priming in which seeds are soaked in water and dried before sowing to accomplish seed hydration [2]. Though hydropriming is a simple technique, 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 considering the duration of soaking and volume of water required. Hence keeping in view the prospects of seed priming, a systematic study was attempted with different volumes of water for different durations to optimize the hydropriming treatments for germination and vigour enhancement in cowpea.

### MATERIALS AND METHODS

The study was carried out in the seed research

laboratory of the Department of Olericulture, Kerala Agricultural University, Thrissur during December 2005. Seeds of cowpea, 'Variety Anaswara' released by Kerala Agricultural University was used for standardizing the hydropriming techniques. Fine cleaned and graded cowpea seeds were soaked in 3 different volumes of water (half, equal and double the volume of seed) for five different durations of 2, 4, 8, 16 and 32h. The treated seeds were dried under electrical fan [3] until seeds got original moisture content. The treatment effect was evaluated by testing germination percentage [4], speed of germination [5] and determination of vigour index [6]. The data were subjected to CRD analysis to establish the effects of treatments over control.

### RESULTS AND DISCUSSION

Results revealed that all studied parameters were influenced by the duration of soaking, volume of water used for soaking and their interaction. The present investigation on hydropriming revealed 35

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per cent improvement in all germination parameters over control at 2 and 4h soaking. Hardly any of the treatment of prolonged duration found significantly higher than untreated seeds. Among the quantity of water taken for soaking, half the volume of water registered higher mean values for all the parameters except days to 50 per cent germination and percentage of radicle protrusion where these values were found to be lower as compared to equal and double the volume of water. Germination percentage, speed of germination, vigour index-1 and vigour index-2 as influenced by different hydropriming treatments are presented in Table 1.

Hydropriming resulted in an increase in germination from 68 (non primed) to 100 per cent. But prolonged soaking of seeds (8h and above) resulted in a decrease in germination, lesser than control in most of the cases. Above 90 per cent germination could be obtained in all the volumes of water with 2h and 4h duration with maximum value (100%) in 2h soaking with double the volume of water. This was followed by 4h soaking with half and equal volume of water (98 % germination) and double the volume of water (95 % germination). Increase in germination was supported by the number of days taken for achieving 50 per cent germination in the present study. Fifty per cent germination was achieved earlier (4 days) in all the volumes of water at 2h and 4h soaking period whereas it took longer days in other soaking durations (Table 1).

Among the durations, the mean value for speed of germination was higher in 2h (20.9) and 4h (20.7) soaking. Considering the interaction of soaking durations and volume of water, speed of germination was significantly higher than control (14.1) in 2h and 4h soaking duration with maximum values in 2h soaking with double the volume of water (24.9) and 4h soaking with equal volume of water (24.3).

Vigour index-1 increased significantly due to priming and the values were higher than control (1958) in almost all the cases except 8h soaking with equal and double the volume of water and 32h soaking with double the volume of water. Maximum vigour index-1 (3540) was observed in 2h soaking with double the volume of water

followed by 4h soaking with half (3365) and equal (3334) volume of water (Table 1).

Vigour index-2 was the highest (8.8) in seeds soaked in double the volume of water for 2h whereas non primed seeds recorded a vigour index-2 of 3.25. Vigour index-2 was higher than control in almost all except two treatments (8h soaking in equal volume of water and 32h soaking in double the volume of water).

Increase in values of both the vigour indices in the present study was supported by the results of Kaur *et al.* [7] who reported that hydroprimed chickpea seeds showed three fold more vigour than non primed seeds. They also suggested that superiority of the hydropriming treatments was due to the higher activities of amylase, invertase, sucrose synthetase and sucrose phosphate synthetase in the seedlings of hydroprimed chickpea seeds. The higher amylase activity in shoots of hydroprimed seedlings enhanced the rapid hydrolysis or transitory starch of the shoot leading to more availability of glucose for shoot growth and this was confirmed by the low level of starch in shoots of primed seedlings. It is also known that priming brings the seeds to the next phase of germination by reducing the days required for germination from sowing [8].

There was no radicle protrusion in 2, 4 and 8h soaking and beyond that, higher percentage of radicle protrusion was found with maximum values in longer soaking duration (Table 1). Highest values of 22 and 20 were recorded in 32h soaking in equal and double the volume of water respectively. It was also found that, in the present study, no treatment of prolonged duration (8, 16 and 32h) performed better than untreated seeds. Ineffectiveness of this prolonged soaking may be due to higher rate of radicle protrusion and imbibitional injury, which is directly related with rate of water imbibition regulating seed germination. Imbibitional injury was first recognized by Powell and Mathews [9] who pointed out that it is due to higher rate of water imbibition, the rapid inrush of water into embryonic cell of fast imbibing legume seeds, leading to physical disruption of the cell membrane. According to Sefa and Stanley [10], hilum size was the most important controller of rate of water

Table 1. Effect of hydropriming treatments on germination percentage, speed of germination, days required for 50 per cent germination, vigour index-1, vigour index-2 and percentage of radicle protrusion

Duration(h)	Germination percentage				Speed of germination				Days to 50 % germination						
	Seed water ratio		Control		Seed water ratio		Control		Seed water ratio		Control				
	1:1/2	1:1	1:2	Control	1:1/2	1:1	1:2	Control	1:1/2	1:1	1:2	Control			
2	93	93	100	68	89	22.0	22.6	24.9	14.1	20.9	4.0	4.0	4.0	5.5	4.4
4	98	98	95	68	90	20.9	24.3	23.6	14.1	20.7	4.0	4.0	4.0	5.5	4.4
8	78	50	58	68	64	20.7	10.8	11.8	14.1	14.4	4.5	6.0	5.5	5.5	5.4
16	80	65	68	68	70	14.4	13.4	13.7	14.1	13.9	5.0	6.0	5.5	5.5	5.5
32	83	63	65	68	70	13.9	10.8	10.9	14.1	12.4	6.0	6.0	6.0	5.5	5.9
Mean	86	74	77	68	76	18.4	16.4	17.0	14.1	16.5	4.7	5.2	5.0	5.5	5.1
CD						T	D	TxD			T	D	TxD		
						1.6	2.1	3.6			0.3	0.4	0.6		
T = Treatment D = Duration															
Duration(h)	Vigour index-1				Vigour index-2				Percentage of radicle protrusion						
	Seed water ratio		Control		Seed water ratio		Control		Seed water ratio		Control				
	1:1/2	1:1	1:2	Control	1:1/2	1:1	1:2	Control	1:1/2	1:1	1:2	Control			
2	2865	3307	3540	1958	2918	6.11	5.57	8.80	3.25	5.93	0	0	0	NIL	0
4	3365	3334	2976	1958	2908	7.90	5.84	3.80	3.25	5.20	0	0	0	NIL	0
8	2109	1374	1520	1958	1740	3.94	2.05	4.13	3.25	3.34	0	0	0	NIL	0
16	2259	2075	2303	1958	2149	4.28	5.15	3.98	3.25	4.17	10	17	13	NIL	10
32	2474	2179	1908	1958	2130	5.22	4.66	3.12	3.25	4.06	8	22	20	NIL	12.5
Mean	2614	2454	2449	1958	2369	5.49	4.65	4.77	3.25	4.54	3.6	7.8	6.6	NIL	4.5
CD						T	D	TxD			T	D	TxD		
						1.15	1.48	2.56			0.3	0.4	0.6		
T = Treatment D = Duration															

imbibition in cowpea (*Vigna unguiculata*) seeds and the seeds absorbed nearly 80 per cent water in the first three hour soaking.

From this study, it was understood that both volume of water and duration of soaking is important in enhancing the vigour of cowpea seeds. Results clearly indicated that 2h soaking in double the volume of water is the best, giving highest percentage of germination, speed of germination, vigour index-1 and vigour index-2 (100, 24.9, 3540 and 8.8 respectively). This was due to higher initial germination, dry matter production and early attainment of 50 per cent germination. Longer hours of soaking (8h and above) resulted in lower values for all the parameters studied.

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