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Short communication

Effect of auxins on shoot and root growth in an endangered medicinal plant *guggal* [*Commiphora wightii (*Arnott.) Bhand.]

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ABSTRACT

An investigation was carried out to study the effect of IBA and NAA on vegetative propagation of *guggal* [*Commiphora wightii (*Arnott.) Bhand.] through cuttings, at Navsari Agricultural University, Navsari. The experiment consists of ten treatments: IBA, NAA and their combination, each at 2000, 4000 and 6000 mg l^{-1} along with control, replicated thrice. Ten cuttings per each treatment and per replication were planted. Planting media used were: sand, soil and vermicompost, in 2:1:1 ratio. Cuttings were dipped for five minutes in solutions of IBA, NAA and their combinations. Cuttings treated with 4000 mg l^{-1} IBA proved to be the best for shoot and root responses, viz., days taken to first sprouting (11.67 days), number of shoots per cutting (10.27), number of leaves in the longest shoot (44.07), length of longest shoot (51.69cm), diameter of the longest shoot (4.40mm), rooting percentage (61.19), number of primary roots per cutting (15.01), length of the longest primary root (26.36cm), and number of secondary roots (22.37) and length of the longest secondary root (21.40cm) per cutting. It was concluded that IBA @ 4000 mg l^{-1} was most effective for obtaining maximum shoot and root growth.

Key words: *Guggal*, propagation, IBA, NAA

The Indian bdellium [*Commiphora wightii* (Arnott.) Bhand.] is a well-known medicinal plant of Burseraceae family. It is an important oleo-gum producing plant. The plant possess oleo-gum producing ducts, tapping of which produces a pale yellow, aromatic fluid known as *guggal* gum used in allopathic, *ayurvedic* and *unani* systems of medicine owing to its anti inflammatory, anti-rheumatic, hypocholesteremic, hypolipidemic and anti-fertility activity. The plant is reported to be an important component of flora of the tropical arid ecosystem (Kumar and Shankar, 1982). Forests are the main source for collection of *guggal* gum. However, with rising pressure on natural resources, forests are shrinking rapidly. Due to the high demand for *guggal* in medicine, not only the pharma industries but others too have done destructive harvesting, using faulty methods of gum tapping. This has led to decimation of the plants compounded by inadequate replenishment. This species is now listed under category 'A' of endangered plants (Tajuddin *et al*, 1997). *Guggal* can be propagated by seeds and through vegetative means. Seeds show poor germination besides needing scarification. As considerable variability occurs in seedling populations, vegetative propagation is required to produce true-to-type progenies. *Commiphora wightii* is known to be propagated through stem cuttings (Mertia and Nagrajan, 2000; Singh *et al*, 2009; Kumar *et al*, 2006). It being an arid region plant, the present investigation on *guggal* was designed to evaluate influence of the auxins IBA and NAA on regeneration of cuttings under South Gujarat conditions.

The trial was carried out at Department of Horticulture, N.M. College of Agriculture, Navsari Agricultural University, Navsari. Hardwood cuttings of *guggal* 20 cm in length with 4-5 buds were used. A slant cut was made at the base of the cuttings which were then treated with various concentrations of IBA, NAA (2000, 4000 and 6000 mg l^{-1}) and their combinations, at the same levels of concentration. Cuttings in the control group were treated with distilled water. All the cuttings were dipped in respective concentrations of solutions for 5 minutes. Ten cuttings were planted per treatment in black polythene bags containing sand, soil and vermicompost in 2:1:1 ratio. The experiment was laid out in CRD, with 3 replications. Data on root and shoot growth were recorded at 120 days after planting. Results were analyzed statistically.

Shoot traits

Auxin tested in the experiment had significant influence on various shoot characters, compared to the control. IBA @ 4000 mg l^{-1} was the best and recorded minimum number of days to first sprout (11.67 days), highest number of shoots per cutting (10.27), higher number of leaves in the longest shoot (44.07), longest shoot (51.69cm) and highest diameter in the longest shoot (4.40mm) (Table 1). Early sprouting, increase in number of shoots and shoot length may be due to utilization of the stored carbohydrates perhaps due to influence of the auxin through cell division and elongation. At higher concentration (6000 mg l^{-1}), growth of shoot decreased. This could due to the inhibitory/toxic effect, supported by Singh *et al* (2009) in *guggal*, Parmar *et al* (2010) in bougainvillea, and Singh and Singh (2005) in poinsettia.

Root traits

Different root promoting substances, i.e. IBA, NAA (auxins) and their combinations were significantly superior over the control in improving the root parameters studied. IBA @ 4000 mg l^{-1} significantly increased rooting percentage (61.19) and other root traits like, number of primary roots per cutting (15.01), length of the longest primary root (26.36 cm), number of secondary roots (22.37) and length of the longest secondary root (21.40cm) per cutting, over other treatments (Table 2). Lowest values for all the characters were seen in control. Better rooting and root growth with the auxins might be ascribed to greater metabolic activity and utilization of sugars and starch upon hydrolysis in the stem. IBA was found to be superior to NAA, or combinations thereof, because of its greater chemical stability, slow mobility in plants and slow destruction by auxin-

Table 1. Effect of PGRs on shoot growth parameters in *guggal* cuttings

PGR concentration (mg l^{-1})	Number of days taken to sprout	Number of shoots per cutting	Number of leaves in longest shoot	Length of longest shoot (cm)	Diameter of longest shoot (mm)
T_1 (IBA 2000)	13.00	3.97	30.07	33.28	3.03
T_2 (IBA 4000)	11.67	10.27	44.07	51.69	4.40
T_3 (IBA 6000)	12.33	5.83	33.07	36.76	3.56
T_4 (NAA 2000)	15.33	6.33	41.37	34.76	3.20
T_5 (NAA 4000)	13.67	6.23	31.03	36.83	3.73
T_6 (NAA 6000)	15.67	4.80	33.63	35.73	3.34
T_7 (IBA 2000 + NAA 2000)	14.00	6.90	38.40	33.95	3.91
T_8 (IBA 4000 + NAA 4000)	19.33	5.03	30.57	32.06	3.15
T_9 (IBA 6000 + NAA 6000)	21.33	4.10	26.57	28.66	2.99
T_{10} Control	26.33	3.00	19.42	25.97	2.41
S.Em.±	0.67	0.22	1.35	1.33	0.13
C.D. *(P=0.05)*	1.99	0.65	3.98	3.93	0.39
C.V. (%)	7.19	6.72	7.12	6.61	6.78

Table 2. Effect of PGRs on root parameters in *guggal* cuttings

PGR concentration (mg l^{-1})	Rooting %	Number of primary roots per cutting	Length of longest primary root (cm)	Number of secondary roots per cutting	Length of longest secondary root (cm)
T_1 (IBA 2000)	57.37	10.85	21.83	19.37	14.53
T_2 (IBA 4000)	61.19	15.01	26.36	22.37	21.40
T_3 (IBA 6000)	51.18	9.91	19.37	12.24	13.63
T_4 (NAA 2000)	47.53	8.76	21.07	15.47	17.53
T_5 (NAA 4000)	53.51	11.82	22.97	20.02	14.84
T_6 (NAA 6000)	48.43	6.94	17.27	17.27	14.07
T_7 (IBA 2000 + NAA 2000)	50.40	12.89	23.97	20.57	19.23
T_8 (IBA 4000 + NAA 4000)	34.35	9.19	16.63	14.05	11.66
T_9 (IBA 6000 + NAA 6000)	31.29	6.41	15.73	15.73	9.23
T_{10} Control	18.45	3.24	10.40	10.40	7.13
S.Em.±	1.67	0.36	0.72	0.63	0.55
C.D. *(P=0.05)*	4.92	1.06	2.13	1.86	1.63
C.V. (%)	6.37	6.54	6.39	6.51	6.68

degrading enzymes. NAA may have been destroyed more rapidly by the auxin-degrading enzymes. Strong influence of IBA on rooting and root growth has been experimentally substantiated earlier by various workers, viz., Singh *et al* (2003 and 2009) and Kumar *et al* (2006) in *guggal;* Singh and Singh (2005) in poinsettia and Parmar *et al* (2010) in bougainvillea.

CONCLUSION

It may be concluded that among all the treatments used in our study, IBA @ 4000 mg l^{-1} was the most effective for achieving maximal shoot and root growth in *guggal*.

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