

## Sex and altitude based study on leaf related parameters in *Zanthoxylum Armatum* Roxb.

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### Abstract

*Zanthoxylum armatum* Roxb. is a vulnerable medicinal plant known for its medicinal properties for long globally. In Garhwal region of Himalaya the plant is dioecious in nature and is found from 600 to 2000 m amsl (above mean sea level). In the present work leaf material of three different accessions from different altitudes (700, 1200 and 1600 m amsl) was collected and subjected to study of leaf related parameters like number of leaflets, size of leaflets, number of prickles and size of prickles. A considerable variation was found in all the accessions. In general it was found that the mean number of leaflets and leaflet size increased with increasing altitude in both the sexes. The mean number of prickles was found to be more at higher altitudes but minimum was found at middle altitude in both the sexes. The mean number of leaflets in accessions varied from 6 to 9 in male plants and in female plants from 8 to 10. The mean size of leaflets in male plants varied from 6 to 11 cm and in female from 7

to 9 cms in different accessions. The number of prickles in male plants ranged from 10 to 15 per leaflet and in female leaflets from 5 to 10 in different accessions. In all three accessions the size of prickles varied from 0.82-1.32 cm in male and 0.45 to 1.28cms in female plants.

**Keywords:** sex and altitude variation / foliar characters / *Zanthoxylum armatum* Roxb.

### Introduction

Among different medicinal plants *Zanthoxylum* (family: Rutaceae) is one of such vulnerable genus which possess high medicinal, economical as well as ecological importance and have about 250 species spreading all over the world. In India, 11 species of this genus are reported. These are; *Z. budrunga*, *Z. oxyphyllum*, *Z. ovalifolium*, *Z. acanthopodium*, *Z. planispinum*, *Z. armatum*, *Z. nitidium*, *Z. rhesta*, *Z. simulans*, *Z. avicennae* and *Z. limonella*. Out of these, 4 species; *Z. armatum* DC., *Z. acanthopodium* DC., *Z. oxyphyllum* Edgew, and *Z. budrunga* are present in Uttarakhand (Kala *et al.*, 2005). *Z. armatum* is commonly known as Indian Prickly Ash, Nepal Pepper or Toothache Tree. Local name of this plant is

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Tejphal (Hindi), Tejowati (Sanskrit), Mukthruhi (Manipuri) and Timur (Nepal).

*Zanthoxylum armatum* is a vulnerable deciduous shrub or small tree which grows in well drained alluvial, black soil. In India, it has been reported from the warmer valleys of the Himalaya from Jammu and Kashmir to Assam and Khasi (1,000 to 2,100m asl), in the Eastern Ghats in Orissa and Andhra Pradesh (1,200 m) and the lesser Himalayan regions in the north-eastern part of India for example, Naga Hills, Meghalaya, Mizoram, and Manipur (Kala *et al.*, 2005). *Z. alatum* is synonyms to it (Gupta *et al.*, 2011).

*Zanthoxylum armatum* prefers semi shady or no shade for growth. Valleys and thickets in the mountain wasteland and the under-storey of mixed forests are customary locations of the species. Now this plant is facing severe problems like over-harvesting, less germination of seeds, ignorance by local people and many more and is becoming lesser in frequency. The plant has been cytomorphologically less explored. In Garhwal region the plant is present in dioecious nature (Fig. 1 and Fig. 2). To the best of our knowledge no work on sex and altitude has been done earlier only very less morphological work has been reported in this plant (Gaur, 1999).

### Materials and Method

The leaf material of both male and female plants was collected from three different sites of Garhwal as shown in table 1 and was subjected to the study of leaf related parameters like number of leaflets, size of leaflets, number of prickles and size of prickles.

### Observations

The leaves were found to be alternate, imparipinnate compound and prickly (Fig. 3). The parameters studied showed variation in both sexes at different altitudes. In both male and female plants the mean number of leaflets increased from lower to higher altitudes. The mean number of leaflets in male plants ranged from 6 to 9 and in female plants from 8 to 10. The data is as shown in Table 2.

The mean size of leaflets in male and female plants increased with increase in altitude (table 3). The mean size of male and female plant leaflet varied from 6 to 11 cms and 7 to 9 cms respectively.

The mean number of prickles per leaf in male plants increased with altitude while in female such relationship was not found (table 4). The mean number of prickles in male varied from 10 to 15. In female plant leaf minimum number of prickles was found in middle heights and maximum was found at higher altitudes. In female leaves the prickles ranged from 5 to 10 per leaf.

Accession No.	Altitude (meter above mean sea level)	Name of the village
Z-1	750 m	Devtoli, Karanprayag
Z-2	1200 m	Semi-Gwar, Pokhri
Z-3	1500 m	Kumud , Joshimath
<b>Table 1.</b> Details of sites from which leaf material was collected		

In both sexes at higher altitudes mean size of prickles was found to be maximum, though in both minimum size of prickles was found at middle altitudes (Table 5). Maximum size of prickles was found to be 1.37cms in male leaves and 1.28 in female leaves.

Accession	Sex	Mean ± SE	Range
Z-1	Male	6.25 ± 0.36	3.00 - 7.00
	Female	8.31 ± 0.49	5.00 - 11.00
Z-2	Male	7.09 ± 0.28	5.00 - 9.00
	Female	9.91 ± 0.83	3.00 - 13.00
Z-3	Male	9.40 ± 0.45	7.00 - 11.00
	Female	10.09 ± 0.41	7.00 - 11.00

**Table 2:** Data showing mean number of leaflets in male and female plants of *Z. armatum*

Accession	Sex	Mean ± SE	Range
Z-1	Male	9.90 ± 0.77	7.00 - 13.00
	Female	7.50 ± 1.28	3.00 - 12.00
Z-2	Male	12.20 ± 1.13	8.00 - 17.00
	Female	4.80 ± 1.45	2.00 - 13.00
Z-3	Male	14.70 ± 0.40	13.00 - 16.00
	Female	9.70 ± 0.65	7.00 - 12.00

**Table 3:** Data showing mean number of prickles in male and female leaflets of *Z. armatum*

Accession	Sex	Mean ± SE	Range
Z-1	Male	6.25 ± 0.32	5.30 - 8.00
	Female	7.37 ± 0.47	5.00 - 8.50
Z-2	Male	8.66 ± 0.32	7.50 - 10.30
	Female	7.57 ± 0.30	6.40 - 9.00
Z-3	Male	11.46 ± 0.32	10.00 - 12.20
	Female	9.45 ± 0.83	6.00 - 12.00

**Table 4:** Data showing mean size of leaflets in male and female plants of *Z. armatum*

Accession	Sex	Mean ± SE	Range
Z-1	Male	0.89 ± 0.02	0.80 - 1.00
	Female	0.47 ± 0.06	0.20 - 0.70
Z-2	Male	0.82 ± 0.04	0.70 - 1.00
	Female	0.45 ± 0.05	0.30 - 0.80
Z-3	Male	1.37 ± 0.07	1.10 - 1.60
	Female	1.28 ± 0.20	0.60 - 2.00

**Table 5:** Data showing mean number of prickles in male and female leaflets of *Z. armatum*



**Fig. 1:** Female plant



**Fig. 2:** Male plant



**Fig. 3:** A single leaf with leaflets of *Z. armatum*



**Fig. 4:** Plant with seeds

### Results and Discussion

To the best of our knowledge this type of sex and altitude based study on leaf related morphology has been done for the first time. Gaur (1990) reported 1.5cm long prickles, alternate leaves and 10-15 cms long imperipinnate, leaflets 3-30, 2-6 X 1.5 to 2.5 cms toothed. In the present work the number of leaflets in male and female were found to be increase along with rise in altitude and the mean number varied from 6 to 9 and 8 to 10

respectively. The size of leaflets also increased with rise in altitude in both male and female plants, the mean size of leaflets varied from 6 to 11 and 7 to 9 cms respectively. The mean number of prickles was found to increase with altitude but in female leaves maximum number was found at high altitude but the minimum size was found at middle altitude. The mean number of prickles in male and female varied from 10 to 15 and 5 to 10 respectively. In both sexes at higher altitudes mean size of prickles was found to be maximum, though in both minimum size of prickles was found at middle altitudes. Maximum size of prickles was found to be 1.37cms in male leaves and 1.28 in female leaves.

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