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White-berry mistletoe (*Viscum album* L.): A Hemiparasitic Plant: Occurrence and ethno-botanical use in Kashmir

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Abstract
White-berry mistletoe (*Viscum album* L. subsp. *album*), is a hemiparasitic plant locally called as 'banada', 'kaw-khoor' or 'nal kachud', occurring specifically on walnut trees and rarely on *Populus* trees mostly in foot hill areas in Kashmir. In the former host it grows mostly on outer branches of the tree crown while in the later case it often grows directly on the tree trunk. We found heavy mistletoe occurrence specifically on isolated walnut trees, mainly on the outer branches of tree crowns. The shrub is used in wound healing, rheumatism and as a laxative in traditional medicine. Farmers in some study areas use it for feeding livestock including cattle and sheep, especially during winters, when no green fodder is available; it attracts farmers and their livestock.

Keywords: *Viscum album* L, Hemiparasitic Plant, ethno-botanical

Introduction
The white-berry mistletoe (*Viscum album* L. subsp. *album*) is an evergreen, parasitic, perennial flowering plant belonging to the family loranthaceae and growing on the branches of some trees. Since it contains functional chlorophyll, it is considered as hemiparasitic plant (Catal and Carus, 2011) [3]. However, due to low amounts of chlorophyll-protein complexes, the mistletoes in general have a low capacity for photosynthesis, which partially explains their ability to adapt to drought conditions (Turquet and Salle, 1996) [12]. The mistletoes obtain water and nutrients from the host on which they grow. They have a widespread global distribution, growing up to 80 cm on the branches of several forest and fruit trees in tropical, temperate, and semi-arid regions at altitudes ranging from 300 m to 2,000 m (Davis 1982) [4]. More than 200 species of trees and shrubs have been reported to be their hosts.
During several field surveys conducted in Shopian and Pulwama districts of Jammu and Kashmir, India during the months of September to December, 2017, we have observed the occurrence of mistletoe (*Viscum album* L.) especially in foot hill areas, specifically on walnut trees, on the branches not on trunks and very rarely on other trees like *Populus* mostly on trunks (Fig. 1). Locally it is known as 'nal kachud' also called as 'banada' and 'kaw-khoor' in other parts of the state. Our main aim of these surveys was germplasm collection of wild forage plants and organizing training programmes regarding recent advances in fruit and fodder production. We found mistletoe occurrence specifically on isolated walnut trees, mainly on outer branches of the tree crowns. This might be due to the absence of competition between isolated walnut trees as competition among trees has a negative effect on mistletoe occurrence (Matula *et al*., 2015) [10]. It has been reported earlier also that mistletoe infection is more on larger Scots pine trees than on smaller ones within the infected tree population and that trees with mistletoe had higher number of dead branches than trees with no infection, besides, parasitized trees were more prevalent in low-density stands than in high-density stands, with infection occurring mainly on the outer branches within trees crown (Kolodziejek and Kolodziejek, 2013) [9]. During focussed group discussion with some of the elderly men in the villages, we were informed that 'nal kachud' reduces the vigour and bearing capacity of walnut trees when heavily infested. Mistletoes have been reported to adversely influence the growth of host. Besides affecting their height and diameter, quality and quantity of wood, the fruiting is reduced and hosts are exposed to the risk of being attacked by insects or fungi (Varga *et al*., 2012) [14]. The high mortality in Scots pine (*Pinus sylvestris* L.) populations at many places across Europe has been attributed partly to mistletoe infestation (Dobbertin and Rigling, 2006) [5]. Mistletoes are therefore, often considered as pests that kill trees and devalue natural habitats, but some species have recently been recognized as ecological keystone species- organisms that have a disproportionately pervasive influence over their community.

A broad array of animals depend on mistletoe for food, consuming its leaves and young shoots, thereby transferring pollen between plants and dispersing the sticky seeds. Thus, mistletoe can have a positive effect on biodiversity, providing high quality food and habitat for a broad range of animals in forests and woodlands worldwide.

Mistletoe has opposite, thick, leathery, oval or lance-shaped leaves that are about two inches long. It has densely crowded branches, thus forming a drooping yellowish green bushes about 2-3 feet long on the branches of a host tree. The flowers, borne in compact spikes may be either bisexual or unisexual. They are yellower than the leaves and appear in the late winter. The fruits are single-seeded, white berries, which when ripe are filled with a sticky, semi-transparent pulp. This sticky material is called viscin, which is a complex adhesive mix of cellulosic strands and mucopolysaccharides. It helps the seed to attach itself firmly to the future host. The seeds are eaten by birds and spread by them to other trees. The seeds then germinate, ultimately producing haustorium that penetrate the new host tissue for obtaining water and nutrients for the growth.

Medicinal use and ethnobotany

Viscum album L. is famous as an important medicinal plant for millennia now. Its preparations have been used in the treatment of cancer and this anticancer activity of mistletoe extract has been ascribed to the presence of lectins, viscotoxins and alkaloids; two novel amino-alkaloids have recently been isolated from it (Amer and Fossen, 2012) [1]. Decoction made by grinding the whole plant with common salt is used as a laxative. It is dried, burnt and the ash is found to be effective in healing of wounds. There are reports of its use in migraine, epilepsy, abscess and joint pain, in healing of fractures, wounds and as a laxative (Kapahi *et al*., 1993; Khan *et al*., 2004; Bhat *et al*., 2012; Gariola *et al*., 2014; Rather and Baba, 2015) [7, 8, 2, 6, 11]. Poultice made from the dried parts of the plant has been used to treat fractures while warm paste of the plant is applied to cure rheumatism and joint pains.

Mistletoe as forage

We have observed that farmers in some study areas use mistletoe for feeding livestock including cattle and sheep. Especially during winters, when no green fodder is available it attracts farmers and their livestock despite the fact that it is a tedious job to harvest these plants for fodder. Mistletoe is, in fact consumed by herbivores in some places, especially during periods of forage shortage and drought (Umucahlar *et al*., 2007) [13].

Fig 1: Mistletoe (*Viscum album* L.) - heavy infestation on an isolated walnut tree; single plant growing on *Populus* tree; close up view and branches with white berries.

Conclusion

Once a mistletoe plant is established on its host, it usually is possible to save a valuable branch by pruning and judicious removal of the wood invaded by the haustorium, if the infection is caught early enough. Some species of mistletoe can regenerate if the pruning leaves any of the haustorium alive in the wood. We advocate that more studies should be conducted to study mistletoe infection of walnut trees.

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