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Air layering of *Parkia roxburghii* G. Don Syn. *P. timoriana* (DC.) Merr. A high value tree species of northeast east India

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Abstract

The medicinal and food tree species *Parkia timoriana* (Fabaceae: Mimosoideae) is widespread in north eastern region of India, where it has a strong socio-cultural and economic importance. However, the populations of this species are highly threatened in large parts of its range due to overexploitation and environmental degradation. Thus, attempt has been made to propagate this valuable tree sp. through air-layering method and establishment of multi-location trial for genetic conservation of the species. The objective mainly highlighted the response of wrapped and unwrapped in root regeneration. For regeneration through air layering, two different rooting media were tested during rainy season. Selected branches were treated with 200ppm IBA and the media covered with sand, soil and FYM (in 1:2:2 ratio) with moistened sphagnum moss and wrapped with polythene strips. The covered transparent polythene strips depict best root initiation after six weeks of incubation. Whereas, branches wrapped with coconut husk and without polythene sheet strips shows no roots initiation. The branch treated without hormone also failed in the study. Further, it was observed that branches wrapping for extended period, upright or straight branches were having rotting symptoms. Inclined branches towards the earth respond for better result than the straight one. Cut rooted branches were shift immediately to polybags having 1:1:1 soil: sand: FYM medium and kept under shed to 30 days so for their survival.

Keywords: propagation, indole- butyric acid, air- layering, polythene strips

Introduction

Parkia roxburghii syn. *Parkia timoriana* is one of the most economically important leguminous tree species of north eastern India. It belongs to the family Leguminosae and sub-family Mimosaceae. The genus comprises of four species indigenous to India, viz., *P. timoriana*, *P. biglandulosa*, *P. leiophylla* and *P. insignis* while, information on geographical distribution of the last three species is not available, only *P. timoriana* is indigenous to northeastern India (Don and Singh, 1986)^[5]. Distribution of the species is in the states viz. Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura. The trees are generally found in the homestead garden of the villagers and nearby forest areas. Flowers, mature seeds, green pods are the good source of proteins, fats, carbohydrates, vitamins and minerals (Seal, 2011)^[14]. Due to its high economic value of pods for medicinal importance and as food, it has an important contribution to the diet and makes a great earning source of local tribal people. The village peoples are not only sale the green pods and mature seed in the market but they also sale the *parkia* seeds for the purpose of regeneration in the different states of N.E. region at a high rate. This knowledge we have gathered from the village people during our survey for selection of healthy trees of *P. timoriana* under the on-going project. Both the flowers and pods are used in preparation of a typical Manipuri salad and for other palatable dishes. Hence, it is consumed from tender to mature fruits, seeds and massive harvesting of the species may be faces for poor regeneration of new plants. Fruit and seed are a favourite food of many insects, rodents and primates posing a threat to a chance of natural regeneration. Beside this, trees are confined to the specific locality and endemic because, bat is the main pollinator of the species which is also not easily available and other nocturnal visitors include months (Phillips, 1975-76)^[10]. Again, *Megapis dorsata* also reported by (Docters van Leewen 1933 and 1938)^[3, 4] as a visitor. From the propagation point of view *P. timuriana* could be successfully cultivated through stump planting (Singh *et al.*, 2000)^[15]. To maintain the same genetic identity, vegetative propagation of the species through rooting of shoot cuttings is also little known (Don and Singh, 1986)^[5]. As reported, the tree is also susceptible to various insect pests and shows heavy mortality and decline in regeneration. Infestation of *P. timoriana* was

reported both in the field and storage seeds by *Cadra cautella* (Thangjam *et al.*, 2003) [18]. Having high economical value combined with different handicaps for future regeneration, which is the main attraction lies among the researchers. Again, the lack of organized plantation is also reported by (Roy *et al.* 2016) [13]. (Singh *et al.*, 2000) [16] reported the genetic and environmental factors influence in regeneration of selected trees propagation and a wide range of diversity was observed in *Parkia roxburghii* genotypes within Manipur due to climatic and altitudinal variations.

Hence, the present investigation was targeted for genetic improvement of the species through multilocation trial. Target is to regeneration of healthy plants through vegetative propagation such as rooting of branch cuttings, layering of the selected trees of different states of NE region etc.

Materials and methods

Present experimental study location of Rain Forest Research Institute, Jorhat, Assam, India lies, 26° 46' N and 94° 24' E. Experiment was conducted during the month of September 2019 and the approx temperature, precipitation and humidity was recorded in the field 28^o-30^o C, 216.6mm, 87% respectively. Tree age selected for the trial was 8-9 years old. Branches were measured about 12–15 cm in length, 2-3 cm in diameter and prepared for hormonal treatment. Small circular strips of bark approx 2 cm were girdled out very carefully below the nodal area of the branch using sharp knife. Exposed area of the bark was treated with prepared rooting media and pasted firmly. 0.1% aqueous bavistine solution as fungicide applied in the girdling areas before pesting of prepared media. Two methods were tested where, rooting media was used with soil: sand: FYM 1:2:2 and moistened sphagnum moss with rooting hormone indole –butyric acid (IBA) of 200ppm concentration. The girdling areas were wrapped with 150µm transparent polythene strips and tightly bind both the ends. In the second method, same media was applied but the girdling area was wrapped without transparent polythene strips only with coconut husk and tightly bind both the ends. After detach from the tree the branches were transferred to 1:1:1 soil: sand: FYM medium and kept under shed and watering was done as per their requirement.

Results and discussion

Results observed after six weeks of incubation in two different media, root initiation was observed from the branches of first method (Fig.1 & 2). The second method branches wrapped with coconut husk and without polythene sheet strips shows no roots initiation. Rotting of branches may be due to moisture retention problem. Experiment on air layering was done by several researchers in tree improvement program and recorded success in different tree species. Among the different vegetative propagation trials 100 % success was reported in air layering of *Parkia speciosa* Hassk (Chanthadet, 1991) [2]. In *Chebulic mycobalum* success on rooting of air layering was recorded after treatments with Indole butyric acid (IBA) (Misra and Jaiswal, 1994) [9]. IBA has been found to stimulate root initiation in air layers of many plant species like *Carissa carandas* and *Dalbergia sissoo* (Puri and Nagpal, 1988) [11]. Air layering has been reported in many other forest tree species such as *Ficus krishnae* & *Ficus auriculata* (Tomar and Singh, 2011) [19], *Bombax ceiba* (Venkatesh *et al.*, 1978) [20], *Gmelina arborea* (Arya and Haque, 1982) [1], *Prosopis cineraria* (Solanki *et al.*, 1984) [17], *Acacia nilotica* (Sharma *et al.*, 2004) [15], *Guadua*

angustifolia (Verma *et al.*, 2013) [21], *Eucalyptus microtheca* (Husain and Ponnuswamy, 1964) [8]. The main target of our experiment on covered polythene sheet along with the media was also reported by Rain *et al.* 2011 on covering of polythene sheet for higher root biomass. It also may be the experiences of continuous raining during the experimental period. A similar type of study also recorded in *Pterocarpus erinaceus* where author optimizes the rooting in relation to frequency of water supply (Habou *et al.*, 2017) [7]. Second method with coconut husk without polythene wrapping was not recorded for rooting.

Hence, this preliminary study of this important species may be a great approach and as reported as a the planting of these multipurpose tree species should be promoted in all the NE states of India for conservation of natural resources and improving the livelihood of hill farmers in the region (Firake *et al.*, 2013) [6].



Fig 1: Emerging of roots after six weeks of *P. timoriana*



Fig 2: Growth of roots after one week of *P. timoriana*



Fig 3: Pollinators (bats) are viewing on the tree of *P. timoriana* at Agartala, Tripura

Conclusion

Air laying method is a viable method of vegetative propagation. The results obtained from the study can be concluded that branches treated with 200ppm IBA and covered with sand, soil and FYM (in 1:2:2 ratio) media and wrapped with moistened sphagnum moss with wrapped polythene strips shows best root initiation. The branches wrapped with coconut husk and without polythene sheet strips shows no roots initiation. Rotting of branches was observed during extended period. Inclined branches towards the earth respond for better result than the straight one.

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