

# Development of Grafting Technique in Ardu (*Ailanthus excelsa* Roxb.)

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## Summary

A simple grafting technique for *Ailanthus excelsa* mature trees is developed. One year old seedling root stocks were grafted with two months old scions collected from 7 to 10 year old trees using wedge and patch grafting methods from February to April. It is important that the scion should have same thickness as of seedling rootstock for better compatibility in tissues. Graft unions were wrapped with parafilm strip to avoid desiccation and pathological problem. Grafted plants were kept in mist-polyhouse for initial two weeks in 80% relative humidity. Thereafter, these plants were hardened in shade house for another 8-10 weeks.. Wedge grafting is more successful (grafting success  $\approx$  50%) as compare to patch grafting. Once graft is established, the growth of scion is normal and mark of graft union also become lighter with due course of time.

This technique can be handled easily by farmers and field staff of SFDs. Present grafting method is more efficient over any other clonal technique developed so far. Two year old demonstration trial of male and female plants raised through grafting revealed that female plants have about 10% superiorly in height and girth parameters over male plants.

## Introduction

Ardu (*Ailanthus excelsa* Roxb.) is a multipurpose tree species (MPTS) of arid region because of its ability to grow well at low rainfalls (from 400 to 1900 mm) and in strong light conditions (Seth et al, 1962, Bhimya et al, 1963). Therefore, semi arid areas of Rajasthan are quite suitable for this species. This tree is useful to mankind in various ways. The wood is white and very light (433 kg/m<sup>3</sup> at 12% Moisture Content). The timber can be used where lightness is the priority, especially for making catamarans for fishing, packing cases, sword sheaths and matchboxes. It is also suitable for grade-III commercial and grade-IV moisture proof plywood. The leaves of this tree are excellent source of fodder in Rajasthan. It is also important for meeting the demand of plywood, match stick, toys and packing material Industries of Rajasthan (Jat et al. 2011). Stem bark of this tree is bitter in taste but it is used as astringent, febrifuge, stomachic, anthelmintic, antispasmodic, expectorant and used for the treatment of bronchitis, cold, cough, skin diseases, trouble of rectum, diarrhoea, dysentery, dropsy, fever due to tridosha, guinea- worms, snakebite and also is proven an effective contraceptive (Kumar et al, 2010).

Ardu (*Ailanthus excelsa* Roxb.) play an important role in management of land resources and securing livelihoods of economically poor people through agroforestry system to meet the increasing demand for food, fodder and fuel wood. It is considered second after Khejari

(*Prosopis cineraria*) for fodder. It is one of the important tree species (MPTS) for drought period in arid ecosystem to sustain the productivity of sheep, goat and other animals to secure livelihoods of farmers (Jat et al, 2011). This species is dioecious in nature hence, some trees (female trees) bear the fruits and other (male plants) do not produce seeds (Roxburgh, 1795; Sharma, 2000). Female trees have shown higher growth in terms of mean values for fodder and wood as compared to the male trees. Therefore, selective cloning of highly vigorous female trees can be exploited to improve fodder and timber production (Chandak and Jaimini, 2004).

Attempts were made to develop clonal technique to induce rooting in stem cuttings (Sharma and Tomar, 2003) and through tissue culture technique (Sharma et al, 2008, Parveen and Tomar, 2009). However, success rate of macropropagation was very poor (5% with stem cuttings) and in case of micropropagation rooting was 50% and hardening success was still poor. Presently described grafting technology developed at AFRI is simple, economic and easy to adopt by farmers and field forest functionaries for propagating selected superior phenotypes or genotypes for enhancing fodder productivity.

## **Location & Duration**

Arid Forest Research Institute, New Pali Road, Jodhpur 342005  
Year 2007-2008

## **Site Conditions**

Technique was developed using mist polyhouse and hardening facilities at AFRI, Jodhpur. Jodhpur is situated between 25° 51' 08" & 27° 37' 09" North latitude and 71° 48' 09" & 73° 52' 06" East longitude at 200 m asl. Atmosphere is generally dry and relative humidity ranges from 25% to 55% except during the monsoon period. Average annual rainfall is approximately 320 mm. In summer, the maximum temperature is around 42°C and the minimum temperature is around 37°C. In winters, the maximum temperature is around 27.5°C and the minimum temperature is around 15.5°C. Jodhpur is bright and sunny throughout the year.

## **Issues**

Rajasthan has about 11% of livestock of the country. There is a demand of 76.5 million tons of fodder in Rajasthan, but the supply is only 56.1 million tons in year 2006 (Source: Animal Husbandry Department, Rajasthan, 2010) leaving a gap of 20.4 million tons fodder in Rajasthan. Moreover, with the increasing pressure on land for growing food grains, oil seeds and pulses and diversified use of agriculture residues, the gap between the demand and supply of fodder is increasing.

Ardu is considered second after Khejari (*Prosopis cineraria*) for fodder due to wider adaptability and higher tolerance to biotic and abiotic stresses (Jat et al., 2011). Thus promoting this species

with higher fodder yielding clonally propagated planting stock can help in reducing this gap between demand and fodder supply.

## **Practices**

Presently *Ailanthus excelsa* plantations are raised through seeds, where gender, quality of seedling and high productivity cannot be assured. In this species, no economically viable clonal propagation technique is available so far. Thus presently developed grafting technique can be useful to farmers and state forest departments (Rajasthan and Gujarat) to propagate selected female plants to improve fodder productivity of the area.

## **Approach**

Ardu (*Ailanthus excelsa* Roxb.) is dioecious in nature. Some trees bear the fruits (female trees) and other does not produce seeds (male plants). Both trees exhibit differential pattern in growth characteristics. Females had higher mean values for fodder and wood as compared to the male trees. Therefore, selective cloning of highly vigorous female trees can be exploited to improve fodder, fuel wood and biomass production particularly for semi arid conditions.

## **Methodology**

Grafting experiments were conducted in February, March and April months using two methods viz. Wedge and Patch grafting, in this species. Wedge grafting (Grafting success  $\approx$  50%) gives better results as compare to Patch grafting. Since success was higher in Wedge grafts, this method is described in following paragraphs.

One year old hardy seedling rootstock (with 0.5-7 inches stem dia at 4 inches height) from nurseries was selected. Such seedling root stocks can be raised and harden for one year in a big polybog (6 inches diameter) with proper soil mixture. Seedling rootstock off 3 to 4 inches above the soil line was cut by using sharp, clean pruning cutters and makes the cut straight across the top. Sixty days old scions were collected from sprouts of 7 to 10 year old selected female or male trees. Both scion and rootstock of same thickness were used for grafting experiment. The selected scion was cut across the bottom into a 3-inch section. Excess of leaves were removed leaving one to two leaves at the top of scion. The rootstock top was cut in "v"-shaped notch (1/2-inch-deep triangular wedge) in the wood by using sharp, clean knife. Similarly, bottom of the scion was cut into a 1/2-inch-long wedge shape so that it can slip and fit perfectly inside the notch of rootstock. Bottom of the scion was gently pushed into the notch in the rootstock and wrap it with parafilm strip. The wrapping started 1 inch below the bottom of the graft and extend it up 1 inch past the graft. During this process care was taken to minimize the desiccation of scion and rootstock and removal of new sprouts from rootstocks if any, so that root stock support only scion and establishes strong graft union. Such grafted plants were kept in mist-polyhouse for initial two weeks than transferred to shade house for 8-10 weeks for proper hardening.

## Results Achieved

Grafted technique for *Ailanthus excelsa* was developed by Tomar et al., in 2004. However they reported very poor (10% only) successful grafting union between scion and rootstock. In a recent research work under ICFRE project sanctioned to AFRI not only the grafting technique was improved significantly (Grafting success  $\approx$  50%), a demonstration trial of male and female *Ailanthus excelsa* grafted plants was also established in 2008.

Experiments conducted by using Wedge and Patch grafting methods (Figure 1) as described in methodology. Results of these experiments revealed that Wedge grafting was more successful as compare to Patch grafting. Maximum success ( $\approx$ 50%) was achieved with wedge grafting technique. There was insignificant difference in grafting success of Male and female scions used in experiments indicate that both kind of trees (Male and female) can be clonally propagated through this technique. Initial survival was about 90% in mist polyhouse but it reduced to almost 50% after hardening for two months in shade house. Maximum casualty occurred during this hardening phase.



**Figure 1: Wedge and Patch grafts in Ardu**

Demonstration Trial (Figure 2) of grafted seedlings with male and female scions was established in July 2008 in a Randomized Block Design. Trial is irrigated and is being maintained and

growth data collected as per project schedule. Initial data indicated that the female plants are performing better (5.34% higher in height and 10.77% higher in girth) as compare to male plants. The present studies clearly indicate that this species can be propagated by grafting techniques like other tree species such as Teak, Red sanders, *Pinus petula*, Chirpine and *Dalbergia latifolia*. In these species successful field grafting has been reported by many workers (Rawat and Kedarnath, 1968, Kedarnath et al., 1976; Kapoor et al.,1977; Kedarnath et al.,1979 and Venkatesh, 1992). However, further investigations are required to improve the success rate. Presently described simple grafting technique is a better alternative for this species in comparison to the existing other non economical asexual methods. If some more efforts are made this technique can be further improved to make it more efficient.



**Figure 1: Demonstration trial of male and female *Ailanthus excelsa* grafted plants**

### **Applicability**

Present technique is applicable for multiplication of selected female or male Ardu trees for plantation activities with enhanced fodder productivity of agriculture and forest lands particularly in Rajasthan and Gujarat states. This technique can easily be adopted by farmers and field staff of forest departments.

## Dissemination

Grafting technique of Ardu has been disseminated through farmers and SFDs traibnings at AFRI, Jodhpur. To popularize this technique it has been published in Hindi (AFRI Darpan) and English (AFRI's information broacher). A demonstration trial of male female plants raised through grafting has also been established in 2008 in experimental area of AFRI.

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