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EFFECTS OF AUXINS AND SEAWEED EXTRACT ON THE STEM CUTTINGS OF A MEDICINAL PLANT- *BALIOSPERMUM MONTANUM* M.Arg

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The effects of various concentrations of auxins and extract of *Hypnea muciformis* Lamour on the morphological and the biochemical changes in the stem cuttings for vegetative propagation of *Baliospermum montanum* M.Arg. (Euphorbiaceae) were studied. The effects on morphological parameters such as the percentage and the number of sproutings, shoot length, the number and fresh and dry weights of roots and the biochemical studies such as quantitative estimation of chlorophyll pigments, sugars and starch were carried out. The studies reveal that higher concentrations of auxins, in particular IBA and NAA in combination with 1% seaweed extract (SE) and higher concentrations of SE individually, produced better results.

Keywords : Auxins; *Baliospermum montanum*; Seaweed extract; Stem cuttings; Vegetative propagation.

Introduction

Propagation by cuttings is the most important method of vegetative propagation as it is inexpensive, rapid, simple and progenies produced by them are exactly without any genetic variations[1]. The application of auxins in stem cuttings for early rooting have been reported in the propagation of forest tree species[2,3]. However, studies on the effects of growth hormones on the rooting behaviour of the stem cuttings of the medicinal plants appear to be meagre[4]. Further the survey of literature reveals that there were a few reports on the application of seaweed extracts to the stem cuttings to study their effects on rooting and sprouting behaviors[5]. Hence, the present work on the stem cuttings used in vegetative propagation of the *Baliospermum montanum* (Euphorbiaceae), an important medicinal plant, has been taken up to study the effects of auxins and extract of *Hypnea muciformis.*

Material and Methods

The red alga *Hypnea muciformis* Lamour was collected from the estuary of Pannithittu, Pondicherry. They were washed in seawater followed by tap water. The algal extracts were prepared by adopting method of Rama Rao[6]. 50ppm, 100ppm and 200ppm concentrations of IAA, IBA and NAA were employed[7] for the present study. The different concentrations of auxins and seaweed extract (SE) were prepared fresh on the day of requirement (Tables 1, 2). Disease and pest free shoots of uniform sizes were obtained from plants of *Baliospermum montanum* growing in the Horticultural Farm at Madakadipet, Pondicherry. The method of Ramassamy *et al.*[8] was followed for the propagation and maintenance of the cuttings and preparation of rooting medium.

The readings were taken every 15 days for percentage and number of sprouts and length of shoot. The number, length and wet and dry weights of roots were calculated at the end of 60th day. In respect of biochemical studies methods of Shoaf and Lium[9] for photosynthetic pigments, Dubois *et al.*,[10] for sugars, McCready *et al.*,[11] for starch were adopted.

Results and Discussion

Vegetative propagation techniques in horticulture, pharmacognosy and forestry have become more relevant for rapid and reliable multiplication of desired genotypes. The exploitation of the qualitative and quantitative economic traits are highly correlated with the success of the technique for its vegetative propagation. The present study is an attempt to bring out the morphological and biochemical responses of stem cuttings of *Baliospermum montanum* used in vegetative propagation to auxins and extract of *Hypnea muciformis* individually and in

combination. *Baliospermum montanum* is a leafy, monoecious, undershurb. Its leaves,seeds and root latex are used in treating diseases of skin, piles, wounds, enlarged spleen, inflammation, anemia, leucoderma and jaundice[12].

Several studies have been done by various workers on the effects of auxin on stem cuttings individually[13,14] or in combination with plant extract[15]. It is evident from the data that 100% sprouting was achieved in four concentrations (viz. IBA 100ppm, IAA 100ppm +1%SE, IBA 100ppm +1%SE and 3%SE) (Table 1). The number of sprouts initially was less in all treated cuttings over control but the number steadily increased over the period in most of the treated cuttings except the lower concentrations of IAA, and SE and all concentrations of NAA (Table 1). IBA individually and in combination with SE and 3% SE produced the best results. Contrary to the above results, lower concentrations of IAA, NAA promoted better sprouting in all agro forestry species[3]. In conformity to the study of Puri and Shamet[14] on some social forestry species, IBA was found to be more effective in the present study at higher concentrations. During vegetative propagation early growth of sprouting depends on the food reserve available in the cutting[16].This is followed by root formation which enables the plants to absorb nutrients from growth medium. It is believed that early shoot formation might have an unfavourable effect on root initiation because this creates competitive situation between roots and shoot for nutrient reserves within the cuttings. Thus, early shoot formation may exhaust the nutrient reserves. This is confirmed from the present study as the cuttings treated with NAA and control registered higher percentage of sprouting in the beginning but later sprouting percentage declined as these sprouts dried up probably failure of root formation in those cuttings (Table 2).

The shoot length in all the treated cuttings showed better average over control especially in higher concentrations of IAA, IBA, NAA (100ppm and 200ppm) separately and in combination with SE. However, the maximum shoot length was observed in IAA 200ppm+1%SE. Similarly higher concentration of SE showed better results than 1% SE and 2%SE (Table 1).

It is noteworthy that results obtained from the cuttings treated with IAA and NAA did not produce any encouraging results with reference to number, length, fresh and dry weights of roots; but IBA treated cuttings produced good results individually and in combination with SE (Table 1; Fig. 1).

It is pertinent to note that for the first time the present study brings out quantitative changes in sugar and starch along with quantitative changes in pigments. It is evident from the quantitative values obtained that the content of chlorophyll pigments and carotenoids found to be better in auxins + SE combinations than individual hormone treatments (Table 2). The enhanced values of photosynthetic pigments may be attributed to the presence of a variety of minerals in *Hypnea muciformis*[17] which in combination with auxin produced better results. It is noteworthy that the content of starch showed a decreasing trend and sugars an increasing pattern in cuttings that produced greater number and longer roots (Fig. 1). This is in conformity with the finding of Puri and Verma [18]in cuttings of *Dalbergia sissoo*.

The decrease of starch with time was seen in these cuttings which showed early rooting (Table 2). The continued loss of starch is attributable to the export of carbohydrates to the developing roots. Many workers have attributed this decrease in starch to the mobilization of it into sugars[13,19-20]. Therefore, in the *Baliospermum montanum* encouraging results were obtained in cuttings treated with higher concentrations of auxins (IBA and NAA) in combination with 1% SE and 3% SE individually, confirms the beneficial role of auxins in combination with SE.

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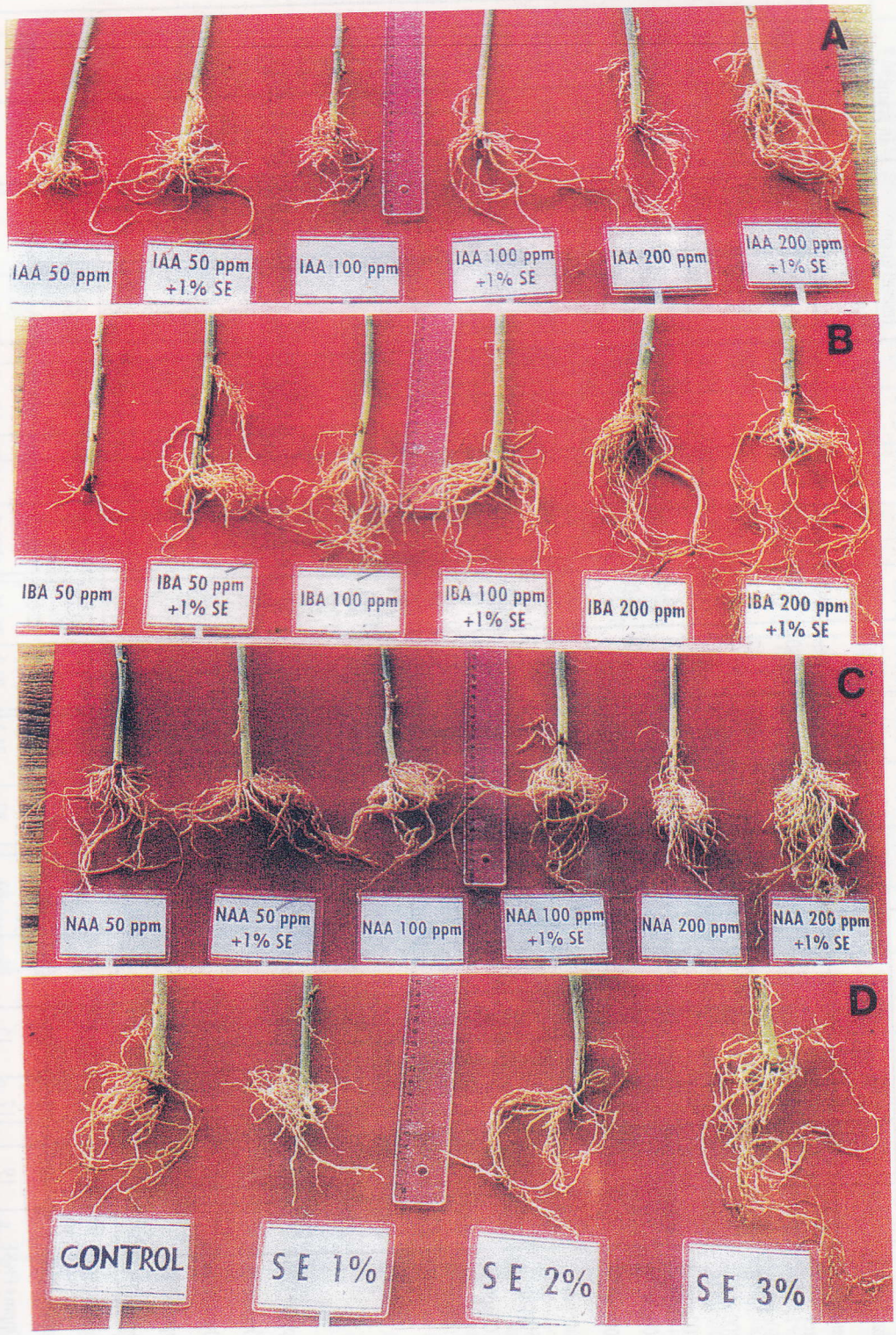

Fig.1.A - D : Root morphology. A: Cutting treated with IAA and IAA+ 1% SE; B: Cutting treated with IBA and IBA+1% SE; C: Cutting treated with NAA and NAA+ 1% SE; D: Cutting treated with SE and Control.

Table 1. Effects of Auxins and Seaweed extracts (SE) on the morphological parameters in the stem cuttings of *Balliospermum montanum.*

Treatments	Number of sproutings				Percentage of sproutings				Shoot length(mean) in cm				No. & Length of roots (mean) in cm		Fresh & dry weights (mean) in grams	
	15th	30th	45th	60th	15th	30th	45th	60th	15th	30th	45th	60th	Number	Length	Fresh weight	Dry weight
Control	42	32	26	19	100	100	85	80	15	46.07	99.7	206.44	14.66	12.31	2.042	0.409
IAA50ppm	29	23	21	16	87	87	87	87	15.33	41.3	100.73	219.06	8.66	8.25	0.803	0.066
IAA100ppm	37	32	27	26	93.3	87	93.3	93.3	17.38	42.92	114.03	207.8	9	15.36	1.689	0.21
IAA200ppm	28	28	25	21	87	93.3	93.3	87	16.08	44.14	126.54	251.31	11	9.06	0.949	0.054
IBA50ppm	22	24	22	20	73.3	87	87	80	16.08	53.55	122.8	219.8	14.66	10.08	1.485	0.175
IBA100ppm	35	24	24	23	93.3	100	100	100	12.31	65.17	138.95	280.9	11.66	10.8	1.765	0.272
IBA200ppm	30	27	19	19	100	93.3	73.3	73.3	12.68	40.59	127	225.33	21.66	9.08	3.484	0.431
NAA50ppm	41	22	18	18	93.3	93.3	80	73.3	14.41	61.72	151.82	268.6	19.33	9.08	2.614	0.258
NAA100ppm	20	20	19	7	87	87	80	73.3	14	42.36	100.7	202.58	23.33	7.63	3.140	0.323
NAA200ppm	13	8	8	7	87	40	40	40	27	58.88	181.6	287.16	23.66	9.92	5.081	0.536
1%SE	28	28	27	23	93.3	100	93.3	93.3	9.84	33.11	97.88	194.04	16.33	8.5	0.647	0.083
2%SE	34	27	24	19	80	93.3	80	80	14.9	34.65	134.57	230.63	15.66	9.21	1.274	0.092
3%SE	33	30	28	27	100	100	100	100	18.96	66.85	149.48	290.08	18.33	12.05	3.989	0.476
IAA50ppm+1%SE	29	25	24	21	93.3	93.3	93.3	93.3	16	63.65	152.04	285.04	12.66	12.87	2.667	0.31
IAA100ppm+1%SE	29	26	26	23	100	100	100	100	8.33	37.26	210.6	256.39	13	10.68	1.013	0.1
IAA200ppm+1%SE	31	25	20	18	100	93.3	87	80	15.35	65.36	164.83	299.52	12.33	15.45	3.724	0.368
IBA50ppm+1%SE	34	27	27	21	93.3	93.3	93.3	87	11.38	54.12	103.18	225.35	15.66	8.29	1.665	0.161
IBA100ppm+1%SE	30	25	22	21	100	100	100	100	14.36	46.36	143.38	273.27	18.66	12.26	2.579	0.357
IBA200ppm+1%SE	19	16	15	15	67	80	87	80	30.28	58.86	135.06	260.78	19.66	10.43	2.411	0.327
NAA50ppm+1%SE	40	28	25	20	93.3	93.3	93.3	93.3	12.65	52.55	132.41	265.28	24.66	10.5	2.666	0.276
NAA100ppm+1%SE	19	17	15	14	80	87	73.3	73.3	25.46	168.7	148.86	290.13	17.33	11.76	2.350	0.249
NAA200ppm+1%SE	18	15	15	13	87	93.3	73.3	73.3	22.16	64.35	157.15	291.76	24.66	9.57	4.044	0.431

Table 2. Effects of Auxins and Seaweed extracts (SE) on the Bio- Chemical parameters in the stem cuttings of *Balliospermum montanum*.

Treatments	Chlorophyll 'a'		Chlorophyll 'b'		Total Chlorophyll (a+b)		a/b=ratio		Carotenoid		Total Sugar		Reducing Sugar		Non - Reducing Sugar		Starch	
	30th day	60th day	30th day	60th day	30th day	60th day	30th day	60th day	30th day	60th day	30th day	60th day	30th day	60th day	30th day	60th day	30th day	60th day
Control	0.708	0.728	0.150	0.220	0.858	0.948	4.720	3.309	0.588	0.503	105.0	40.0	28.2	39.6	76.8	0.38	205.6	522.9
IAA50ppm	0.948	1.274	0.182	0.532	1.130	1.806	5.209	2.395	0.853	0.871	54.4	104,8	33.8	98.2	19.57	6.27	101.4	149.4
IAA100ppm	0.716	1.169	0.147	0.301	0.863	1.470	4.871	3.884	0.643	0.727	102.2	136.0	48.6	129.0	50.92	6.65	120.0	106.6
IAA200ppm	0.777	0.798	0.301	0.150	1.078	0.320	2.581	0.948	0.499	0.522	60.6	102.0	18.8	101.2	39.71	0.76	98.02	140.2
IBA50ppm	0.882	1.008	0.219	0.161	0.101	1.169	4.027	6.261	0.438	0.599	131.6	134.6	52.6	127.0	75.05	7.6	230.0	600.0
IBA100ppm	0.756	1.022	0.147	0.312	0.903	1.334	5.143	3.276	0.643	0.648	168.4	191.4	87.4	92.4	76.95	7.9	371.2	443.0
IBA200ppm	0.879	1.001	0.305	0.210	1.184	1.211	2.882	4.767	0.494	0.599	143.2	137.8	139.0	100.0	3.99	35.91	348.8	450.4
NAA50ppm	0.910	0.910	0.340	0.175	1.250	1.085	2.677	5.200	0.855	0.552	90.2	117.8	66.6	74.4	22.42	41.23	123.6	214.0
NAA100ppm	0.980	1.232	0.154	0.280	1.134	1.512	6.364	4.400	0.181	0.659	164	160.8	100.2	112.0	60.61	46.36	209.6	399.4
NAA200ppm	0.842	1.554	0.263	0.318	1.105	1.872	3.202	4.887	0.417	0.899	127.8	124.8	32.8	82.0	90.25	42.8	614.4	2342.4
1%SE	1.008	1.225	0.210	0.588	1.218	1.813	4.800	2.083	0.937	0.776	77.0	144.6	64.0	109,2	12.35	33.63	516.0	542.6
2%SE	0.812	1.092	0.388	0.637	1.200	1.729	2.093	1.714	0.496	0.739	261.8	195.8	99.2	59.6	111.72	129.39	376.0	517.0
3%SE	1.141	1.256	0.245	0.532	1.386	1.788	4.657	2.361	1.088	0.713	118.8	182.6	110.2	86.4	7.98	91.39	416.2	280.0
IAA50ppm+1%SE	0.882	1.176	0.356	0.224	1.238	1.400	2.478	5.250	0.592	0.764	108.6	486.0	96.2	185.8	11.78	285.19	120.0	144.0
IAA100ppm+1%SE	0.997	0.987	0.399	0.350	1.396	1.337	2.499	2.820	0.687	0.743	199.8	206.0	121.0	120.0	74.86	81.7	408.0	254.0
IAA200ppm+1%SE	0.770	0.798	0.364	0.378	1.134	1.176	2.450	2.111	0.515	0.576	118.6	137.8	95.2	128.8	22.23	885.5	469.8	216.0
IBA50ppm+1%SE	0.994	1.211	0.342	0.343	1.336	1.554	2.906	3.531	0.694	0.804	134.6	171.4	92.4	92.4	40.09	75.05	558.4	266.8
IBA100ppm+1%SE	0.848	1.540	0.140	0.273	0.988	1.813	6.057	1.978	0.580	0.941	216.0	381.8	124.0	58.6	87.4	307.04	680.2	305.2
IBA200ppm+1%SE	0.840	1.211	0.393	0.411	1.233	1.622	2.137	2.947	0.627	0.638	179.2	304.0	170.8	91.4	8.74	201.97	518.0	177.4
NAA50ppm+1%SE	1.302	1.288	0.370	0.308	1.672	1.596	3.519	4.182	0.769	0.867	130.2	310.0	87.4	97.2	40.66	202.16	326.6	389.4
NAA100ppm+1%SE	1.400	1.315	0.252	0.490	1.652	1.805	5.556	2.684	1.128	0820	188.0	356.0	127.0	141.0	5.80	204.25	243.0	366.0
NAA200ppm+1%SE	1.267	1.673	0.266	0.420	1.533	2.093	4.763	3.983	0.499	0.923	143.2	384.0	37.8	79.4	100.13	761.0	305.8	99.47

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