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ROLE OF PLANT GROWTH REGULATORS ON THE FIELD ESTABLISHMENT OF CASHEW AIR LAYERS*

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Air-layering is generally adopted for clonal propagation of cashew. But high mortality of the transplanted layers in the field has become a major handicap in adopting this method extensively. The main cause attributed to this was inadequately developed root system (Cheriyan and Kurien, 1976). The use of growth regulators was reported to have improved the root system and the field establishment of air-layers of many tropical crop plants (Singh *et al.*, 1962; Chhonkar and Singh, 1967; Acharya and Dash, 1972; Singh *et al.*, 1973; Misra and Agrawal, 1975). The present investigation was undertaken to study the influence of growth regulators on the rooting and transplant stand of cashew air-layers.

Materials and Methods

The experiment was conducted in the Botanical Garden, Gandhi Krishi Vignana Kendra of University of Agricultural Sciences, Bangalore from April 1977 to February 1978, The study was conducted in two stages: the first part consisted of studying the response of growth regulators on the rooting efficiency of layers; such treatments which showed better response to rooting were selected for field trial and this formed the second part. The parameters taken for screening the treatments were number, length and weight of the roots.

Three growth substances at three different concentrations were used (viz. IBA – 0, 200 and 300 ppm; NAA – 0, 100 and 200 ppm and 2,4-D–0, 10 and 30 ppm). The design used was 3^3 confounded design with three replications and there were altogether 27 treatments. The layering was carried out in trees, 10 to 15 years old. Lanolin (anhydrous C. P) paste was used as carrier for the growth regulators and sphagnum moss was the rooting medium. Ten layers were maintained for each treatment and the layers were removed from the trees after 75 days of layering for root studies as well as for field studies. There were 8 treatments (including control) for field trial. The field study of the layers was undertaken from December 1977 to February 1978 and a RBD design with 3 replications was used for this. Five layers were maintained per treatment and were taken as a unit for each treatment for observation. Field establishment was recorded after 60 days of transplanting. Partial shade was provided temporarily by using coconut fronds during summer season.

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Table 1

Average number of roots per rooted layer at the end of 75 days

Treatments IBA + NAA + 2,4-D (ppm)	Primary roots	Secondary roots
0 + 0 + 0 (Control)	6.22	5.67
0 + 100 + 0	8.22	10.53
0 + 200 + fI	8,37	7.60
0 + 0 + 10	7.67	9.13
0 + 100 + 10	8.06	12.27
0 + 200 + 10	9.67	12.40
0 + 0 + 30	9.39	10.67
0 + 100 + 30	10.64	11.53
0 + 200 + 30	10.89	11.47
200 + 0 + 0	9.11	12.20
200 + 100 + 0	12.93	16.40
200 + 200 + 0	13.03	16,93
200 + 0 + 10	12.50	15.40
200 + 100 + 10	17.19	19.27
200 + 200 + 10	12.06	17.13
200 + 0 + 30	9.81	10.60
200 + 100 + 30	15.19	17.33
200 + 200 + 30	11 97	14.27
300 + 0 + 0	10.39	12.20
300 + 100 + 0	11.33	16.47
300 + 200 + 0	11.69	20.40
300 + 0 + 10	16.42	21.40
300 + 100 + 10	11.58	15.67
300 200 + 10	21.19	25.60
300 + 0 + 30	11.25	13.53
300 + 100 + 30	10.55	13.60
300 + 200 + 30	9.33	12.20

'P ratio		C. D. at 5%	1 %		CD at 5%	1%
IBA		1.74	2.32	**	2.35	3.14
NAA	NS	—			2.35	—
2,4-D	**	1.74	2.32	**	2.35	3.14
IBA x NAA		3.01		NS		—
IBA x 2,4-D		3.01		NS		—
NAA x 2,4-D	NS	—		NS		—
IBA x NAA x 2,4-D	*	5.21		NS		—

*P = 0.05; **P = 0.01; NS = Not significant

Table 2

Average length (cm) of **roots** measured **at** the **end of** 75 **days**

Treatments IBA+NAA+2, 4-D (ppm)	Primary roots	Secondary roots
0 + 0 + 0 (Control)	3.65	3.01
0+100+0	4.49	3.94
O + 2OO + O	4.53	3.35
0 + O+ 1O	5.02	4.31
O + 100 + 1O	5.18	3.74
O+2OO+1O	4.36	3.57
O + 030	4.70	4.21
O+1OO+3O	4.91	4.10
O+2OO+3O	5.41	3.92
2OO+O+O	5.55	3.79
2OO+1OO+O	5.55	4.80
200+2000	5.36	4.82
2OO+O+10	5.14	5.10
2OO+100+1O	5.60	5.00
2OO+2OO+10	6.08	4.65
200 + 0 + 30	5.67	3.96
2OO+1OO+3O	5.96	4.80
2OO+2OO+3O	5.68	4.81
3OO+O+3	5.18	3.68
3OO+1OO+O	5.18	4.53
3OO+2OO+O	5.85	5.46
3OO+O+1O	6.04	5.46
3OO+1OO+1O	5.70	5.34
3OO+2OO+10	6.27	5.02
3OO+O+3O	6.06	5.80
3OO+1OO+3O	6.07	4.08
3OO+2OO+3O	5.61	3.60

'F' ratio		C. D. at 5%	1%		C. D. at 5%	1%
IBA	**	0.10	0.13		0.36	0.48
NAA	**	0.10	013	NS		
2,4-D	**	0.10	0.13	**	0.36	4.48
IBA x NAA	**	0.19	0.24	NS		
IBA x 2, 4-D	**	0.19	0,24	NS		
NAA x 2, 4-D	**	0.19	—		0.62	0.83
IBA x NAA x 2, 4-D	**	0.35	0.46		1.07	

P = 0.05; ** P 0.01; NS = Not significant

IBA Concentration (ppm)	2,4-D; 0 (ppm) NAA (ppm) 0	100	200	2,4-D; 10 (ppm) NAA (ppm) 0	100	200	2,4-D; 30 (ppm) NAA (ppm) 0	100	200	Mean
0	4.04	3.99	4.38	3.98	5.47	5.20	4.94	4.66	5.76	4.71
	(1.24)	(1.20)	(1.72)	(1.01)	(1.15)	0.33)	(1.19)	(1.41)	(1.45)	(1.30)
200	5.15	5.63	6.60	5,14	8.06	7.96	4.26	9.17	5.04	6.34
	(1.38)	(1.34)	(1.70)	(1.41)	(2.33)	(1.77)	(1.12)	(2.31)	(1.83)	(1.69)
300	4.92	5.78	9.01	8.43	5.33	9.81	5.17	6.01	5.26	6.34
	(1.57)	(172)	(2.23)	(2.13)	(1.48)	(2.65)	(1.67)	(1.58)	(1.65)	(1.85)
Mean	4.70	5.15	6.66	5.85	6.29	7.66	4.79	6.61	5.35	
	(1.40)	(1.42)	(1.88)	(1.52)	(1.67)	(1.92)	(1.33)	(1.77)	(1.64)	

Effects	IBA	NAA	2,4-D	IBA x NAA	IBA x 2,4-D	NAA x 2,4-D	IBA x NAA x 2,4-D
Significance	**	NS (NS)	NS (NS)	NS (NS)	NS (NS)	NS (NS)	NS (NS)
CD at 1% level		1.67		CD at 5% level	(0.38)		

* P=0.05; ** P=0.01; NS= Not Significant

Table 4
Field establishment of layers

Treatments (IBA+NAA+2,4-D (ppm)	Mean of 3 replications			
	Mean	Percentage	No. of sprouts	No. of leaves
300+200+10	4.00	80.00	3.60	16.13
300+ 0 + 10	4.00	80.00	3.67	15.00
200+100+10	3.67	73.33	3.17	16.20
200+100+30	3.67	73.33	3.50	15.30
200+200+ 0	3.67	73.33	3.30	15.40
200+100+10	3.33	66.67	2.67	11.03
200+ 0+10	3.00	60.00	3.27	13.70
0+ 0+ 0 (Control)	2.00	40.00	1.23	5.50
'F' ratio			**	*
C D at 5% level			1.12	5.68
C D at 1 % level			1.55	—

\- P= 0.05
\- - P= 0.01

Results and Discussion

The data on the number, length and weight of roots are presented in Tables 1. 2 and 3 respectively.

The number of primary roots and secondary roots was increased significantly by the use of growth regulators. The main effect of IBA as well as 2,4-D and the interaction effects of IBA + 2,4-D and IBA + NAA were significant in the production of primary roots. Combinations of IBA 300 ppm + NAA 200 ppm and IBA 300 ppm + 2,4-D 10 ppm were superior to other treatment combinations. As regards secondary roots, the main effects of IBA, NAA and 2,4-D were significant.

The length of the primary roots was significantly increased by the main effects of IBA, NAA and 2,4-D and their interaction effects. Similarly the length of secondary roots was increased significantly. The mam effects of IBA and 2,4-D and interaction effect of NAA +2, 4-D were found significant. There was an increase in the length of secondary roots at 10 ppm of 2,4-D but at 30 ppm there was reduction in length, indicating that there is a critical level of concentration of 2,4-D beyond which 2,4-D adversely affects the rate of growth of secondary roots.

സംഗ്രഹം

ബാംഗ്ളൂർ കാർഷിക സർവകലാശാലയിൽ നടത്തിയ പരീക്ഷണങ്ങളിൽ ഐ. ബി . എ., എൻ. എ. എ., 2,4–ഡി എന്നീ സസ്യഹോർമോണുകൾ ഒരു പ്രത്യേക വീര്യത്തിൽ കൂട്ടിക്കലർത്തി ഉപയോഗിക്കുന്നത് കശുമാവു പതികൾക്ക് നല്ല വേരുവ്യൂഹം ഉണ്ടാകുന്നതിനും ഇപ്രകാരമുള്ള പതികൾ മുറിച്ചു നടുകയാണെങ്കിൽ കൂടുതൽ രക്ഷപ്പെടുന്നതിനും സഹായിക്കുമെന്നു കണ്ടു.

References

Acharyya, N. and Dash, P. C. 1972. Effect **of** two **plant** growth substances on cashew air layers. *Curr. Sci.,* **41,** 534-535,

Cheriyan, S. and Kurien K, 1976 Vegetative propagation of cashew. Some observations in S. Kerala. *Cashew News Teller,* 10, 15-17.

Chhonkar, V. S. and Singh, R. 1967 Effects of plant regulators on air layering in cashew nuts. *Indian J. Hon.* 24, 89-92.

Erickson, L. C. and Bitters, VV. P. 1953 Effect of various plant regulators on rooting of cuttings of citrus and related species. *Proc. Am. Soc. Hort. Sci.* 61, 84–88.

Hitchcock A. E. and Zimmerman, P. W. 1944. Comparative root inducing activity of phenoxy acids. *Proc. Am. Soc. Hort. Sci.* 45, 187–189.

Misra, R, S. and Agrawal, A. K., 1975 Root induction in air-layers of Kaghzikalan with special reference to plant growth regulators *Progressive Horticulture,* 7, 181-186.

Singh, S., Chaugh, D. V., and Singh, K. K. 1962 Seasonal and interaction effects in marcotting of litchi with some plant regulators. *Indian J. Agric. Sc.* 35, 101–113.

Singh, P., Bajwa, M. S. and Singh, R, 1973. Propagation of ber. *Plant Science, 5,* 137–139.

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