



Growth pattern of *Celastrus paniculatus* Willd. in two different habitats of district Tehri Garhwal, Uttarakhand (India)

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Abstract: Tehri Garhwal is one of the most important hilly district of Uttarakhand state, which is located at the foot hills of Himalayan mountain ranges has a rich and diverse form of vegetation along with medicinal and aromatic plants. Traditionally the folk people and the local inhabitants utilize the vegetation from their contiguous in the form of medicine, timber, food, fiber etc. Among these useful plants population of the some useful plants are becoming rare and threatened due to unsustainable utilization, overexploitation, construction of roads, over grazing, pilgrims, construction of large dams, forest encroachment, landslides and natural calamities, modernize agriculture etc. Out of these medicinal plants, a very important and threatened medicinal plant is *C. paniculatus* (Malkangni). The present study deals with conservation and cultivation practices of *C. paniculatus* in two altitudinal sites i.e. site 1st - village Budogi lying on the altitude of 2000m asl. and site 2nd - S.R.T. Campus Botanical Garden, Badshahithaul (Tehri Garwal), upto 1600m asl. Measurements of the plant height, number of leaves, size of veins etc. was compared at two altitudinal zones. The samples parameters from site 2nd showed maximum growth rate of *C. paniculatus* i.e. 8.4 ± 0.86 cm, 9.01 ± 2.0 and 2.63 ± 0.23 cm for plant height, number of leaves and size of veins respectively as compared to site 1st i.e. 5.19 ± 0.52 cm, 4.85 ± 0.85 and 2.27 ± 0.1 cm. Thus, *C. paniculatus* showed best growth rate at an elevation up to 1600m. The cultivation practice will provide reliable information for cultivation of this species in a particular altitudinal range.

Keywords: *Celastrus paniculatus*, Conservation, Medicinal plants, Threatened, Tehri Garhwal

INTRODUCTION

Celastrus paniculatus is a highly medicinal plant is belonging to family Celastraceae, commonly known as Malkangni in Hindi, Jyotismati in Sanskrit (Gaur, 1999) and Maalkauni or Kaunya in local tongue. Majority of this plant species occurring in sub-Himalayan tract reaches upto 2000m (Rekha *et.al.*, 2005). *C. paniculatus* is a deciduous woody climber, stem has rough, reddish brown bark, densely covered with small elongated white lenticels. Leaves are oval or elliptic in shape. Flowers are tiny yellow-greenish color with 3.8 mm diameter; capsules of the plant are globosely, trilobed, dark orange-yellow colored with 1-1.5cm diameter containing 3-4 seeds which are enclosed by orange red aril (Gaur, 1999).

C. paniculatus has wider use in Ayurveda, Charak-samhita, Unani, Sidha and local inhabitants. The plant species is generally used for memory enhancing and nervous disorder properties (Phulwaria *et al.* 2013). Unsystematic collection of this plant from the wild has posed a serious threat to its existence in the wild, especially when the plants are harvested well before seed start become fully grown (Martin *et.al.* 2006). Cultivation of medicinal plants is the source of supply

of raw material without threatening their existence from wild (IUCN, 1993). By knowing the threat of extinction there is urgently need to develop conservation strategies, propagation protocols, and selection of suitable cultivation sites and commercial cultivation of this species (Butola *et.al.* 2012). Before the cultivation of medicinal plants there is urgently need to identify suitable cultivation sites and prioritize those sites which are best suitable for the growth of plants. There is no evidence report of *C. paniculatus* propagation in different altitudinal sites. Therefore, the present study experimented the conservation and cultivation practices of *C. paniculatus* at two different altitudinal zones of district Tehri Garhwal i.e. Village Budogi 2000m asl and S.R.T. Campus Badshahithaul, Tehri Garhwal, 1600m asl.

MATERIALS AND METHODS

Experimental area: For the analysis of growth pattern of *C. paniculatus*, the study was conducted in the month of May to December 2014. For the experiment the author's selected two different altitudinal sites i.e. Village Budogi 2000m asl. and S.R.T. Campus Badshahithaul, 1600m asl.

Plant material: Germ plasm collection of *C. paniculatus*

was done in the month of December, 2013. The plant material (Seeds) was collected from different region of the forest mainly from Nagani (Henwal-ghati) and Bhagirathipuram (Khaand-khal) along an altitude up to 1200m asl. The collected germplasm was dried under sun light for one week. The dried seeds were kept in polythene bags and stored in dry and cool conditions.

Soil bed material: Soil was collected from the adjacent forest of both sites. From site 1 and site 2 soils taken from both sites of forest and mixed with some animal dung in the ratio of 10:3. The soil mixed with manure and kept into polythene bags. After the preparation of mixture a hole was made in the mixture of soil with the help of an iron screw and put the seeds into the soil and sprinkled some amount of water.

Germination: The seeds were germinated in the month of June 2014. Out of 20 seedlings we randomly took 5 seedlings (average 3 cm.) for experimental trail and the readings were taken on the basis of plant height, number of leaves and size of the veins (mid rib) etc.

Data analysis: The present data were analyzed statistically by using MS-Excel and graphs were made using ORIGIN Version 6.1 Data Analysis and Graphics Design software. The data represented mean values of measurements with standard deviation and standard error.

RESULTS AND DISCUSSION

The growth of *C.paniculatus* from two different altitudinal sites was observed in the month of June, 2014 to December, 2014. These experimental data showed well growth percentage at site 2 *i.e.* S.R.T. Campus, Botanical Garden as compared to site 1. Based on experimental data site 2 is significantly better for cultivation and germination for *C. paniculatus*, while site 1 doesn't show favorable growth conditions. In the present experimental trail the maximum height was shown at site 2 *i.e.* 8.4±0.86 cm (Table 1). Maximum number of leaves was also observed in site 2 (9.01±2.0), However, minimum number of leaves was observed in site 1 *i.e.* 3.9±0.63. Size of mid rib also influences the growth rate in both sites. Maximum size of mid rib was observed at site 2 *i.e.* 2.63±0.23 cm while site 1 sample have small size *i.e.* 2.1±0.1 cm. (Table 1). The experimental study highlights the general pattern of growth in *C.paniculatus* from growing till the adjustment of the plants. The growth is somewhat slower in 1st to 5th weeks but after the successful acclimation with surroundings environment, the growth is towards higher rates (Fig. 8). Overall the best growth rate was seemed in site 2 as compared to site 1.

The average data from June to December also revealed that addition of animal dung with soil improve the growth rate of *C.paniculatus*. The experimental study also reveals that the root lengths also influence the growth rate of plants. The samples of site 2 have longer

Table 1. Growth pattern of *Celastrus paniculatus* in two altitudes.

Growth parameters Samples	Site 1					Site 2				
	P1	P2	P3	P4	P5	p1	p2	p3	p4	p5
Plant height ±SE cm	4.94±0.51	5.08±0.5	5.11±0.51	5.19±0.52*	5.3±0.5	7.56±0.82	8±0.82	8.2±0.8	8.4±0.86*	8.4±0.86
Number of leaves ±SE	4.8±0.84	4.85±0.85*	3.9±0.63	4.25±0.73	4.75±0.8	8±1.0	8.1±1.4	7.0±1.5	6.6±1.4	9.01±2.0*
Size of mid rib (Vein) ±SE cm	2.14±0.1	2.03±0.1	2.1±0.1	2.27±0.1*	2.08±0.16	2.0±0.15	2.4±0.2	2.2±0.1	2.2±0.1	2.63±0.23*

Values are = mean ± SE, Where P1, P2, P3, P4 and P5 = Site 1st and p1, p2, p3, p4 and p5= Site 2nd respectively. * =significant values.

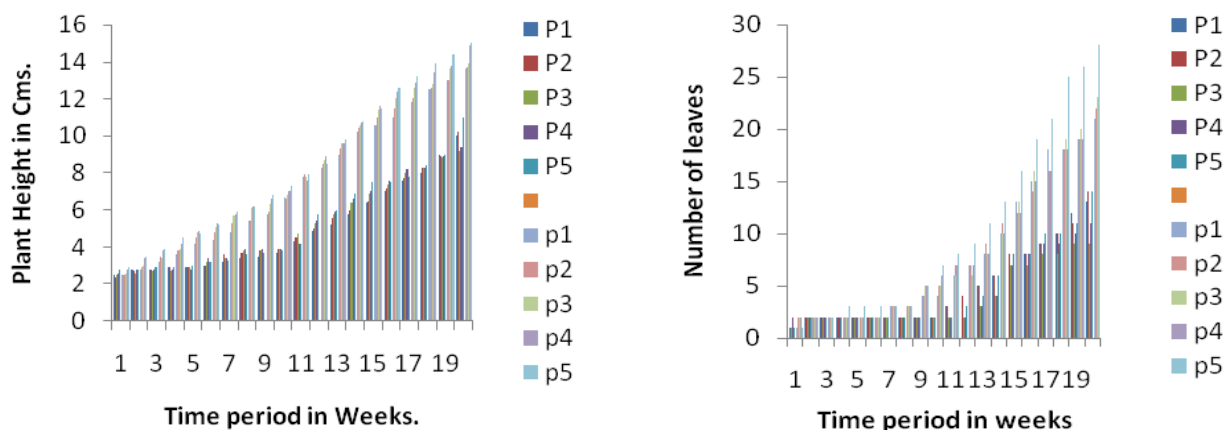


Fig. 1. Growth rate of *C. paniculatus* and comparison of growth in Site 1 and Site 2. Graphical representation shows the Number of leaves in site 1 and Site 2. Where P1, P2, P3, P4 and P5 = Site 1st and p1, p2, p3, p4 and p5= Site 2nd

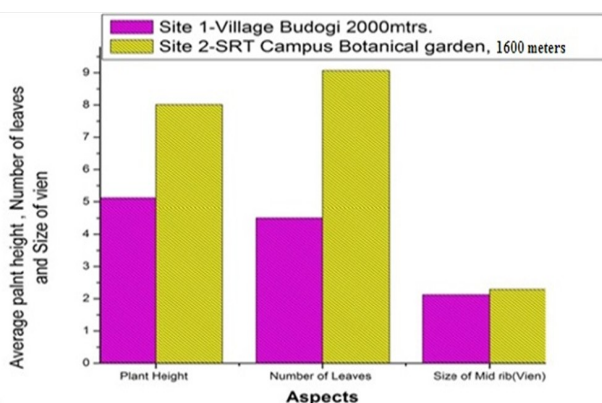


Fig. 2. Overall growth pattern of *C. paniculatus* including average plant height, number of leaves and size of midrib.

Conclusion

The experimental study of the plant species concluded that the conservation and cultivation of *C. paniculatus* in two different natural sites indicated that the site 2 had best growth rate including plant height (8.4 ± 0.86 cm) number of leaves (9.01 ± 2.0) and size of the veins (2.63 ± 0.23 cm) cm, while at site 1 there was an overall slow growth rate of the plant. *C. paniculatus* showed best growth rate at an elevation up to 1600 meters which is feasible for cultivation. The present observation provides baseline information for selection of suitable cultivation sites and conservation of threatened plant species in different altitudinal zones of Himalayan region. This is the easiest and cheapest method of

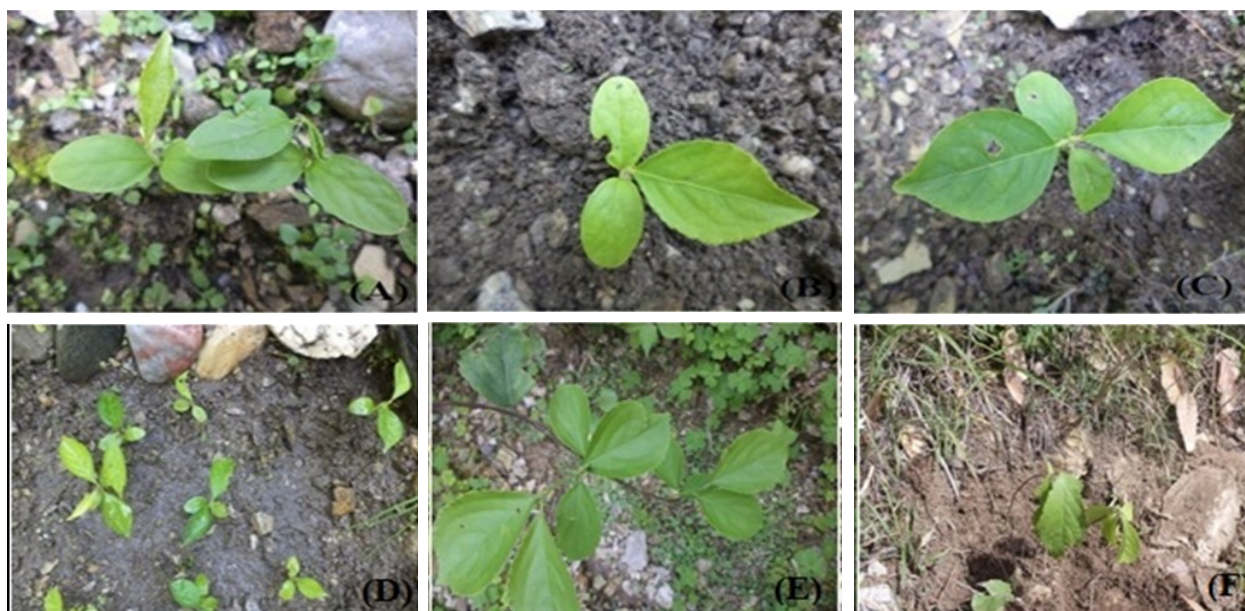


Fig. 3. Germination of *C. paniculatus* at Site 1. (A). newly bud emerges from seeds. (B). Seedling at three leaf stage, starts emerging after 2 and half months. (C). four leaf stage after 3 months. (D). Samples of *C. paniculatus* at site 1. (E). In the month of August 2014, maximum growth (F). Successfully planted at slopes of Agricultural fields.

root length then other treatments of the experiment (Fig. 8).

conservation and cultivation of threatened medicinal plants in the Himalayan regions. It is also indicated that *C. paniculatus* is mostly found at slopes of rocks,

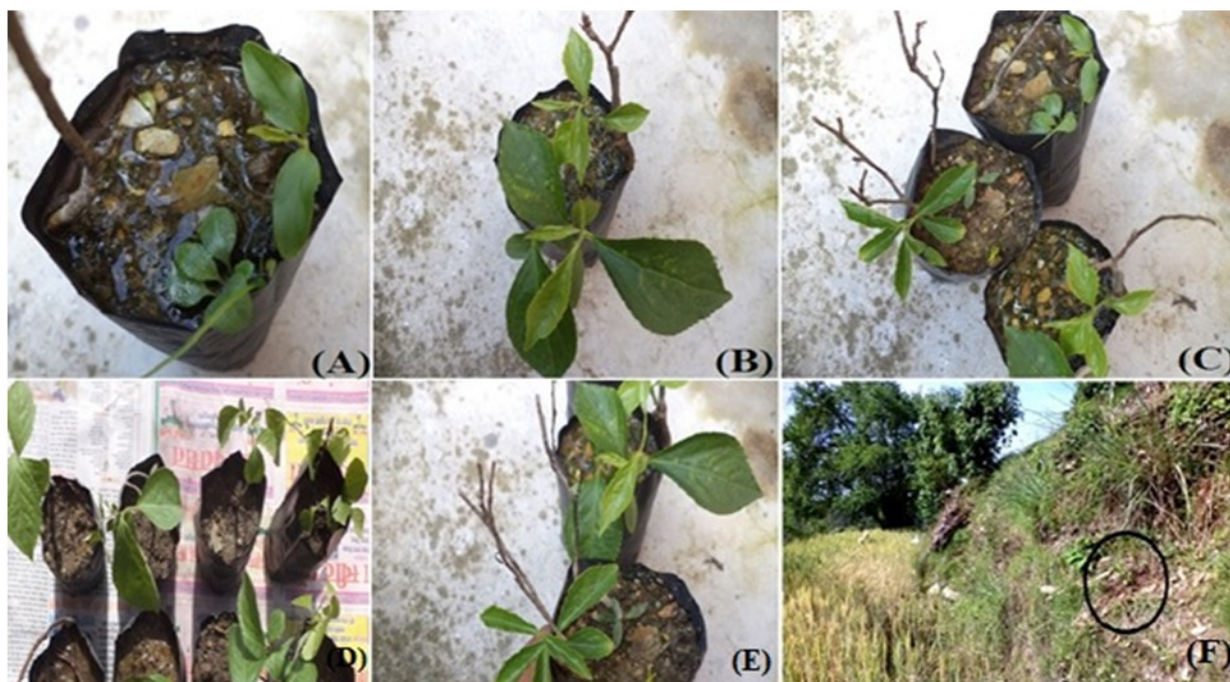


Fig. 4. Germination of *C. paniculatus* at site 2. (A). newly bud emerges from seeds. (B). New leaves starts emerging after 2 and half months. (C). after 3 months. (D). Samples of *C. paniculatus* at site 1. (E). In the month of August 2014, maximum growth observed (F). Successfully planted at slopes of agricultural fields.

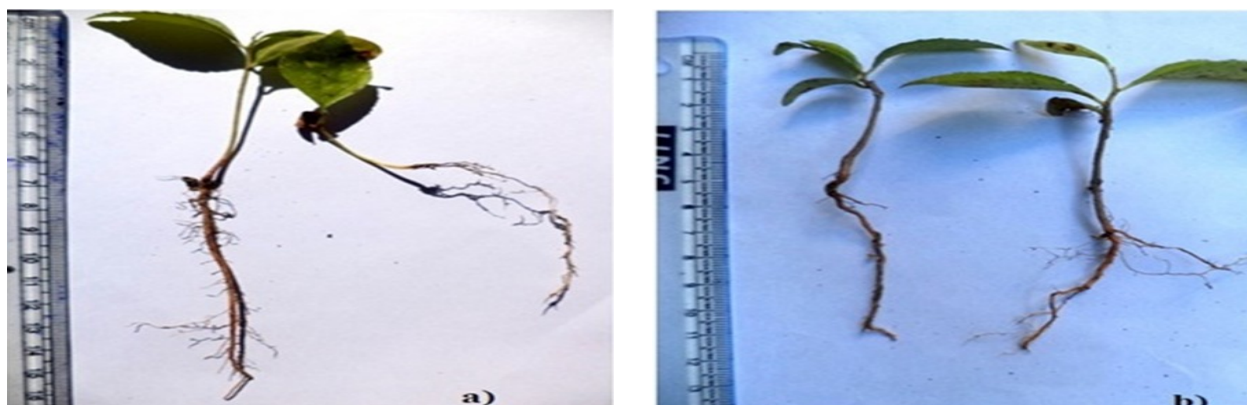


Fig. 5. Growth of seedling after two months after emerging from the seeds: a. Site 2 and b. Site 1.

root also goes very inside into rocks and this species also need temperate climate (maximum sunlight) and low rainfall conditions for growth. Therefore, it is urgently needed to develop well suited nurseries for suitable environmental conditions and regular monitoring of plant growth habits in an altitudinal gradient will be helpful for conservation.

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