Seed Res. 49 (2): 98-101, December, 2021

Improvement of Seedling Vigour by Chemopriming in Cashew

MEERA MANJUSHA AV* AND PK RETHEESH

Regional Agricultural Research Station, Kerala Agricultural University,
Pilicode, Kasaragod, Kerala-671310, India
*Meera.manjusha@kau.in

(Received: August 2021, Revised: September 2021, Accepted: December 2021)

ABSTRACT: Cashew (*Anacardium occidentale* L.), is mainly propagated through soft wood grafting. Success of grafting and health of the graft is profoundly influenced by the vigour of root stock. In many crops, seed priming has been reported as an effective technique to produce vigorous seedlings. Hence a study was conducted at Kerala Agricultural University Regional Agricultural Research Station (North zone), Pilicode, to know the influence of different seed priming agents on growth and vigour of the rootstock seedlings of cashew. Seeds of the cashew variety: Priyanka, which is popular in the region, was used for raising the root stock seedlings. There were significant differences on the percentage of germination of seeds among the treatments. While the percentage of germination was highest for the seeds primed with KCl 0.5%, that was lowest for the seeds primed with urea 5% and 10%. Germination rate was highest for KNO_3 3%. Differential responses to treatments were noticed as days progressed. At 15 days after sowing (DAS), seed vigour index (SVI) was highest with KNO_3 1% and 3% treatments, though the seedling length, girth and number of leaves did not vary significantly. At 30 DAS the seedling length was highest with KCl 1% and stout plants were observed with those raised from the non-primed seeds and seeds primed with distilled water for 24h. SVI was highest with the seeds primed with KCl 0.5% and distilled water 12h. At 45 DAS, the treatments using urea 5% and 10%, KNO_3 3% and non-primed seeds have resulted in taller seedlings. Whereas non treated seeds and seeds primed with distilled water for 12h had higher girth. Highest number of leaves was observed when priming the seeds with distilled water for 24h, Urea 10% and KNO_3 3%. SVI was highest with treatments of KNO_3 3%, non-primed seeds, distilled water for 12h and urea 10%. Since seed priming with KNO_3 3% resulted higher SVI, seedling length and increased number of leaves that could be recommended for obtaining good quality rootstocks in cashew.

Keywords: Cashew, Priming, KNO_3, Seedling vigour

Cashew (*Anacardium occidentale L.*) is an important export oriented cash crop of India. As cashew is a highly profitable crop which requires less managerial attentions, its cultivation is being extended to non-traditional areas also which demands quality planting material in less time and huge quantity. Cashew is mainly propagated through softwood grafting. Vigour of root stock and scion are the most important factors that determine the success of grafting and field survival. The effectiveness of seed priming in improving the germination and emergence in many crops has already been proven. Cashew has shown increased seedling length and vigour when subjected to hormopriming with gibberellic acid of 200 ppm strength [1]. Early attaining of desired plant height and girth by the seedlings could possibly shorten the production cycle of grafts. This is particularly relevant to cashew, as heavy casualties are often noticed during graft establishment on account of low vigour of the rootstock seedlings. Hence, to find out an appropriate method to overcome this problem, a seed priming experimental study was conducted at the Kerala Agricultural University Regional Agricultural Research Station (North zone), Pilicode, Kasaragod district. The effectiveness of various seed priming agents on the vigour and biometric characteristics of the cashew rootstock seedlings were studied in this experiment.

MATERIALS AND METHODS

An experiment was conducted at the horticultural nursery of the Regional Agricultural Research Station, Pilicode, in completely randomized design with eight treatments + one control (non primed seeds) and three replications. Cashew (variety: Priyanka) seeds having uniform age, size and weight were selected carefully for sowing. Before sowing, the seeds were primed with specific priming solutions. The priming solutions used for the experiment

were KCl, KNO_3, Urea and distilled water each for 12 h and distilled water for 24 h. After priming, the seeds were washed twice with distilled water and sown with stalk end facing upwards in potting mixture filled in black polythene bags of size 20cm × 15cm. The potting mixture was prepared by mixing equal quantities of sand, soil and well decomposed farm yard manure in 1:1:1 ratio. Each replication had 55 such poly bags. Observations on germination percentage, germination rate, seedling length, seedling girth, number of leaves per seedling and vigour index were recorded at 15, 30, and 45 days after sowing (DAS).Germination rate was calculated according to the daily germination percentage data, based on the following formula [2].

$$GR = \frac{\Sigma n}{Dn}$$

Where, GR = germination rate, n = number of seeds germinated on a specific day, and D = number of days from the start of experiment.

Germination percentage was determined at the 15, 30 and 45 DAS till 65 days from start of the experiment, based on the following formula [3].

$$G\% = \frac{n}{N}$$

Where, G% = Germination percentage, n = number of seeds germinated, and N = total number of seeds planted.

Seedling Vigour Index **(**SVI**)** as defined by Abdul Baki and Anderson was calculated using following formula [4].

$$SVI = \frac{\text{Seed germination\%} \times \text{Average seedling length}}{100}$$

The number of leaves at 15, 30 and 45 DAS was determined by computing the average of the leaf count of ten random seedlings, per replication. The seedling height at 15, 30 and 45 DAS was also recorded in the same manner. Whenever the observation was made in terms of percentage, those data were transformed into arc sine values for statistical analysis. Critical difference values were computed at 5% probability wherever the F test was significant.

RESULTS AND DISCUSSION

At 15 DAS, the germination percentage was highest in KNO_3 3% treated seeds, followed by KNO_3 1% and KCl 0.5% (Table 1). The germination percentage improved considerably by 30 DAS for all the treatments and for this time the highest germination percentage was observed with KCl 0.5% and distilled water soaking for 12 h followed by KNO_3 3%. The germination percentage

Table 1. Effect of seed priming treatments on germination characteristics in cashew var. Priyanka

Treatments	Germination,%			Germination rate
	15 DAS	30 DAS	45 DAS	
KCl 0.5%	54.55	83.64	83.64	359.61
	(47.61)	(66.24)	(66.23)	
KCl 1.0%	14.55	69.09	69.09	172.22
	(22.40)	(56.22)	(56.22)	
KNO_3 1%	54.55	76.36	76.36	344.47
	(47.60)	(60.91)	(60.91)	
KNO_3 3%	56.36	78.18	78.18	438.17
	(48.65)	(62.15)	(62.15)	
Urea 5%	49.09	65.45	65.45	254.23
	(44.48)	(54.06)	(54.06)	
Urea 10%	36.36	63.64	65.45	222.56
	(37.08)	(52.92)	(54.06)	
Distilled water 12hrs	38.18	81.82	81.82	343.17
	(38.16)	(64.76)	(64.76)	
Distilled water 24hrs	29.09	74.55	76.36	255.31
	(32.64)	(59.69)	(60.91)	
Direct sowing	48.33	76.36	78.18	348.10
	(44.04)	(60.91)	(62.15)	
Mean	42.34	74.34	74.95	303.70
F Test	**	**	**	**
CD (P=0.05)	1.88	2.63	2.62	8.93

Table 2. Effect of seed priming treatments on seedling vigour in cashew var. Priyanka

Treatments	Seedling vigour index		
	15 DAS	30 DAS	45 DAS
KCl 0.5%	475.09	2012.74	2356.79
KCl 1.0%	125.09	2609.49	2697.77
KNO_3 1%	559.27	2320.95	2428.62
KNO_3 3%	541.73	2403.31	3791.82
Urea 5%	498.60	1844.07	3342.04
Urea 10%	360.81	1962.12	3213.16
Distilled water 12hrs	350.81	2515.91	3600.00
Distilled water 24hrs	284.12	2270.66	3304.51
Direct sowing	386.54	2201.31	3741.26
Mean	398.01	2237.84	3164.00
F Test	**	**	**
CD (P=0.05)	129.41	184.45	611.17

increased marginally with the time period of 45 DAS. At 45 DAS also the percentage of germination exhibited the same trend as that of 30 DAS. When germination rate was considered, the seeds treated with KNO_3 3% had the highest value, which was followed by KNO_3 1% and non treated seeds (control). Rest of the treatments can be reckoned as not effective in improving the germination rate. Germination rate is considered to be a better indicator since it reflects on both number and speed of germination. Seed priming exhibited increased germination rate, greater germination uniformity and total germination percent in paddy [5]. These favourable results of seed priming can be attributed to the occurrence of certain metabolic repair during the imbibition [6] like buildup of germination-enhancing metabolites [7] and osmotic adjustment [8], and, for seeds that are not re dried after treatment, a simple reduction in imbibition lag time [8]. Salts like KNO_3 reduce water potential of the solutions in which seeds are steeped and deplete the water content of seeds. This makes the seeds, to proceed to the first stage of germination, to rapidly imbibe water with no lag after sowing [9].

Seedling vigour index (SVI) at 15 DAS was highest in KNO_3 1%, KNO_3 3% and KCl 0.5% primed seeds. At 30 DAS, SVI was highest in KNO_3 3% primed seedlings and in those primed with distilled water for 12 hours and direct sowing treatments. At 45 DAS SVI was highest for KNO_3 3%, Distilled water for 12 h and Urea 5 and 10% (Table 2).

Regarding biometric characters of seedling, highest seedling height was recorded in KNO_3 1% and Urea 5% at 15 DAS, KCl 1% at 30 DAS and Urea 5 and 10% and KNO_3 3% at 45 DAS (Table 3). Regarding seedling girth, at 15 DAS all the treatments were statistically on par. Distilled water for 24 hours and direct sowing has resulted in higher girth at 30 DAS. At 45 DAS all the treatments except KCl 0.5%, KNO_3 1% and 3%, were superior and statistically on par. Number of leaves did not show any significant differences at 15and 30 DAS. At 45 DAS, all the treatments were on par except KCl 0.5% and KNO_3 1% which resulted lower number of leaves. Different chemicals that can be used as osmotica in seed priming; have got different characteristics and levels of efficacy which vary according to the crops as well [10]. KNO_3 and KCl had improved seed quality parameters in paddy [5], black gram [11], mustard and radish [12] and many other crops. Priming with GA_3 200, 400ppm Thiourea 5000 and 10000ppm, KH_2PO_4 2500 and 5000 ppm, Kinetin 20 and 40ppm, NaCl 10% and NaH_2PO_4 1000ppm

Table 3. Effect of seed priming treatments on seedling biometric characteristics in cashew var. Priyanka

Treatments	Seedling height, cm			Seedling girth, cm			Number of leaves		
	15 DAS	30 DAS	45 DAS	15 DAS	30 DAS	45 DAS	15 DAS	30 DAS	45 DAS
KCl 0.5%	8.71	24.07	28.18	2.08	2.01	2.55	4.13	7.15	9.12
KCl 1.0%	8.60	37.77	39.05	2.10	1.98	2.79	4.25	7.60	9.76
KNO_3 1%	10.25	30.39	31.80	2.13	1.95	2.61	4.40	7.13	7.35
KNO_3 3%	9.61	30.74	48.50	1.95	1.91	2.55	4.50	7.37	11.47
Urea 5%	10.16	28.17	51.06	1.93	2.15	2.93	4.40	7.73	10.88
Urea 10%	9.92	30.83	49.09	2.07	1.82	2.90	4.28	7.47	11.53
Distilled water 12hrs	9.19	30.75	44.00	1.95	2.01	3.07	3.89	7.23	11.00
Distilled water 24hrs	9.77	30.46	43.27	2.08	2.60	2.72	4.43	7.10	11.73
Direct sowing	8.00	28.83	47.85	1.84	2.64	3.08	4.20	7.20	11.10
Mean	9.36	30.22	42.53	2.01	2.12	2.80	4.28	7.33	10.44
F Test	NS	**	**	NS	**	*	NS	NS	**
CD (P=0.05)	-	2.36	7.94	NS	0.26	0.37	NS	-	2.13

had increased the storability of cashew seeds up to 13 months [13].

CONCLUSION

As seed priming with $KNO_3$3% for 12 h resulted in seedlings with higher SVI, seedling length and more number of leaves, it could be recommended for obtaining good quality rootstocks for the propagation of cashew.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the Associate Director, RARS Pilicode for extending the technical support and facilities for conducting the experiment.

REFERENCES

1. LAKSHMIPATHI ADIGA JD KALAIVANAN D AND SAROJ PL (2013). Response of cashew (*Anacardium occidentale* L) to osmopriming with gibberellic acid (GA_3). *Journal of Plantation Crops,* **45(3)**: 455-459.
2. MOHAMMADI GR (2009). The influence of NaCl priming on seed germination and seedling growth of canola (*Brassica napus* L.) under salinity conditions. *American Eurasian Journal of Agriculture and Environmental Science*, **5**: 696-700.
3. BAJEHBAJ AA (2010). The effects of NaCl priming on salt tolerance in sunflower germination and seedling grown under salinity conditions. *African Journal of Biotechnology,* **12**: 1764-1770.
4. KIM SH CHOE ZR KANG JH COPELAND LO AND ELIAS SG (1994). Multiple seed vigour indices to predict field emergence and performance of barley. *Seed Science and Technology*, **22**: 29-38.
5. BASRA SMA FAROOQ M HAFEEZ K. AND AHMED N (2004). Osmohardening: A new technique for rice seed invigoration. *International Rice Research Notes (IRRI, Philippines)* **29**: 80-81.
6. BRAY CM DAVISON, PA, ASHRAF M AND TAYLOR, RM (1989). Biochemical changes during osmopriming of leek seeds. *Annals of Botany,* **63**: 185-193.
7. BASRA SMA FAROOQ M AND TABASSUM R (2005). Physiological and biochemical aspects of seed vigor enhancement treatments in fine rice (*Oryza sativa* L.). *Seed Science and Technology*, **33**: 25-29.
8. BRADFORD KJ (1986). Manipulation of seed water relations via osmotic priming to improve germination under stress conditions. *Horticultural Science Alexandria,* **21**: 1105-1112.
9. HEYDECKER WJ HEYDECKER J HIGGINS AND GULLIVER K (1973). Accelerated germination by osmotic seed treatment. *Nature,* **246**: 42-46.
10. TAYLOR, AG ALLEN PS BENNETT MA BRADFORD KJ BURRIS JS AND MISRA MK (1998). Seed enhancements. *Seed Science Re*views **8**: 254-256.
11. SRIMATHI P AND SUJATHA K (2006). Chemical Priming for improved seed yield and quality in blackgram (*Vigna mungo* (L.) Hepper) Var. Co 5. *Plant Archives,* **6**: 177-180.
12. NETHAJI C (2006). Seed priming techniques to improve seed vigour of mustard and radish. *M.Sc. (Ag) Thesis*, Tamil Nadu Agricultural University, Coimbatore. p 123.
13. MINI C AND JOSE MATHEW (2008). Effect of priming on seed viability and vigour in Cashew (*Anacardium occidentale* L.). *Seed Research,* **36**: 37-41.