# AUTECOLOGY OF *AILANTHUS GLANDULOSA* DESF. IN WESTERN HIMALAYAS

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## Introduction

*Ailanthus glandulosa* Desf is a deciduous tree and belongs to family Simaroubaceae. It grows very fast and produces abundant root-suckers and therefore can be used to clothe barren and stony hills (Brandis, 1874). In temperate Zone of Himalayas it is noticed growing between 1500 to 1800 m above the mean sea level. It associates with *Populus ciliata* and forms a colony which helps in stabilizing the hill slopes (Mathur *et al.*, 1982). Informations on its morphological characters such as height, crown area, clean bole etc., seed germination, root characteristics including root suckers and propagation technique is not available therefore, attempts were made to study its autecology and have been reported.

## Material and Methods

This study was carried out along NH-22 between Fagu and Shillaru where *A. glandulosa* occurs abundantly on both upper and lower sides of the road. It throws a lot of root suckers. *A. glandulosa* flowers in May-June and seed matures in November-December. Newly produced roots were dugout for three years from different localities in the study area at the time of commencement of growth in early spring. Twenty two centimeters long freshly dug root pieces were planted in Shillaru nursery. Seven centimeters deep furrows were made 30 cm apart in nursery beds of 1 $m^2$ area and twenty two centimeters long roots cuttings were laid horizontally in these furrows keeping 10 cm distance between two pieces in a furrow. The root cuttings were covered by about five centimeters thick layer of soil. The beds were irrigated regularly. Seed germination was tested in nursery as well as in laboratory at different time intervals from the date of collection.

Eighty six plants of *A. glandulosa* were measured for different morphological characters and mean value of each character is presented in this communication. Five plants of different diameters were dug out carefully to measure root characteristics. Biomass of different plant parts was also measured of these five trees by adopting selective harvesting technique. Fresh weight of individual part of separate tree was measured in the field and composite samples were brought to laboratory for dry weight estimation. Propagation through stem/branch cuttings has also been tried in nursery.

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**Result and Discussion**

*Biomass of different plant parts and morphological characters* : Biomass of different diameter trees of *A. glandulosa* is presented in Table 1. Stem contributes maximum to the total biomass followed by root, leaves and branches in that order except that of tree of 16.2 cm diameter where branches contribution was more than leaves. Total biomass increased with the increase in diameter of the tree. The same trend was observed in *Eucalyptus tereticornis* where total biomass increased with increasing age and diameter of trees (Singh, 1982). On an average, stem contributes 39.2% to the total biomass while the average contribution of root, leaves and branches was 25.7%, 18.5% and 16.3% respectively.

Of eighty six trees studied, the minimum values of d b h, clean bole, trees height and crown area were 6.6 cm; 1 05 m; 4 3 m and 4.9 $m^2$ while the maximum values were 52.5 cm; 3.4 m; 14.0 m and 72.3 $m^2$. The average values of d.b.h, clean bole, tree height and crown area were recorded 21.28 ± 8.85 cm; 2.14 ± 0 52 m, 8 43 ± 1.97 m and 24.77 ± 14 90 $m^2$ respectively. *A. glandulosa* sprouts very well through root-suckers and forms a thick colony and checks erosion specially splash erosion. The ability of a plant species in checking splash erosion depends upon the crown area (Singh *et al.*, 1990). This species is very much suitable for soil conservation.

*Root characteristics* : Different root characters such as tap root length, number of lateral roots, average length of lateral roots,

**Table 1**

*Biomass of different plant parts of Ailanthus glandulosa.*

| Plant No. | D.B.H (cm) | Biomass of different plant parts (kg/tree) | | | | Total Biomass (Kg/tree) |
|---|---|---|---|---|---|---|
| | | Stem | Branches | Leaves | Root | |
| 1 | 16.2 | 20 5 (42.9) | 9.7 (20.3) | 7.3 (15.3) | 10.2 (21.3) | 47.7 |
| 2 | 25.4 | 23.0 (33.5) | 11.5 (16.7) | 14.6 (21.2) | 19 5 (28.4) | 68.6 |
| 3 | 29.9 | 27.2 (36.9) | 11.3 (15.3) | 14.9 (20.2) | 20.2 (27.4) | 73.6 |
| 4 | 36.6 | 42.0 (42.1) | 14.2 (14.2) | 17.5 (17.5) | 26.0 (26.0) | 99.7 |
| 5 | 46.1 | 47.3 (40.3) | 17.5 (15.1) | 21.3 (18.4) | 29.5 (25.5) | 115.6 |

Figures in ( ) are the percentage of that part in respect of total biomass.

diameter of lateral roots at 10.0 cm interval and average taper rate per 10 0 cm interval, are tabulated in Table 2. This table reveals that *A. glandulosa* has a well developed root system with a tap root which penetrates deep in the soil. Maximum root depth recorded was 205.0 centimeters. Number of lateral roots varied from six to nine and their lengths from 46.8 to 216.1 cm. On road sides cutting and landslips where roots of this tree get exposed, large number of root suckers sprouting up and colonise the landslips. The average taper rate at 10.0 cm interval decreases as the root length and diameter of trees increases (Table 2) which indicates that roots are stronger in old plants than younger ones. On an average the root of individual *A glandulosa* tree binds over an area of 3.11 $m^2$. Roots can increase the stability of slopes by anchoring a weak soil mass to fractures in bed rock, by crossing zones of weakness to more stable soil. and by strengthening soil with long fibrous binders (Mathur *et al.*, 1982, and Singh *et al.*, 1990).

**Table 2**

*Root characteristics of Ailanthus glandulosa.*

| Plant No. | D.B.H. (cm) | Tap root length (cm) | No of lateral roots/ plant | Average length of lateral root/ plant (cm) | Spread of lateral root/ plant ($m^2$) | Average of diameter of lateral root at root/plant 10 cm intervals | Average taper rate/ 10 cm |
|---|---|---|---|---|---|---|---|
| 1 | 16.2 | 62.5 | 7 | 46.8 | 1.30 | 2.29; 1.30; 0.98; 0.80; 0.61; 0.41. | 0.37 |
| 2 | 25.4 | 105.6 | 6 | 89.3 | 1.45 | 4 10; 3.18; 2.38; 1.78; 1 33; 0.98; 0.72; 0.63; 0.47; 0.31; 0.26. | 0.35 |
| 3 | 29.9 | 165.2 | 8 | 139.5 | 4.20 | 4.82; 4.05; 4.00; 3.72; 3.20; 2.85; 2 58; 2.37; 2.18; 1.79; 0 94; 0.80; 0.59; 0 47; 0.32; 0.21. | 0.30 |
| 4 | 36.6 | 190.7 | 6 | 172.5 | 3.60 | 4.92; 4.80; 4.75; 4.60; 4.42; 4.20; 3.99; 3.87; 3.57; 3 31; 3 13; 2 98; 2 45; 2.18; 1 75; 0 98; 0.78; 0.56; 0 36. | 0 25 |
| 5 | 46.1 | 205.0 | 9 | 216.1 | 5.00 | 5.20; 4.91; 4.80; 4.65; 4 48; 4.32; 3.98; 3.31; 2.81; 2.42; 2.29; 1.93; 1.72; 1 35; 1.14; 1.12; 0 98; 0 71; 0.67; 0.60; 0.45; 0.35; 0 23. | 0 22 |

*Seed germination and stem cutting* : *A. glandulosa* seeds remain viable for over one year period. Seeds collected in December, gave 86.00 ± 3 60% and 84.33 ± 5.04% germination in March the following year in laboratory and nursery respectively (Table 3). September sowing gave 64 00 ± 10.58% and 54.33 ± 7 57% germination in laboratory and nursery. *A. glandulosa* seed absorbs more water than its weight within 24 hours period of soaking which indicates that *A. glandulosa* seed has no seed coat dormancy.

**Table 3**

*Germination behaviour of Ailanthus glandulosa seeds.*

| Conditions/Months | Germination (%) |
|---|---|
| *In Laboratory* | |
| March | 86.00 ± 3 60 |
| May | 83 40 ± 4 87 |
| September | 64 00 ± 10 58 |
| *In Nursery* | |
| March | 84.33 ± 5 04 |
| May | 70 66 ± 4.32 |
| September | 54 33 ± 7 57 |

± is the standard deviation of mean.

Twenty two centimeters long newly produced stem/branch cuttings were planted in nursery deds at monthly interval throughout the year. Beds were irrigated regularly but no root formation took place in these cuttings. It was noticed during this study that 20 to 30% cuttings planted in March and April, sprouted and new leaves appeared which dried up later as no root formation took place. This aspect needs further study in controlled environment.

*Sprouting of root suckers* : *A. glandulosa* reproduces abundantly through root suckers. The suckers spring from the roots which get exposed or injured. Twenty two centimeters long root cutting planted in nursery beds sprouted, the data is given in Table 4. On an average 65.81 ± 5.43% sprouting of suckers was recorded in nursery conditions. Suckers generally appeared in cluster and recorded their presence at the cut ends of root segments. Singh and Kashayap (1982), have also studied suckers development in *Populus ciliata* root and concluded that the incised roots of *P. ciliata* have good suckering capacity. Normal roots of growing *A. glandulosa* do not produce suckers which may be due to the presence of auxin which

**Table 4**

*Sprouting of root sucking in Ailanthus glandulosa*

| Years | Sprouting (%) |
|---|---|
| 1980 | 66.66 ± 7.63 |
| 1981 | 60.00 ± 13.22 |
| 1982 | 70.68 ± 8 66 |

± is the standard deviation of mean.

supresses suckering in such roots. Breaking down of the auxin in excised roots facilitates suckers production in *Populus tremuloides* (Schier, 1975). The results of present investigation get significant support from the results of *Populus ciliata* and *P. tremuloides*.


## SUMMARY

**The autecology of *Ailanthus glandulosa* Desf. in Western Himalayas was studied. Its biomass and root development was analysed. It is a good soil binding tree species and reproduces through seed and root suckers. Seed remains viable for over one year.**


## पश्चिमी हिमालय क्षेत्र में एलैन्थस ग्लेण्डुलोसा डेस्फे० की व्यक्ति-पारिस्थिकी

आर०पी० सिंह, एम०के० गुप्त व प्रकाश चन्द्र


### सारांश

पश्चिमी हिमालय प्रदेश में एलैन्थस ग्लैण्डुलोसा डेस्फे० की व्यक्ति-पारिस्थिकी का अध्ययन किया गया। इसके जैवपुंज और जड़ों के विकास का विश्लेषण किया गया। यह मिट्टी बाँधने वाली अच्छी वृक्ष जाति है तथा बीज और जड़वों से पुनरुत्पन्न हो जाती है। बीज एक वर्ष तक जीविष्णु बना रहता है।


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