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Population Status of Two Threatened species, *Trachycarpus takil* (Hook) H. Wendl. and *Cyathea spinulosa* Wall, in the Pithoragarh district of Uttarakhand

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ABSTRACT: Population status of two threatened species viz. *Trachycarpus takil* (Hook) H. Wendl. and *Cyathea spinulosa* Wall of Kumaon part of the Uttarakhand was studied. It was observed that these two species occur in localized parts near Thal and Kalamuni, Pithoragarh, Uttarakhand. Per hectare density of *Trachycarpus takil* and *Cyathea spinolosa* was estimated to be 1.5 and 0.15 P ha^{-1} respectively. As population of these two species is very low, suitable should be taken to restore the dwindling population of species. It is suggested that local villagers, researchers, students etc. should be made aware about declining population and conservation strategies for these species through awareness programmes. Suitable micro-propagation techniques should be developed for multiplication and conservation of species.

Keywords: Density, Threatened species, Conservation, Micro-propagation.

I. INTRODUCTION

Threatened species assessment provides basis of chances of extinction in future based on past and present trends. The main lacunae in our knowledge with regard to threatened species lies in the present actual status of the species i.e. the exact number and location of populations of these species occurring in the wild, quantities of the numbers collected for economic exploitation or other purposes; their capacity to reproduce and propagate themselves in nature and their population's or representatives in cultivation under artificial conditions in farms or experimental gardens. Such observations require repeated visits to the field and need efforts of several botanists and constant monitoring.

In the present study, two threatened species *viz. Trachycarpus takil* (Hook) H. Wendl. *Cyathea spinulosa* Wall. were studied for their population status in the Pithoragarh district of Uttarakhand. *Trachycarpus takil* (Hook) H. Wendl. is medium size palm belongs to family arecaceae. It is endemic to Kumaon and Western Himalaya, Nepal and locally known as Thakal. Local people use its leaves for thatching, broom and ornamental purposes. Owing to its limited distribution and exploitation by the people, species is under tremendous pressure. *Cyathea spinulosa* Wall. is a rare terrestrial fern found in ravines along streams in shady and dark forests and prefers to grow away from direct sunlight. It is distributed in Bhutan, China, Japan, Malaysia, Myanmar, Nepal, Philippines, Taiwan and Thailand.

In India, species is found in Assam, Eastern Himalaya, Central and South India. Species has restricted distributed in Garhwal and Kumaon (Joshi *et al*. 2009). Both the species have limited distribution in the Kumaon.

II. MATERIALS AND METHODS

Fig. 1. Map of Study Area

The survey for estimation of density of species was conducted during first week of March 2017 at Thal and Kalamuni areas Pithoragarh district, Uttarakhand. Line transect sampling method (Buckland *et al.*, 2001) was used for estimating the population status of the species. Width of the belt was kept 20 m (10 m either side of the road). The total length of the belt was 10 km. All the individuals coming across in the area were enumerated (Fig. 1).

Fig. 2. A view of naturally growing *Trachycarpus takil* in Kalamuni, Pithoragarh district.

Fig. 3. A view of naturally growing *Cyathea spinulosa* in Thal, Pithoragarh district.

III. RESULTS AND DISCUSSION

Taxonomic description of *Trachycarpus takil* and *Cyathea spinulosa* is given here under:

IV. TRACHYCAROUS TAKIL

Trachycarpus takil Becc. in Webbia 1: 52. 1905; Osmast, For. Fl. Kumaon 546. 1926.
Chamaerops martiana Duthie in Gard. Chron 457. 1866 *non* Mart. 1832.
Description: A medium sized palm with erect stem up to 10 m high and 30 cm dia. Covered with a fibrous network , the upper portion more or less hidden by the persistent dead leaves which hang down. Leaves 7-15 cm long, fan shaped, suborbicular, plicate, margin segmented; the segments shortly bifid or bidentate at the tip, glabrous beneath. Petiole 0.3 to 1.3 m long, subtrigonous, margins armed with minute irregular subspinescent teeth. Flowers greenish yellow, clustered on the branches of a paniculate spadix 30–60 cm long; peduncle compressed, 2.5-4 cm broad, reflexed in fruit. Male flower: sepals suborbicular; petals twice as long as the calyx. Spathes 2–3, 20-25 cm long, redish brown, densely clothed with deciduous scurfy tomentum. Drupe reniform.
Distribution: The palm tree is native to the Kumaon division of Uttarakhand in northwestern India, and into adjacent western Nepal. The palm grows at altitudes of 1,800–2,700 m and it receives snow and frost on a regular basis in its native habitat.

V. *Cyathea spinulosa*

Cyathea spinulosa Wall. ex Hook., Sp. Fil. 1: 25, t. 12C. 1844; Bedd., Handb. Ferns Brit. India.: 6, f. 3. 1883; Bedd., Suppl. Ferns Brit. Ind.: 2. 1892; Holttum, Kew Bull. 19: 471. 1965
Alsophila decipiens Scott. in Bedd., Ferns Brit. India: t. 311. 1869.–*Amphicosmia decipiens* (Scott.) Bedd., Suppl. Ferns Brit. Ind.: 1. 1876; Bedd., Handb. Ferns Brit. India: 10. 1883; Bedd., Suppl. Ferns Brit. Ind.: 2. 1892. – *Cyathea decipiens* (Scott) C.B.Clarke & Baker, J. Linn. Soc., Bot. 24. 409. 1888.

Family: Cyatheaceae.

VI. DESCRIPTION

Trunks to 4.5 m tall. Stipes dark purplish, distinctly spiny near base; scales shining dark brown, stiff, their bases later develop into spines. Laminae about 3 m long, 1.5 m wide; c.23 pairs of pinnae, a few basal pinnae reduced; pinna-rachis bearing scales; pinnules broadly cuneate at sub-sessile base, acuminate at apex, about 8 cm long, 1.8 cm wide; ultimate segments toothed distally; costae underneath scaly but not hairy, scales pale brown; costules and lower surface of lamina minutely pubescent. Sori near costules, indusiahemitelioid, i.e. cup-shaped with apical portion of sori naked.

Habitat: *C. spinulosa* occurs in humus soils in shadowed forest locations

Distribution: It is distributed in Bhutan, China, Japan, Malaysia, Myanmar, Nepal, Philippines, Tiwan and Thialand. In India, species is found in Assam, Eastern Himalaya, Central and South India. In Uttarakhand, species is distributed in Garhwal and Kumaon (Joshi *et.al.* 2009).

Population status: The population status of *Trachycarpus takil* near Kalamuni, pithoragrah district is presented in Table 1. The population of the species was very scanty. A total of 30 individuals were recorded from the surveyed areas. Per hectare density was estimated to be 1.5. The population status of *Cyathea spinulosa* near Thal and adjoining areas in the Pithoragarh district is given in Table 2. Only 3 individuals were encountered during survey of the area. Per hectare density (P ha^{-1}) was estimated to be 0.15. No regeneration was observed in the area.

Table 1: Population status of *Trachycarpus takil* (Plants ha^{-1}) in Kalamuni and adjoining areas, Pithoragarh. District.

Belt width	Belt length	Total area	Total no. of plants	Tree/ha
20 m	10 km	20 ha	30	1.5

Table 2: Population status of *C. spinulosa* (Plants ha^{-1}) in Thal and adjoining areas, Pithoragarh District.

Belt width	Belt length	Total area	Total no. of plants	Tree/ha
20 m	10 km	20 ha	3	0.15

Several workers have stressed the need for conservation of threatened flora of Himalaya e.g. (Deva 1978; Jain and Sastry 1984; Pangtey & Rawat 1984; Rao & Hajra 1986; Hajra and Rao1990; Nayar and Sastry 1987, 1988, 1990; Rao *et al*., 2003; Rawat 2008). In the present study reveals that distribution of these threatened species was very restricted and population was very less. Therefore, it is essential to take suitable conservation measures to save the species from extinction in near future. This can be achieved through conducting mass awareness program to the local villagers, researchers, students etc. Development of appropriate micro-propagation techniques is also required urgently for multiplication and conservation of species.

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