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Response of Different Growth Regulators and Seed Treatments of Cashew Under Mist Condition

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Abstract

An experiment was carried out to study the response of different growth regulators and seed treatments of cashew under mist condition. The study revealed that soaked in water for 48 hrs + 100 ppm GA_3 recorded highest germination percentage (95.83), growth and root parameters *viz.*, seedling height (29.01 cm), seedling girth (4.23 cm), number of leaves (23.78), intermodal length (7.37 cm), dry matter of shoot (48.36%) and shoot to root ratio (6.29).The four varieties showed a wide variation among themselves with respect to the growth and root characters. However, variety BPP8 recorded better response to the treatment combinations compared to the other varieties under mist conditions. The study concluded seed treatment of 48 hrs water soaking + 100 ppm GA_3 was found to be the best treatment in producing vigorous seedlings in different varieties of cashew.

Key words: Growth regulators, Seed treatments, Seedling vigour, Cashew

Introduction

Cashew (*Anacardiumoccidentale* L.) is a tropical evergreen hardy tree crop. This crop was introduced into India during the 16th century as a soil conservation crop. Among the major

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horticultural and plantation crops, cashew plays an important role in earning the foreign exchange through its export. Seed germination enhancement technologies based on pre-sowing seed infusion have attracted considerable interest in both seed physiological research and seed industry, where they have been commercialized (Sivasubramaniam*et al.,* 2012). The use of seed enhancement techniques is not new to agriculture and earlier practices have been described for such treatments (Kalyani *et al.,* 2009). Enhancement of nut germination and seedling characteristic can be improved through use of GA_3, IBA and NAA to overcome the seed dormancy, promotes germination, internodal length, hypocotyl growth and cell division in cambial zone, increase the size of leaves and root length. Seedlings with good root and shoot systems are essential for withstanding normal transplantation shock or drought and better establishment of cashew seedling. Based on above studies, an experiment was initiated to improved germination and seedling growth in cashew.

Material and Methods

The present investigation was conducted at College of Horticulture, Rajendranagar, Hyderabad. The experiment was laid out on Completely Randomized Block Design with seven treatments, four varieties (BPP-5, BPP-8, VRI-2, and H-1), two conditions and three replications. The experimental site is situated at latitude of $17^0$20' N and longitude of $78^0$25'E, an altitude of 530.38 meters above mean sea level. The treatments *viz.*,T_1 (Soaking in water for 24 hrs), T_2 (Soaking in water for 48 hrs), T_3 (Storing in moist gunny bag for 24 hrs), T_4 (Soaking in water for 24 hrs + 100 ppm GA_3), T_5 (Soaking in water for 24 hrs + 100 ppm NAA), T_6 (4 Soaking in water for 24 hrs + 100 ppm IBA), T_7 (Soaking in water for 48 hrs + 100 ppm GA_3), T_8 (Soaking in water for 48 hrs + 100 ppm NAA), T_9 (Soaking in water for 48 hrs + 100 ppm IBA), T_{10} (Storing in moist gunny bag for 24 hrs + 100 ppm GA_3), T_{11}(Storing in moist gunny bag for 24

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hrs + 100 ppm NAA), T_{12} (Storing in moist gunny bag for 24 hrs + 100 ppm IBA)and T_{13} served as a control without any treatment impose. Per-treated cashew seeds were sown in polythene bag size 25 x 15 cm and 300 gauge thickness which were filled with 2/3rdof the potting mixture and cashew seeds were sown vertically with the tip facing upward and the seeds are covered with 1/3rd of the potting mixture.The percentage of germination was calculated as per Stephan, 2008. The observations *viz.,* seedling height (cm), seedling girth (cm), number of leaves and intermodal length (cm) were recorded at 120 days of sowing. Dry matter % of shoot and dry matter % of root were recorded at 120 days of sowing by keeping in brown paper bags and dried in hot air oven at 70^{0}C temperatures till constant weight was obtained. Each dried sample was then weighed on an electronic pan balance and average dry weight of shoot/ root was calculated of each shoot/root and shoot to root ratio was obtained as per Mulanax, 2005. Statistical analysis was done by using OPSTAT software package.

Results and Discussion

The result revealed that there was significant different among the treatment combinations and the variety under mist condition (Table 1). Among the different treatments, treatment imposed with soaking in water 48 hrs + 100 ppm GA_3(T_7) recorded maximum germination percentage (95.83) followed by soaking in water for 24 hrs + 100 ppm GA_3 (T_4) (95.83) compared to lowest recorded in control (75.00).The variety BPP-8 recorded significantly highergermination percentage (92.56) followed by H-1(92.30) than the other two varieties. The growth parameters viz., seedling height (29.01 cm), seedling girth (4.23 cm), number of leaves (23.78) and internodal length (7.37) were higher in treatment combinations of water soaking in water 48 hrs + 100 ppm GA_3 followed byT_4 (26.37 cm, 3.93 cm, 22.82 and 6.98 cm,

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respectively). However, among varieties, BPP-8 recorded better response with respect to growth parameters compared to the other varieties.

The higher rate of germination percentage might be due to combined effect of water soaking and GA_3which might have accelerated the early germination by enhancing the synergistic effects of GA3 on sufficient amount of auxins in cashew seeds and hence they respond well to gibberellins (Shanmugavelu, 1979) whereas, water absorption might have lead to activation of enzymes, hydrolysis of food material and resulted in maximum germination percentage supported by Araujo *et al.* (2009) and Oblisami*et al.* (1979).Moreover, the mist condition provides higher per cent of humidity and temperature which might have hasten the faster seed germination and seedling growth. The results are supported by Amoah (2005) and Sivasubramaniam*et al.* (2012) where cashew seeds treated with water soak for 48 hours and GA_3 at 100 ppm gave better germination and growth. The increase in seedling growth parameters with GA3 might be related to the fact that GA_3 promote stem and shoot elongation through the increase of both cell division and from internodes elongation in higher plant. The results were also supported by Nabil *et al.* (2007) and Hopkins and Huner (2004), in higher plants.

There was significant different recorded among the treatment combinations and the variety with respect to the root characters (Table 2). The highest dry matter percentage of shoot and shoot to root ratio were recorded by treatment, soaking in water for 48 hrs+ 100 ppm GA_3 (48.36 and 6.29, respectively) followed by treatment T_4 (soaking in water for 24 hr+ 100 ppm GA_3) (44.61 and 5.72, respectively). However, treatment soaking in water for 48 hrs + 100 ppm IBA (T_9) recorded higher dry matter percentage of root (30.54) followed by soaking in water for 24 hrs + 100 ppm IBA (T_6) (28.48) compared to control (18.43). The significant variation among

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the four varietieswas also recorded with regards to the root parameters. Among the four, BPP-8 and BPP-5 recorded better response in root characters compared to VRI-2 and H-1.

The larger size nuts had the tendency of faster growth as evidenced in the larger dry matter yield generation (Adeyemi *et al.*, 2011).These larger size nuts had higher vegetative growth which might be due to large food reserved in the cotyledons of seeds. The result also indicates that higher vegetative growth make significant contribution to dry weight of seedlings Pugalendhi*et al.* (1990) in cashew.Similar findings were supported by Nabil *et al.* (2007) and Walase*et al.* (2007).The increased in fresh weight of seedling might be due to enhancement of shoot length and number of leaves and stem girth by GA_3. As fresh weight increased, it simultaneously increased the dry matter % of shoot (Choudhary and Chakrawar, 1982) in rangpur lime. The imposed of combined treatments both water and GA_3 might have influenced more vegetative growth in terms of plant height, stem diameter, leaves number and internodal length which ultimately resulted in increased in shoot to root ratio. The results were also supported by Sivasubramaniam*et al.* (2012) and Mini and Mathew (2008) in cashew.

Conclusion

To conclude, the study revealed that among the different treatment combinations T_7 (soaking in water for 48 hrs + 100 ppm GA_3) recorded the best result followed by T_4 (soaking in water for 24 hrs + 100 ppm GA_3) to produce vigorous cashew seedling under mist chamber condition.

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Table 1. Effect of different growth regulators and seed treatments on growth parameters on cashew under mist condition

Treatment	Germination (%)					Seedling height (cm)					Seedling girth (cm)				
	V1	V2	V3	V4	Mean	V1	V2	V3	V4	Mean	V1	V2	V3	V4	Mean
T_1	76.66	93.33	93.33	93.33	89.16	22.79	26.86	23.10	20.54	23.32	3.30	3.66	3.53	3.46	3.49
T_2	76.66	100.00	96.66	93.33	91.66	25.44	28.53	24.84	22.51	25.33	3.93	3.70	3.76	3.70	3.77
T_3	80.00	96.66	96.66	76.66	87.50	24.65	27.55	23.64	21.81	24.41	3.60	3.46	3.46	3.43	3.49
T_4	83.33	100.00	96.66	100.00	95.00	26.18	31.81	25.56	21.92	26.37	4.16	4.13	3.40	4.03	3.93
T_5	80.00	80.00	86.66	86.66	83.33	24.59	25.96	23.99	21.77	24.08	3.46	3.86	3.11	3.36	3.45
T_6	80.00	93.33	73.33	93.33	85.00	24.11	29.31	23.59	20.45	24.37	3.66	3.50	3.48	3.60	3.56
T_7	83.33	100.00	100.00	100.00	95.83	28.54	32.60	28.55	26.34	29.01	4.23	4.50	4.03	4.16	4.23
T_8	80.00	90.00	90.00	93.33	88.33	24.46	28.49	23.54	19.73	24.06	3.70	3.40	3.03	3.63	3.44
T_9	76.66	93.33	96.66	86.66	88.33	25.23	30.69	24.16	21.54	25.41	3.40	3.80	2.99	3.63	3.46
T_{10}	80.00	100.00	96.66	100.00	94.17	26.76	29.23	24.57	23.26	25.96	3.50	3.63	3.40	3.46	3.50
T_{11}	76.66	96.66	93.33	96.66	90.83	25.68	27.57	25.45	21.45	25.04	3.33	3.50	3.30	3.66	3.45
T_{12}	80.00	93.33	96.66	96.66	91.66	26.08	29.13	24.86	24.83	26.23	3.50	3.90	3.33	3.63	3.59
T_{13}	73.33	66.66	76.66	83.33	75.00	22.06	25.58	22.51	20.00	22.54	3.20	3.30	3.30	3.46	3.32
Mean	78.97	92.56	91.79	92.30		25.12	28.72	24.49	22.01		3.61	3.72	3.39	3.63	
	V	T		V x T		V	T		V x T		V	T		V x T	
SEm±	1.24	2.23		4.47		0.21	0.38		0.77		0.03	0.05		0.11	
CD(P=0.05)	3.46	6.23		NS		0.59	1.07		NS		0.08	0.15		0.31	

[NS=Non Significant; T_1= Soaking in water for 24 hrs; T_2= Soaking in water for 48 hrs; T_3= Storing in moist gunny bag for 24 hrs; T_4= Soaking in water for 24 hrs + 100 ppm GA3; T_5= Soaking in water for 24 hrs + 100 ppm NAA; T_6= Soaking in water for 24 hrs + 100 ppm IBA; T_7= Soaking in water for 48 hrs + 100 ppm GA3; T_8= Soaking in water for 48 hrs + 100 ppm NAA; T_9= Soaking in water for 48 hrs + 100 ppm IBA; T_{10}= Storing in moist gunny bag for 24 hrs + 100 ppm GA3; T_{11}= Storing in moist gunny bag for 24 hrs + 100 ppm NAA; T_{12}= Storing in moist gunny bag for 24 hrs + 100 ppm IBA; T_{13}=Control; V_1=BPP-5; V_2=BPP-8; V_3=VRI-2; V_4=H-1]

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Contd..

Treatment	Number of leaves					Internodal length (cm)				
	V1	V2	V3	V4	Mean	V1	V2	V3	V4	Mean
T_1	17.21	21.54	21.29	19.98	20.01	6.89	6.74	5.94	5.97	6.39
T_2	17.21	22.73	21.18	22.27	20.85	6.97	6.49	5.95	5.68	6.27
T_3	17.99	22.24	21.00	21.07	20.58	7.30	6.74	5.97	5.64	6.41
T_4	19.94	25.54	22.00	23.79	22.82	7.85	7.43	6.65	6.00	6.98
T_5	17.95	23.28	21.44	22.01	21.17	6.65	6.56	6.13	5.19	6.13
T_6	18.80	21.37	20.54	21.00	20.43	7.33	6.67	6.09	5.16	6.31
T_7	20.54	25.58	23.66	25.33	23.78	8.46	7.61	7.00	6.39	7.37
T_8	18.39	23.46	21.36	20.27	20.87	6.99	6.01	6.41	5.08	6.12
T_9	18.58	22.46	21.83	21.61	21.12	7.41	6.52	6.49	6.04	6.62
T_{10}	18.92	22.84	21.66	22.33	21.44	7.57	6.54	6.10	5.55	6.44
T_{11}	17.61	21.22	20.77	21.84	20.36	7.81	6.79	6.58	6.24	6.86
T_{12}	18.82	22.56	21.01	21.46	20.96	6.65	6.10	5.62	5.21	5.90
T_{13}	16.78	20.8	19.66	18.93	19.04	6.43	5.90	5.54	5.40	5.82
Mean	18.36	22.74	21.34	21.68		7.25	6.62	6.19	5.66	
	V	T		V x T		V	T		V x T	
SEm±	0.28	0.52		1.04		0.05	0.1		0.2	
CD(P=0.05)	0.8	1.45		NS		0.16	0.29		NS	

[NS=Non Significant; T_1= Soaking in water for 24 hrs; T_2= Soaking in water for 48 hrs; T_3= Storing in moist gunny bag for 24 hrs; T_4= Soaking in water for 24 hrs + 100 ppm GA3; T_5= Soaking in water for 24 hrs + 100 ppm NAA; T_6= Soaking in water for 24 hrs + 100 ppm IBA; T_7= Soaking in water for 48 hrs + 100 ppm GA3; T_8= Soaking in water for 48 hrs + 100 ppm NAA; T_9= Soaking in water for 48 hrs + 100 ppm IBA; T_{10}= Storing in moist gunny bag for 24 hrs + 100 ppm GA3; T_{11}= Storing in moist gunny bag for 24 hrs + 100 ppm NAA; T_{12}= Storing in moist gunny bag for 24 hrs + 100 ppm IBA; T_{13}=Control; V_1=BPP-5; V_2=BPP-8; V_3=VRI-2; V_4=H-1]

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Table 2. Effect of different growth regulators and seed treatments on shoot and root characters of cashew under mist condition

Treatment	Dry matter of shoot (%)					Dry matter of root (%)					Shoot to root ratio				
	V1	V2	V3	V4	Mean	V1	V2	V3	V4	Mean	V1	V2	V3	V4	Mean
T_1	42.69	37.67	32.69	34.61	36.92	18.48	21.38	22.76	20.32	20.74	5.25	5.73	3.63	4.61	4.81
T_2	44.21	34.44	38.86	38.44	38.99	22.42	19.78	22.40	21.76	21.59	4.12	5.26	5.12	4.54	4.76
T_3	38.86	39.44	34.06	35.49	36.96	23.52	18.63	27.17	18.90	22.06	4.54	5.52	5.00	4.88	4.99
T_4	48.20	48.21	41.34	40.69	44.61	20.42	21.33	26.92	21.79	22.62	5.70	6.36	5.51	5.29	5.72
T_5	41.26	39.47	40.04	35.39	39.04	20.61	21.37	21.90	22.60	21.62	5.48	4.76	5.29	4.66	5.05
T_6	38.80	38.05	37.49	34.46	37.20	25.12	32.04	31.26	25.50	28.48	4.57	4.63	3.63	4.64	4.37
T_7	52.32	53.06	44.07	44.00	48.36	21.13	21.40	23.86	20.02	21.60	5.73	8.13	5.68	5.60	6.29
T_8	39.49	37.23	36.13	31.56	36.10	19.56	20.00	22.26	20.03	20.46	5.52	5.22	4.06	5.00	4.95
T_9	44.10	40.98	39.73	31.93	39.19	26.32	33.46	32.53	29.83	30.54	4.07	5.52	3.63	3.84	4.27
T_{10}	47.47	47.57	40.61	39.31	43.74	18.03	21.63	23.66	20.89	21.05	5.62	5.81	5.37	4.91	5.43
T_{11}	41.64	39.37	39.10	27.46	36.89	20.89	21.50	22.48	20.46	21.33	5.27	5.50	4.46	4.66	4.97
T_{12}	43.90	42.05	35.32	32.29	38.39	24.20	22.67	27.01	27.25	25.28	4.49	4.88	3.66	4.72	4.44
T_{13}	33.21	34.00	30.00	27.25	31.12	18.70	17.76	19.62	17.64	18.43	3.84	4.20	3.58	3.49	3.78
Mean	42.78	40.89	37.65	34.84		21.49	22.53	24.91	22.08		4.94	5.50	4.51	4.68	
	V	T		V x T		V	T		V x T		V	T		V x T	
SEm±	0.43	0.78		1.56		0.3	0.38		0.77		0.09	0.17		0.34	
CD(P=0.05)	1.2	2.18		4.36		0.59	1.07		2.15		0.27	0.48		NS	

[NS=Non Significant; T_1= Soaking in water for 24 hrs; T_2= Soaking in water for 48 hrs; T_3= Storing in moist gunny bag for 24 hrs; T_4= Soaking in water for 24 hrs + 100 ppm GA3; T_5= Soaking in water for 24 hrs + 100 ppm NAA; T_6= Soaking in water for 24 hrs + 100 ppm IBA; T_7= Soaking in water for 48 hrs + 100 ppm GA3; T_8= Soaking in water for 48 hrs + 100 ppm NAA; T_9= Soaking in water for 48 hrs + 100 ppm IBA; T_{10}= Storing in moist gunny bag for 24 hrs + 100 ppm GA3; T_{11}= Storing in moist gunny bag for 24 hrs + 100 ppm NAA; T_{12}= Storing in moist gunny bag for 24 hrs + 100 ppm IBA; T_{13}=Control; V_1=BPP-5; V_2=BPP-8; V_3=VRI-2; V_4=H-1]

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