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Severe Infestation of Killer Mistletoe on *Toona ciliata* in New Forest, Dehradun, Uttarakhand, India

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Abstract
Toona ciliata M. Roem. is a big tree with various economic uses. Mistletoes are partial parasites that attack a number of commercially important tree crops, resulting in the declining quality and quantity of the end product. In the Forest Research Institute, Dehradun, Toon trees are planted as avenue trees at different locations and are infested by mistletoe. The aim of the study was to identify the mistletoe species and to assess the infestation. The mistletoe species was identified as *Scurrula pulverulenta* (Wall.) G. Don. A study reveals varying levels of mistletoe infestation in the branches of Toon trees. In most cases, the infestation is in the initial stages, though some trees showed severe infestation. Suitable management strategies to check infestation are suggested.

Keywords: Infestation, Mistletoe, Toon tree, Genetic Improvement, Management Strategies.

1. Introduction
Toona ciliata M. Roem. is a large deciduous tree with multiple uses. It is commonly known as 'Toon,' Red Cedar, or Indian Mahogany and belongs to the family Meliaceae. It grows up to 25-35 m with a girth of 2 to 3 m, producing a clean bole up to 9-12 m under ideal forest conditions. It is widely spread in Asia between 15° and 25°N in India, Bangladesh, Burma, China, Indonesia, Malaysia, and the Philippines at elevations of 0-1500 m above sea level. In India, it occurs throughout the sub-Himalayan tract and valleys of the outer Himalaya from Jammu eastwards, the plains of Bihar, West Bengal, the Khasi hills, and the valleys of the eastern Ghats in moist localities, the hills of Kurnool, Karnataka, and the Western Ghats[1]. It is usually cultivated as an avenue tree in India.

The species is well known for its versatile timber, which is utilized for construction purposes, shipbuilding, and wood-based goods, like furniture, musical instruments, and carvings[2, 3]. The flowers are used as a pollen and nectar source for honeybees. Economically, the flowers contain nyctanthin, quercetin, and a flavone, which yield a red and yellow dye known as 'Basanti' used to dye cotton and woolen fabrics[4, 5]. The bark is a powerful astringent, a tonic, and an antiperiodic, and it is used to treat dysentery and wounds. The fruit produces aromatic oil[4, 6]. Further, the seeds, leaves, and stems of *T. ciliata* are used in traditional Chinese medicine for the treatment of diarrhea, dysentery, and ringworm[7, 8]. The leaves and young shoots are lopped for cattle fodder in India. Various parts are used medicinally throughout their geographical range.

Mistletoes are partial parasites that infest various tree species[7]. They cause great damage in natural and plantation forests, orchards, and parks throughout the world. They severely damage their host plants in various ways, such as quality of timber, fruit, and oil content, etc.[8].

Materials and Methods

The study was conducted during September 2024 at the Forest Research Institute Campus, Dehradun (Uttarakhand State, India). The average annual rainfall is 2118 mm, of which 80 percent is received from the southwest monsoon during July, August, and September, and the remainder from the retreating monsoon in the cold weather. Except for May and June, relative humidity is well over 40 percent. Maximum temperature reaches up to 44°C and minimum up to 1°C. It has an elevation of 640 m and lies at N latitude 30° 20' 37.7" and E longitude 77° 59' 52.1". *Toona ciliata* is planted in various places at the Forest Research Institute, Dehradun. A survey was conducted for infestation of mistletoes on the *Toona ciliata*. Mistletoe species were systematically studied, and descriptions were recorded. The species was authenticated from the DD Herbarium, Forest Research Institute, Dehradun (DD62161).

Result and Discussion

It was observed that most of the trees of Toon were infested by mistletoes in varying degrees. In most of the species' the infestation was in the initial stage (Fig. 1). However, some of the trees were at a high level of infestation. Mistletoe was identified as *Scurrula pulverulenta* (Wall.) G. Don., which is locally known as 'Banda.'

Figure 1. Infestation of *Scurrula pulverulenta* on branches of *Toona ciliata*

Species Description

It is a stout, woody parasite with dark-grey bark. Leaves opposite, 10-15 cm long, broadly ovate or ovate-oblong, coriaceous, thickly mealy-tomentose when young, base acute or rounded; petiole 1.2-1.7 cm long. Racemes 1.2-6 cm long, axillary, solitary or fascicled. Flowers 2.5 cm long. Pedicels 0.5-0.7 cm long, grey and scurfy outside. Calyx-limb 0. Corolla slender, tubular, and curved; segments 4, linear, and green. Style is very slender. Fruit 0.7 cm long, turbinate, grey, and tomentose. Flowers: September-May, and probably throughout the year.

Various economically important tree species are infested by mistletoes, and reports of such infestations are reported by a number of researchers[9-14]. In the present investigation, infestation of *S. pulverulenta* was observed on branches of Toon trees in various locations. It was observed that infestation was in initial stage, however, in few trees, it was observed in advance stage. In the future, it can pose a serious problem; therefore, it is essential to adopt suitable management strategies to curb the spread of this mistletoe.

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Conclusion

Various tree species are infested by the killer. Mistletoes and the quality and quantity of utilizable products are seriously deteriorated. Toon is an economically important species of multiple uses. To check the mistletoe infestation, apt management practices should be implemented. Elimination of mistletoes manually may be the best option for curbing infestation. In an advanced stage, it is not possible to remove mistletoe, and eventually the tree will die. Hence, it is suggested that mistletoes should be eliminated in initial stages so that further damage can be checked. A genetic improvement program should be taken for developing superior mistletoe-resistant genotypes, and a new plantation should be raised from such superior material.

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Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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