CHAPTER VIII

Vegetative Propagation of Rudraksh Through Branch Cuttings

Introduction

The population of Rudraksh is depleting in nature due to its overexploitation. The ripened fruits of Rudraksh are collected by man in huge quantity from the forest floor for making 'malas' or to sell them in market at higher prices. The Rudraksh plants are also used by the people as fuel and timber. Moreover, the stony nuts of Rudraksh germinate hardly up to 5% in natural conditions and its seedlings are eaten/killed by wild animals. Thus, its regeneration is very poor. As the seeds do not germinate easily in nature, it was thought worthwhile to examine whether this tree species can propagate through vegetative means by giving some growth hormone treatments to stem/branch cuttings in different seasons under the green house conditions.

Materials and Methods

Branch cuttings of Rudraksh were collected from the healthy mother plant (8-10 years old) in four seasons of the year viz., spring (February), summer (May), rainy (August) and winter (November). The uniform-sized cuttings of 15-20 cm length and 5 cm diameter were selected (20 cuttings for each treatment) and treated with 100, 200, 500 ppm (mg/l) each of IAA (Indole acetic acid), IBA (Indole-3 buteric acid), NAA (Napthalene acetic acid) and 2, 4-D (Dicholorophenoxy acetic acid) respectively by dipping about 5 cm

basal cut ends in the respective solution for 24 hours. Twenty cuttings were separately soaked in distilled water to serve as the control. The treated cuttings were planted during aforesaid seasons in polythene bags containing equal amount of garden soil and sand and small amount of farmyard manure. The polythene bags were kept in the net house and watered regularly. The observations on sprouting were made after 30, 45, and 60 days from the date of treatment. Rooting response of the cuttings was observed by uprooting them from the bags.

Results

Sprouting

Sprouting was observed only in February and May in the most treatments except NAA_{100}, IBA_{200}, 2,4-$D_{100,\ 200\ \&\ 500}$. The cuttings planted in February sprouted better than those planted in May. No sprouting was observed in the cuttings planted in August and November. Moreover, number of sprouts per cutting and average sprout length were more in the case of cuttings planted in February than those planted in May (Table VIII.1).

Rooting responses

No rooting was observed in any of the cuttings which sprouted. Though sprouting was observed in both the seasons, sprouts were dead after about one month from the date of sprouting. Thus the hormonal treatments failed to stimulate rooting in the cuttings.

Table VIII.1. Response of cuttings to various growth hormones in different seasons.

Treatments (ppm)	No. of cuttings planted.	No. of cuttings sprouted				Average sprouts per cutting.		Average sprout length (mm)		Rooting (%)		Survival (%)
		Feb.	May	August	Nov.	Feb.	May	Feb.	May	Feb.	May	
IAA-100	20	3 (15)	2 (10)	Nil	Nil	1.33	1	4.5 ±1.1	4.5 ±0.5	Nil	Nil	Nil
IAA-200	20	5 (25)	2 (10)	Nil	Nil	1.20	1	4.2 ±1.6	4.2 ±1.2	Nil	Nil	Nil
IAA-500	20	9 (45)	5 (25)	Nil	Nil	1.55	1.2	4.1 ±1.8	4.6 ±1.9	Nil	Nil	Nil
IBA-100	20	7 (35)	1 (5)	Nil	Nil	1.14	2	5 ±1.3	5 ±1.0	Nil	Nil	Nil
IBA-200	20	10 (50)	- (0)	Nil	Nil	1.20	-	4.9 ±2.4	- -	Nil	Nil	Nil
IBA-500	20	15 (75)	9 (45)	Nil	Nil	1.37	1.4	6.5 ±2.9	5.9 ±2.8	Nil	Nil	Nil
NAA-100	20	- (0)	- (0)	Nil	Nil	-	-	- -	- -	Nil	Nil	Nil
NAA-200	20	2 (10)	1 (5)	Nil	Nil	1.50	1	8.6 ±2.9	4 ±1.1	Nil	Nil	Nil
NAA-500	20	7 (35)	8 (40)	Nil	Nil	1.42	1.5	8.3 ±3.3	7.3 ±2.4	Nil	Nil	Nil
2,4-D-100	20	- (0)	- (0)	Nil	Nil	-	-	- -	- -	Nil	Nil	Nil
2,4-D-200	20	2 (10)	- (0)	Nil	Nil	1	-	6 ±2	- -	Nil	Nil	Nil
2,4-D-500	20	- (0)	- (0)	Nil	Nil	-	-	- -	- -	Nil	Nil	Nil
Control.	20	5 (25)	3 (15)	Nil	Nil	1.40	1.3	4.3 ±1.2	7.7 ±2.3	Nil	Nil	Nil

Values in the parentheses are the percentage of sprouted cuttings.

Discussion

The results of the present investigation and those reported by earlier workers (Momose 1978, Halle & Hanif Kamil 1981, Srivastava & Manggil 1981, Khosla *et al.* 1982b, Smits 1983, Puri & Nagpal 1988, Puri & Shamet

1988, Radwan *et al.* 1989, Bhatt & Todaria, 1993a, b, Chauhan *et al.* 1993, Gauttam & Negi 1997b, Bhatt & Todaria 1990b) show a wide variation in rooting and sprouting ability of cuttings and inconsistent effect of different concentrations of various auxins.

Several workers have reported that exogenous application of hormones induces rooting in a number of species (Bhagawati & Badani 1993, Puri & Shamet 1988, Bhatt & Todaria 1993a, b). The present study suggests that no general conclusion can be drawn regarding the effect of a particular auxin on vegetative propagation of Rudraksh. Though sprouting was induced in cuttings during spring (February) and summer (May) seasons, the hormone treatments could not induce rooting in any of the cuttings in any season.

Seasonal stimulus plays an important role in the callus formation in trees. Only two seasons stimulated sprouting in the stem cuttings of Rudraksh. A number of workers have shown that rooting of cuttings is facilitated when carbohydrate reserve foods are in abundance (Kraus & Kraybill 1918, Knight 1926, Carlson 1929, Duguma 1988). Much of the growth activities remain at minimum during winter. As the temperature starts rising from February onwards, the reserve food material (carbohydrate) is mobilized, which helps in growth flushes. Thus, in February the cuttings are full of reserve food materials. The mobilization of carbohydrates and rising temperature in February stimulates sprouting and rooting. Thus, vegetative propagation can be done more easily in February as compared to the other months of the year during which the cuttings were planted.

Callus tissue plays an important role in vegetative propagation (Satoo, 1956). In this experiment callus formation might have failed probably due to lack of sufficient food reserve, unfavorable temperature and moisture, and some internal factors as reported by Bonga & Durzan (1982).

During vegetative propagation early growth of sprouts depends on food reserve available in the cuttings (Wright 1975) followed by shoot formation. However, where root formation lags very much behind shoot formation, survival rate becomes very low and the plant is likely to die (Duguma 1988). In this study good sprouting was observed in some treatments but root formation did not take place. According to Adriance and Brison (1955) low carbohydrate/N ratio encourages better shoot growth but poor root formation. Thai (1977) reported flagging (drying of shoots) in *Palaquium maingayi* cuttings. He suggested that early shoot formation might have an unfavorable effect on root formation because this creates a competitive relation between root and shoot formation for nutrient reserve in the cuttings. The causes of failure of the rooting in the sprouts emerging from the stem cuttings of Rudraksh and the mechanism to overcome this problem need further investigation. A thorough understanding of these aspects may be helpful in devising techniques that may augment vegetative propagation in this rare species, which shows poor germination.