

ROOTING RESPONSE OF BRANCH CUTTINGS OF TWO PROMISING SACRED *FICUS* TREE SPECIES OF THE TROPICS

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KHALI, M.P., JOSHI, S.C. & DHYANI, P.P. 1996. Rooting response of branch cuttings of two promising sacred *Ficus* tree species of the tropics. Rooting response of stem cuttings of two *Ficus* species, namely *F. bengalensis* and *F. religiosa*, was investigated during different seasons of a year in the presence and absence of auxin treatment. Both species showed poor rooting potential without auxin treatment, but a better response when treated with auxins. A correlation was seen between their active photosynthetic period and rooting capacity. A marked seasonal variation in their rooting behaviour was also observed.

Key words : *Ficus bengalensis* - *Ficus religiosa* - auxins - seasonal variation - rooting response

KHALI, M.P., JOSHI, S.C. & DHYANI, P.P. 1996. Tindakbalas pengakaran bagi keratan dahan dua spesies pokok *Ficus* tropika yang berpotensi dan suci. Tindakbalas pengakaran bagi keratan batang dua spesies *Ficus* iaitu *F. bengalensis* dan *F. religiosa* telah diselidiki pada musim-musim yang berbeza dalam setahun dengan kehadiran dan ketiadaan rawatan auksin. Kedua-dua spesies menunjukkan potensi pengakaran yang lemah tanpa rawatan auksin tetapi menunjukkan tindakbalas yang lebih baik dengan rawatan auksin. Satu korelasi didapati antara tempoh fotosintesis aktif dengan keupayaan pengakaran. Kelakuan pengakaran yang ketara juga diperhatikan dengan perubahan musim.

Introduction

Multiplication of plants through rooting of their stem cuttings, one of the important means of vegetative propagation, is widely being used in horticultural and forest tree species, particularly where seed propagated plants are slow growing. Not all plants readily root by stem cutting when planted in soil. A number of internal and external factors can influence the rooting of stem cuttings (Nanda *et al.* 1974, Eliasson *et al.* 1977, Puri & Shamet 1988). Use of growth regulators, particularly auxins, has proven very useful for promoting rooting of cuttings in several cases (Nanda & Anand 1970, Roberts & Hooley 1988).

Ficus bengalensis and *F. religiosa* are considered sacred plants in the tropics. These species provide multiple uses to the rural people of the tropics and possess many medicinal properties (Anonymous 1956). A survey of literature shows that very little attention has been given to the multiplication potential of these sacred species. The seed germination capacity of these species is also very poor (Singh 1982). Therefore, the present investigation was undertaken to study (i) the seasonal effect, and (ii) the effect of auxins on rooting capacity of the plants.

Materials and methods

Branch cuttings of *F. bengalensis* Linn. and *F. religiosa* Linn. were collected at monthly intervals from March 1988 to February 1989 from trees of approximately 15 years old at 550 m altitude. Uniform cuttings of 23 cm length and 1 cm diameter were selected and divided into five groups, each containing 50 cuttings. The first group served as the control and groups 2 to 5 were treated with 100 and 500 ppm indole-3-acetic acid (IAA) and indole-3-butyric acid (IBA). For treatment about 5 to 7 cm basal cut ends were dipped in the respective solution for the duration of 24 h. Distilled water was used for the control set. After treatment the cuttings were planted in polyethylene bags containing 1:1:1 proportions of garden soil, sand and farmyard manure and were kept in field conditions. Cuttings were watered regularly. The number of cuttings rooted and the number of roots per cuttings were recorded after 60 days of planting.

The photosynthetic rate of 2-y-old saplings of these species grown under identical environmental conditions was recorded at monthly intervals for a year using a portable photosynthesis system (Li-Cor, USA; Model 6000). The youngest fully mature leaves were taken for measurement. The minimum and maximum temperatures of the experimental site were also recorded during the course of the experiment.

Results and discussion

The results obtained from the rooting response of stem cuttings of the two *Ficus* species are shown in Table 1. The results clearly indicate that both species do not root easily and in both cases the control (water treated) showed only 40% rooting capacity. A marked seasonal variation in their rooting behaviours was also observed.

Rooting of control cuttings was observed only in the months of March and April in *F. bengalensis*, and from March to July in *F. religiosa*.

Table 1. Percentage of rooted branch cuttings of two *Ficus* tree species during different months of a year. Figures in parentheses indicate the number of roots per cutting.

Month of planting	Control	IAA (ppm)		IBA (ppm)	
		100	500	100	500
<i>F. bengalensis</i>					
March	30(25)	50(25)	60(30)	60(25)	90(62)
April	45(35)	45(35)	60(37)	60(30)	100(68)
May	- (0)	40(20)	60(25)	40(25)	60(35)
June	- (0)	30(10)	50(10)	40(10)	60(40)
July	- (0)	30(15)	50(15)	60(25)	60(30)
August	- (0)	30(15)	50(20)	60(25)	80(45)
September	- (0)	40(15)	60(20)	50(30)	80(40)
October	- (0)	45(20)	60(27)	50(45)	80(50)
November	- (0)	- (0)	- (0)	- (0)	- (0)
December	- (0)	- (0)	- (0)	- (0)	- (0)
January	- (0)	- (0)	- (0)	- (0)	- (0)
February	- (0)	- (0)	- (0)	- (0)	- (0)
<i>F. religiosa</i>					
March	35(10)	35(15)	35(20)	60(20)	80(40)
April	40(20)	38(20)	40(20)	100(40)	100(45)
May	20(10)	25(13)	35(20)	30(15)	40(30)
June	20(12)	20(15)	30(30)	38(15)	60(45)
July	40(20)	40(25)	40(20)	30(20)	55(43)
August	- (0)	- (0)	- (0)	- (0)	- (0)
September	- (0)	- (0)	- (0)	- (0)	- (0)
October	- (0)	- (0)	- (0)	- (0)	- (0)
November	- (0)	- (0)	- (0)	- (0)	- (0)
December	- (0)	- (0)	- (0)	- (0)	- (0)
January	- (0)	- (0)	- (0)	- (0)	- (0)
February	- (0)	- (0)	- (0)	- (0)	- (0)

Application of auxins considerably increased the rooting percentage as well as the average number of roots per cutting. In general, IBA was found to be more efficient than IAA. IBA has been found superior for rooting in several cases (Adil Al-Kinary 1981, Rana *et al.* 1987). The estimations of photosynthates and endogenous auxin of the branches taken for rooting were not done. However, the monthly observations on the photosynthetic rate for one year of 2-y-old saplings of these plants grown under identical environmental conditions were recorded. The seasonal variations in photosynthetic rate were observed in both the species (Figure 1). The pattern of photosynthetic rate reveals that rooting capacity of these species seems to correlate with active photosynthetic phase. *Ficus bengalensis* showed better rooting response than *F. religiosa*. There was also a significant difference in the photosynthetic rate between the two species. The photosynthetic rate was higher in *F. bengalensis*. Further, with regard to auxins *F. bengalensis* responded better than *F. religiosa*. It has been reported that growth hormones, particularly auxins, promote rooting by activating the hydrolytic enzymes which mobilise the

reserve food (Nanda & Anand 1970). Whether the higher photosynthetic rate of *F. bengalensis* influences its better rooting response needs to be investigated. Further, in both species rooting failed to take place during winter months, characterised by considerably low photosynthetic rate (Figure 1). The prevailing low temperature during this period (Figure 2) may account for the low photosynthetic activity. It is well known that low temperature not only inhibits photosynthetic activity but also affects the translocation of photosynthates (Brown 1982). Use of exogenous auxins also did not initiate rooting during the winter months. This supports the view that a balance between nutritional status and plant growth regulators and auxins is essential for rooting of stem cuttings as has been suggested by Nanda and Dhaliwal (1974).

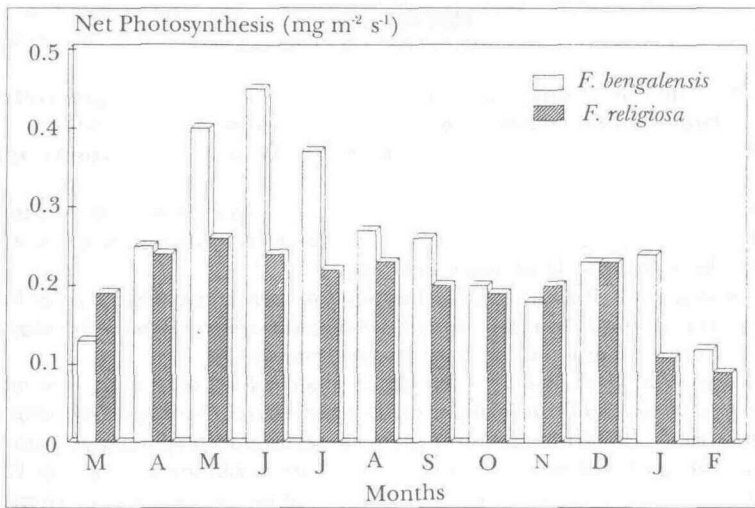


Figure 1. Seasonal variation in net photosynthetic rate in 2-y-old saplings of *Ficus* species

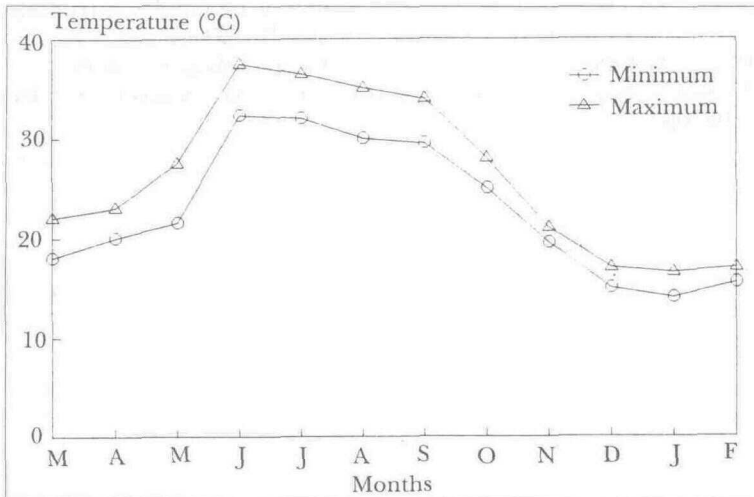


Figure 2. Average monthly minimum and maximum air temperatures during the experiment

Conclusion

Multiplication of these two *Ficus* species through stem cuttings is highly dependent on season and can be promoted considerably using auxins, particularly IBA.

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