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Effect of IBA on rooting and growth of *Morus alba* shoot cuttings under temperate conditions of Kashmir

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Abstract
The present investigation entitled "Effect of IBA on Rooting and Growth of *Morus alba* Shoot Cuttings under Temperate Conditions of Kashmir was carried out at Faculty of Forestry, Benihama, Ganderbal J&K. Cuttings of *Morus alba* having length of 9 inches and pencil size diameter were collected in the first week of March 2018 from actively growing plant (one year old shoot) located in the study area and were treated with Indole 3-butyric acid (IBA) at varying concentrations (100, 150, 200, 250 and 300 ppm) for 24 hours, besides control was maintained by immersing cuttings in distilled water. On the basis of studies conducted and considering various parameters it was concluded that IBA@ 100 ppm is the best plant growth regulator to be used for vegetative propagation of *Morus alba* under existing conditions.

Keywords: *Morus alba*, cuttings, IBA, shoot, propagation

Introduction
Morus alba belongs to family *Moraceae* is a native to temperate Asia. The genus Morus comprises of 68 species with more than 100 known cultivars distributed all over Asia, especially 24 species in China and 19 species in Japan (Sanjappa, 1989) [16]. Among different species of genus Morus, *Morus alba* (White Mulberry), *Morus nigra* (Black Mulberry) and *Morus rubra* (Red Mulberry) have wide range of distribution throughout world (Datta, 2000) [2].

Propagation of Mulberry through stem cuttings is the easiest, cheapest and quickest method of propagation as compared to other methods (Rao and Khan, 1963) [15]. Vegetative propagation is the only method of propagation that results in the production of true to type plants (Haq, 1992) [4]. Propagation by vegetative means have the advantage of greater uniformity and immediate availability of superior clones for plantation work (Khosla *et al*., 1982) [7]. Among the various growth hormones, IBA is widely used for vegetative propagation through cuttings because of its quicker ability to produce roots, chemical stability and low mortality in plants (Soni, 1970) [19]. *Morus alba*, an important multipurpose tree species of Kashmir valley used for silkworm rearing and in different Agroforestry systems was selected for rooting and growth studies with the help of IBA.

Materials and Methods
The present study was conducted in the Faculty of Forestry, SKUAST- Kashmir, Benhama village (Tehsil- Lar, District- Ganderbal). The experimental site lies on the southern aspect at 34°16' 4" North latitude and 74°46' 31" East longitude. The study area is located at an elevation of 1,783m (5850 feet) above the mean sea level. The study area has temperate climate experiencing four distinct seasons: a severe winter (December to Febuary), a cold spring (March to May), a mild summer (June to August) and a pleasant autumn (September to November). The site falls in a mid to high altitude characterized by hot summer and very cold winters. The average precipitation is 690-1150 mm most of which is received from December to April in the form of snow and rains. The climate is generally temperate type, winter is severe extending from December to March. The region faces a wide temperature range from -8 °C in winter to maximum of 33 °C in summer. Winter frost is common and medium to heavy snowfall is also witnessed.

Cuttings of *Morus alba* L. having length of 9 inches and pencil size diameter were collected in the first week of March 2018 from actively growing plant (one year old shoot) located in the study area. Cuttings were treated with IBA at varying concentrations (100, 150, 200, 250 and 300 ppm) for 24 hours, besides control was maintained by immersing cuttings in distilled water. The experiment was laid in polybags with sand, soil, FYM (2:1:1) as potting media at Faculty of Forestry Benihama/ Watlar Nursery of SKUAST-Kashmir. The different IBA concentrations (ppm) used were T0=Control, T1=100, T2=150, T3=200, T4=250 and T5=300. The design of the experiment was CRD with three replications and 30 cuttings per treatment per replication were used. Observations recorded were sprouting percentage, rooting percentage, average number of roots per cutting, height of leading shoot (cm) and collar diameter of leading shoot (mm).

Results and Discussions

Sprouting percentage

The data given in the Table 1 shows that different concentration of IBA exerted a significant influence on sprouting per cent. It is evident from the data (Table 1) that IBA has significant effect on sprouting per cent. Cuttings treated with IBA concentration 100 ppm (T1) showed highest sprouting percentage of 95.55% being statistically at par with T2 (IBA 150 ppm) in which 85.55% sprouting was recorded. Lowest sprouting percentage of 65.00% was recorded in control (T0) which was maintained by treating cuttings with distilled water. Sprouting percentage decreased with increase in IBA concentration. The increase in per cent sprouting of buds in IBA treated cuttings may be due to the stimulation of hydrolysis of nutrient reserves and their mobilization. Sprouting in control may be due to the stored carbohydrates in the cuttings. Higher sprouting differences in treatments may be due to the different amount of auxin absorption of cuttings. Higher sprouting per cent in T1 (IBA 100 ppm) may be due to the less absorption of auxins. Under some conditions, like very low auxins concentration, auxins enhance cell expansion which leads to shoot growth. This low concentration of auxins might have effect on sprouting percentage. Pain and Roy (1981) [13] in *Dalbergia sissoo* reported appreciable sprouting gains due to application of IBA and other chemicals. Nanda *et al*. (1975) [10] also reported that the application of auxin resulted in the breakdown of starch into soluble sugars and bulk of this was used up in the growing of new sprouts. The reduction in sprouting at higher IBA concentrations may be attributed to supraoptimal level.

Rooting percentage

It can be inferred from the data (Table 1) that IBA formulation had a significant influence on rooting of the cuttings. Rooting percentage was significantly affected by treatments. Cuttings treated with IBA concentration 100 ppm (T1) recorded highest rooting percentage of 68.88 % being statistically different from T2 (IBA 150 ppm) in which 57.77% rooting was recorded. Lowest rooting percentage of 13.33 % was recorded in control (T0). Rooting percentage decreased with increase in concentrations of IBA. Rooting in T3, T4 and T5 was at par. The fact that lower concentrations of auxins give better results as compared to higher concentrations has been reported by several workers while experimenting on various species. Sharma *et al*. (1991) [18] found that lower concentrations of IBA were more effective for cuttings of *Ulmus wallichiana* when dipped for 24 hours. Similar results were reported by Chanderashekar *et al*. (1996) [1] in case of mulberry cuttings. Khan and Qaisar (2009) [6] observed 81.14 % rooting in *Morus alba* variety Kanva cuttings when treated with IBA 100 ppm. Negi (1982) [12] reported that 100 ppm of IBA concentration increased number of rooted cuttings and rooting percentage in *Dalbergia latifolia*. The exogenous application of auxins enhance rooting in cuttings has been reported by Nanda *et al*. (1970) [11]. These results are in conformity with the work of Loach (1988) [9] and Kanwar (1991) [5] who suggested that optimum concentration of auxin is favorable, but supra-optimal levels are toxic to root regeneration.

Average number of roots per cutting

It can be inferred from the data (Table 1) that IBA brought about significant difference in number of roots in the cuttings. Average number of roots was significantly affected by treatments. Highest Average number of roots (20.66) was recorded in cuttings treated with IBA concentration 300 ppm (T5) being statistically at par with T4 (IBA 250 ppm) in which 17.33 roots were recorded. Lowest average number of roots (8.66) was recorded in cuttings treated with distilled water (control). Number of roots increased with increase the concentration of IBA. Number of roots recorded at 100, 150, 200 and 250 ppm was at par. These results are in conformity with the findings of Khan and Qaiser (2009) [7] who reported maximum number of roots in *Morus alba* variety Kanva cuttings when treated with IBA concentration of 300 ppm. Pain and Roy (1981) [13] and Shamat and Kumar (1988) [17] also noted a differential increase in number of roots per cutting in *Dalbergia sisoo* as a result of IBA, IAA and NAA.

Height of leading shoot (cm) and Collar diameter of leading shoot (mm)

The data presented in Table 1 showed that height of leading shoot (cm) was significantly influenced by IBA. Cuttings treated with IBA concentration 100 ppm (T1) showed maximum height of leading shoot (22.26 cm) which was significantly different from height of leading shoot in other treatments. Lowest height of leading shoot (9.63 cm) was recorded in control (T0) which was maintained by treating cuttings with distilled water. Height recorded at 150, 200, 250 and 300 ppm was at par with one another. Height of leading shoot decreased with increase in IBA concentration. Collar diameter of leading shoot was significantly affected by treatments. Cuttings treated with IBA concentration 100 ppm (T1) recorded maximum collar diameter of leading shoot (3.90 mm) being statistically different from other treatments. Lowest collar diameter of leading shoot (2.37 mm) was recorded in control. Collar diameter recorded at higher concentration of 150, 200, 250 and 300 ppm were at par with one another. The results are in conformity with the findings of Peer (2002) [14] who reported that lower concentrations of IBA are favorable for growth of mulberry.

Table 1: Effect of IBA on different characteristics of *Morus alba* variety Local

Chemical	Treatment	Sprouting (%)	Rooting (%)	Average number of roots per cutting	Height of Leading shoot(cm)	Collar diameter of leading shoot (mm)
Control	To (distilled water)	65.00	13.33	8.66	9.63	2.37
IBA	T1 (100ppm)	95.55	68.88	15.66	22.22	3.90
	T2 (150ppm)	85.55	57.77	16.33	19.70	3.53
	T3 (200ppm)	84.44	52.22	16.66	19.00	3.56
	T4 (250ppm)	82.21	51.11	17.33	18.20	3.70
	T5 (300ppm)	64.33	50.00	20.66	17.93	3.38
	CD@5%	9.82	2.24	3.52	2.06	0.49

Plate I: Propagation of *Morus alba* variety Local through cuttings

Conclusion

Studies conducted on propagation of Morus species through cuttings reveals that application of 100 ppm concentration of IBA proved most effective for the propagation of *Morus alba* through cuttings. Application of 100 ppm concentration of IBA was found most effective for maximum characteristics of *Morus alba* and may of used in nurseries for its mass propagation.

References

1. Chanderashekar DS, Radakrishnan S, Sikdar AK, Datta RK, Shetty HS. Effect of growth regulators on the propagation of S-36 Mulberry stem cuttings. Indian Forester. 1996; 122:525-527.
2. Datta RK. Mulberry Cultivation and Utilization in India. FAO Electronic conference on mulberry for Animal production. FAO. Morus (I-L) 2000, 45- 62.
3. David FH, Midcap JT. Propagation of woody ornamentals by cuttings. Institute of Food and Agricultural Sciences. University of Florida, 2003.
4. Haq R. Effect of light and weed competition on the survival and growth of *Abies pindrow* seedlings of various ages in different soil media in the moist temperate forests of Pakistan. Pakistan Journal of Forestry. 1992; 42(3):148-162.
5. Kanwar BS. Study on the propagation techniques of *Ulmus laevigata* Royle (Var. Marino). M. Sc. Thesis, Dr. Y. S Parmar University of Horticulture and Forestry, Solan 1991, 75
6. Khan PA, Qaiser KN. Vegetative propagation of *Morus alba* var. Kanva through Branch cuttings. Journal of Tree Sciences. 2009; 28(1, 2):57-59.
7. Khosla PK, Nagpal R, Puri S. Propagation of some agroforestry species by air layering. Indian Journal of Forestry. 1982; 5:171-174.
8. Libby WJ. The use of vegetative propagules in forest genetics and tree improvement. Newzealand Journal Forestry Science. 1974; 4:440-447.
9. Loach K. Hormone application and adventitious root formation in cuttings, a critical review. Acta Horticulture. 1988; 227:126-133.
10. Nanda KK, Gurumurti K, Chibber RN. An evidence for the allosteric nature of IAA oxidase system in *Phaseolus mungo* hypocotyls. Experimentia. 1975; 31:635.
11. Nanda KK, Nanda VK, Kumar P. Some investigations of auxin effects on rooting of stem cuttings of some forest tree species to auxins. Indian Forester. 1970; 94:154-162.
12. Negi KS. A note on rooting response in *Dalbergia latifolia* Roxb. cutting by plant hormones. Indian Forester. 1982; 108(4):249-255.
13. Pain SK, Roy BK. A comparative study of the root forming effect of IPA, IBA and NAA on the stem cuttings of Dalbergia sissoo Roxb. Indian Forester. 1981; 107(3):151-154.
14. Peer KA. Studies on propagation of some cultivars of mulberry (*Morus* spp) through stem cuttings under Kashmir climatic conditions. M. Sc. thesis submitted to SK. University of Agricultural Sciences & Technology of Kashmir, Shalimar, Srinagar, 2002, 1-135.
15. Rao LSP, Khan AA. Vegetative propagation of Japanese mulberry varieties by use of growth regulators. Indian Journal of Sericulture. 1963; 1(3):723.
16. Sanjappa M. Geographical distribution and exploration of the genus *Morus* l. (*Moracea*). In: *Genetic resources of mulberry and utilization* (Eds. K. D. Sengupta). *Central* Sericultural Research and Training Institute (CSRTI), Mysore India, 1989, 4-7.
17. Shamat GS, Kumar S. Rooting studies of *Punica granatum* and *Dalbergia sissoo* cuttings under controlled phyto environmental conditions. Indian Forester. 1988; 114:331-334.
18. Sharma DP, Bhat ML, Allah, Rang. Propagation of Elm (*Ulmus wallichiana*) by cuttings. Indian Forester. 1991; 117(8):664-667.
19. Soni SL. Use of growth regulator in horticulture. Farmers and Parliament. 1970; 5(2):7-8.