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Effect of pre - soaking treatments on germination and growth of cashew (*Anacardium occidentale* L.) rootstocks

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Cashew is one of the major foreign exchange earning horticulture crops of India. Though India exports annually about 1.2 lakh tonnes of cashew kernels worth about ₹ 2,500 crores (Bhat *et al.*, 2007), shortage of raw nuts still remains to be the major problem in the cashew industry and export earnings. India with the largest share of land under cashew (24.0%) produces only 19% of the world's total produce. Vietnam on the other hand, has hardly 10% of the world's cashew farming area but contributes 34% of the cashew nut produced worldwide (Islam, 2009). One of the major production constraints in the country is that most of the plantations are senile and unproductive which has to be replaced with clones of high yielding variety (Huballi, 2009). To boost the cashew production and become self sufficient, there is a need to produce quality planting materials since large planting materials is needed for area expansion and replanting of senile and unproductive cashew orchards. As the viability of nuts deteriorated rapidly on storage (Aravindakshan and Gopikumar, 1979), there is a problem for year - round production of good planting material. However, applications of growth regulators like gibberellic acid were found to stimulate the germination of cashew seed (Furuta, 1961). Therefore, to utilize the stored nuts and produce healthy planting materials, an attempt was undertaken to study the effect of different plant bio-regulators on germination and seedling growth of cashew variety *Jhargram-1*.

The experiment was conducted during March to June 2009 at Horticultural Research Farm (HRF), Mondouri, Bidhan Chandra Krishi Viswavidyalaya, West Bengal. The experimental design adopted was Completely Randomized Design (CRD) with nine treatments. The experiment was conducted with nuts of variety *Jhargram-1* stored for four (4) months in jute bags under ordinary conditions. The seeds were selected based on sinker and floater methods (Mandal, 2000) and those seed which sink in water were used only for the experiment. The seeds were sown in polythene packets (50 seeds per treatment) after soaking for 24 hours. Treatment comprised of T_1 = panchagavya 2 % (a product prepared by mixing cow dung (2.5 kg), cow urine (1.5 litre), ghee (500 g), jaggery (500 g), milk (1 litre) and curd (1 litre)), T_2 = *panchagavya* 4 %, T_3 = GA_3 20 ppm, T_4 = GA_3 40 ppm, T_5 = IBA 20 ppm, T_6 = IBA 40 ppm, T_7 = cow dung, T_8 = cow dung and T_9 = control. The potting mixture consisted of sand, soil and FYM in the ratio of 1:1:1. Polythene bags of 25 cm x 15 cm size were used and about 30 - 40 holes were made per polythene for proper drainage and aeration. Regular weeding, watering, removal of side branches and plant protection measures were adopted (Shumugavelu *et al.*, 2002). Observations on the germination i.e., days taken from first germination to last germination were recorded and germination percentage was calculated. Under each treatment, 6th plants were randomly pulled out 60th days after germination and observations were recorded for shoot and root development. The data on shoot and root length of different treatments were statistically analyzed (Gomez and Gomez, 1984).

The effect of plant bio - regulators on seed germination in cashew have been presented in table-1. Plant bio - regulators have a marked influence on germination of cashew seed. GA_3 40 ppm recorded the shortest duration (9.0) and maximum germination (82.0 %). The percentage germination was also found to vary with the concentration. According to Brian (1959) the plant tissues which respond to gibberellins alone are assumed self sufficient in auxin. The results reported by Shanmugavelu (1963) suggest that the seed of cashew contain sufficient quantity of auxin and hence they respond well to gibberellins than to auxin. This contention also seems to be supported by the results obtained from his studies on the natural occurrence of auxin in the seeds. It is also possible that complex interaction of gibberellins and auxin might probably regulate the seed germination. The property of GA_3 to induce better seed germination has already been reported. According to Duarte *et al.* (1991) they observed 79 - 84 % germination in cashew when seeds were soaked with GA_3 for 24 hours.

Among the panchagavya treated seed, maximum germination was observed with panchagavya 4 % (78.0 %). Similar findings were also reported in coffee by Kannan and Pandeeswaran (2007). The responses of shoot and root growth in cashew due to different concentration of bio - regulators shows that, seed treated with GA_3 induced better shoot growth than other treatments and the shoot growth were also found to increase with increased concentration. GA_3 40 ppm produced maximum shoot growth like plant height, number of

Short Communication
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leaves, leaf length and leaf area. More leaf area might help to enhanced photosynthetic system enabling synthesis of maximum metabolites required for growth and development of plants. Wittwer and Buckovac (1957) also reported increased shoot growth in some plant species due to pre - treatment of seeds with GA_3. On the contrary, GA_3 treatment either generally reduced the root growth or it is unaffected. This is in agreement with the findings of Yabuta and Hayashi (1939). The plant treated with *panchagavya* 4% produced the longest tap root (17.83 cm) compared to other treatments. The beneficial effects of panchagavya on plant growth were also reported by Sappandi (2005) in wood apple and Devechandra (2006) in jamun.

For better germination and seedling growth, bio - regulators like GA_3 may be used as seed treatment to enhance germination of stored seeds.

Table 1: Effect of pre-soaking of bio-regulators on germination and seedling growth of cashew rootstocks

Treatments	Germination (days)	Germination (%)	Plant height (cm)	Seedling diameter (cm)	No. of leaves	Leaf length (cm)	Leaf breadth (cm)	Leaf area (cm^2)	Root length (cm)	Shoot: root
T_1	13.5	71.0	18.46	0.71	8.0	10.16	3.20	22.49	15.96	1.17
T_2	10.0	78.0	22.50	0.82	10.0	12.56	3.33	28.78	17.83	1.26
T_3	12.0	68.0	19.60	0.69	9.0	11.0	2.50	19.33	14.67	1.34
T_4	9.0	82.0	23.77	0.80	11.16	12.76	3.33	29.39	15.40	1.54
T_5	12.5	58.0	16.20	0.62	7.3	8.66	3.13	18.81	15.50	1.05
T_6	11.5	67.0	19.33	0.75	8.73	8.73	3.46	21.34	16.83	1.15
T_7	13.0	65.0	19.96	0.67	9.13	11.7	3.10	24.96	16.23	1.22
T_8	11.0	62.0	17.63	0.64	8.70	12.0	2.50	20.81	14.0	1.26
T_9	14.5	56.0	19.53	0.73	8.5	12.33	3.16	26.90	17.0	1.15
SEm(±)			**0.45**	**0.04**	**0.46**	**0.39**	**0.23**	**2.80**	**0.72**	**0.05**
LSD(0.05)			**1.34**	**0.10**	**1.38**	**1.15**	**N.S.**	**N.S.**	**2.14**	**0.16**

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