

## Original Research Article

# Initiation of Rooting in Shoot Cuttings of *Berberis lycium* Royle through Hormonal Treatments

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## ABSTRACT

The study were conducted on rooting of shoot cuttings of *Berberis lycium* Royle by treating them with seven different treatments viz., T<sub>1</sub> (control), T<sub>2</sub> (1.00% captan + 2.00% sucrose-talc), T<sub>3</sub> (0.20% IBA + 1.00% captan + 2.00% sucrose-talc), T<sub>4</sub> (0.40% IBA + 1.00% captan + 2.00% sucrose-talc), T<sub>5</sub> (0.60% IBA + 1.00% captan + 2.00% sucrose-talc) T<sub>6</sub> (0.80% IBA + 1.00% captan + 2.00% sucrose-talc), T<sub>7</sub> (1.00% IBA + 1.00% captan + 2.00% sucrose-talc) under field conditions at the experimental farm of the Department of Silviculture and Agroforestry, Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan-173230 (HP) during the month of February, 2018. The freshly prepared cuttings of 20 cm length comprising at least four viable buds were used. The experiment was carried out in randomized block design with three replications. The sprouting percent, rooting percent, shoot length, root length and main shoot diameter were significantly influenced by different concentration of applied auxins. The maximum sprouting percent (36.66%) and rooting percent (30.33%) were recorded in the cuttings treated with 0.60 per cent IBA + 1 per cent captan + 2 per cent sucrose – talc (T<sub>5</sub>) and the minimum sprouting percent (10.00%) and rooting percent (3.33%) were observed in untreated shoot cuttings (control) T<sub>1</sub>.

## Keywords

IBA, Captan,  
Rooting, Auxins,  
*Berberis lycium*

## Introduction

International Union for Conservation of Nature and Natural resources (IUCN) assessed *Berberis lycium* Royle under the vulnerable status of conservation (Waseem *et. al.*, 2006). The species is found growing in the Himalayan region in its natural habitat between the altitudes of 850-3500 meters above mean sea level (amsl) on moderate to steep slopes (Sood *et. al.*, 2012). It is an evergreen shrub belonging to the family Berberidaceae. *Berberis lycium* Royle belongs to the over exploited category of wild fruits species in nature (Sood *et. al.*, 2013). It

is utilized for fuel wood due to high calorific value of its wood. The plant has gained significance for its medicinal value particularly in ayurvedic drugs as every part of the plant such as roots, bark, shoot and fruits, which are used in various ayurvedic medicinal preparations for curing number of human diseases (Bhattacharjee, 2008). Beside the berberine present in its rhizomes has marked antibacterial effects and the byproduct of the shrub has cancer suppressing properties. Therefore keeping in the importance of *Berberis lycium* Royle particularly its wider uses in ayurvedic

medicines, the present investigation were proposed to research out a breakthrough in its vegetative propagation through the application of different auxins.

## **Materials and Methods**

### **Study site**

The study was conducted in the experimental field of the Department of Silviculture and Agroforestry, Dr YS Parmar University of Horticulture and Forestry, during the month of February 2018. The study site was located at 30°85'71" N latitude and 76°11'75" E longitude situated at an elevation of 1187 meters above mean sea level. The study area falls in the sub-temperate zone, receiving around 1200 mm precipitation annually, the major part of which is received during July to August (monsoon period). Winter showers, though common, are usually mild. Frost occurs frequently from December to February in four to five spells. In general, May to June is the hottest months, where the highest day temperature goes up to 35°C and lowest night temperature falls down to 22°C. December to January is the coldest months, where day temperature raises up to 18°C and night temperature falls down to -2.5°C. The shoot cuttings of *Berberis lycium* Royle were obtained from the plants growing in its natural habitat in vicinity of the university campus. The freshly prepared cuttings were treated with different auxins such as T<sub>1</sub> (control), T<sub>2</sub> (1.00% captan + 2.00% sucrose-talc), T<sub>3</sub> (0.20% IBA + 1.00% captan + 2.00% sucrose-talc), T<sub>4</sub> (0.40% IBA + 1.00% captan + 2.00% sucrose-talc), T<sub>5</sub> (0.60% IBA + 1.00% captan + 2.00% sucrose-talc) T<sub>6</sub> (0.80% IBA + 1.00% captan + 2.00% sucrose-talc), T<sub>7</sub> (1.00% IBA + 1.00% captan + 2.00% sucrose-talc). In each treatment, 10 cuttings with 3 replications were investigated for recording observations on success in rooting, sprouting, shoot length, root length and main shoot diameter in the nursery beds.

### **Preparation of cuttings**

Cuttings were prepared randomly from the selected shrub of comparable vigour. The length of cuttings was 20 cm long having 1.5 cm thickness of terminal shoots. The care was taken that the cuttings had at least four viable nodes. The prepared cuttings were immediately taken to the laboratory for treatment with different auxin and its concentration. For each treatment 30 cuttings were taken, by making three replications of 10 cuttings each. The cuttings were placed in bundles with tags indicating the label of applied treatments.

### **Preparation of rooting powder formulation**

A required amount of Indole-3-butyric acid (IBA) was taken in 250 ml beaker and dissolved thoroughly in a small quantity of absolute alcohol (10 ml approximately). Then, a desired amount of talcum powder, sucrose and captan was taken and added into the beaker containing dissolved auxin. The small amount of ethanol (80.00%) was used in preparation of these formulations. The mixture was continuously stirred with glass rod to form homogeneous slurry. The alcohol in the mixture was allowed to evaporate by keeping the beaker covered with thin sheet of paper in a cool dry place in dark to prevent frequent exposure to light to avoid degradation of auxin. The dried formulations were grounded to a fine powder.

### **Treatment of cuttings with rooting powder formulation**

The lower portion of desired number of cuttings under each treatment were thoroughly dipped in rooting powder formulation of different auxins for ten seconds, used for the study so that the rooting powder is thoroughly applied to the cuttings. After treating the desired number of cuttings

under each treatment, the cuttings were immediately planted in well prepared nursery beds. Timely hoeing and weeding, irrigation and other after cares of the planted cuttings were under taken regularly and precociously.

### Results and Discussions

The treatments of shoot cuttings of *Berberis lycium* Royle with different doses of auxins for root initiation and other related parameters yielded significant results for all the attributes studied (Table 1). The shoot cuttings treated with T<sub>5</sub> (0.60% IBA+1.00%

captan+2.00% sucrose-talc) exhibited maximum sprouting percent (36.66%) and rooting percent (30.33%). The maximum root length (3.97 cm) and shoot length (3.40 cm) was recorded in T<sub>6</sub> (0.80% IBA+1.00% captan+2.00% sucrose-talc) whereas, the maximum main shoot diameter (2.53 mm) was observed in T<sub>4</sub> (0.40% IBA+1.00% captan+2.00% sucrose-talc). The minimum sprouting percent (10.00%), rooting percent (3.33%), root length (0.70 cm) and main shoot diameter (0.87 mm) was recorded in T<sub>1</sub> (control).

**Table.1** Effect of IBA on rooting behaviour of *Berberis lycium*

Treatments	Sprouting (%)	Rooting (%)	Root length (cm)	Shoot length (cm)	Shoot diameter (mm)
T <sub>1</sub>	10.00(3.32)	3.33(1.77)	0.70	2.63	0.87
T <sub>2</sub>	13.33(3.74)	10.00(3.31)	0.90	2.66	1.87
T <sub>3</sub>	20.00(4.58)	16.66(4.06)	1.62	3.23	1.90
T <sub>4</sub>	23.33(4.91)	23.33(4.91)	3.27	2.73	2.53
T <sub>5</sub>	36.66(6.12)	30.33(5.52)	2.13	2.47	1.97
T <sub>6</sub>	26.67(5.24)	16.66(4.16)	3.97	3.40	1.10
T <sub>7</sub>	16.66(4.16)	13.33(3.74)	2.23	2.80	1.24
S.E (m)	<b>2.99</b>	<b>4.30</b>	<b>0.53</b>	<b>0.09</b>	<b>0.18</b>
C.D <sub>0.05</sub>	<b>9.34</b>	<b>13.40</b>	<b>1.65</b>	<b>0.28</b>	<b>0.55</b>

The values in parenthesis are transformed values (square root transformation)

**Figure.1** Cuttings of *Berberis lycium* showing maximum root length



Reproduction is the universal phenomenon necessary for all living organisms in order to perpetuate in nature and it takes place by sexual and asexual means. Reproduction also ensures the survival and sustenance of species in this planet without which the species could have been extinct. Sexual reproduction ensures genetic variability whereas, asexual reproduction maintains genetic identity. Vegetative propagation is practiced to obtain the plants of desired genetic constitution within short period. Propagation of *Berberis lycium* Royle, through shoot cuttings with the application of various concentrations of auxins yielded encouraging results for its successful asexual propagation under field condition in the present investigation. The available literature categorized this species as hard to root as suggested by Kumar (1994). The hard to root behaviour of this species can be attributed either to anatomical characteristics present in the cuttings or the absence of rooting co-factor which are capable of stimulating root initiation in the propagules. It is well known fact that auxins are known to increase the mobilization of reserve food material by increasing the activity of hydrophilic enzymes, which as a consequence stimulate rooting in shoot cuttings of number of trees and shrubs species. The similar results have been reported by Bhuyan *et al.*, (2017). From the present investigation, it is concluded that the sprouting percent, rooting percent, shoot length, root length and main shoot diameter of *Berberis lycium* Royle were significantly influenced by different concentration of auxins. The shoot cuttings when treated with T<sub>5</sub> treatment combination (0.60%

IBA+1.00% captan+2.00% sucrose-talc) excelled all other treatments including control for root initiation in this hard to root species.

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