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# First report of *Microstroma juglandis* causing downy leaf spot or white mould on *Celtis australis* from Himachal Pradesh, India

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**ABSTRACT**

*Microstroma* sp. collected on living leaves of *Celtis australis* L. (Cannabaceae ) from Himachal Pradesh, India is a new host record. Symptoms of the disease on leaves appeared in the form of small, circular to irregular, white coloured spots or mouldy growth surrounded by a yellow zone. The fungus isolated was identified as *Microstroma juglandis* on the basis of cultural appearance and morphological characters. The pathogen was able to induce the characteristic symptoms of downy leaf spot or white mould within 14-16 days after inoculation.

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## INTRODUCTION

*Celtis australis* L. belongs to family Cannabaceae, is an important deciduous tree species of India. It is distributed worldwide from Southern Europe, North Africa to Asia. The plant leaves and twigs are used as fodder in dry seasons while wood as good quality timber. Extracts from the tree are used to treat edema, headache and boils (Singh, 1982 and Hocking, 1993). A leaf spot disease was observed on *Celtis australis* L. plants growing in Agroforestry farm of Dr. Y S Parmar University of Horticulture and Forestry, Nauni, Solan as well as from the Sundernagar location of district Mandi of Himachal Pradesh, India during a mycological survey of deciduous forest in the area. White mould, or downy leaf spot, is common wherever Celtis is grown. The disease is more unsightly than damaging. Microstroma does not kill the leaf, nor is it known to cause defoliation. Any harm to the Celtis is probably secondary due to the shading of a portion of the leaf surface and hence, a decrease in photosynthesis. Outbreaks of formerly endemic tree diseases and the spread of emerging diseases of exotic tree pathogens represent one of the main consequences of globalized trade having as a natural background, climatic changes (Gonthier and

Garbelotto, 2013; Santini *et al.,* 2013 and Stenlid *et al*., 2013). However, understanding the intricate system of interspecific interactions with hosts and other associated organisms is prerequisite condition for suitable management of the diseases. During recent years, endemic pathogens showed the clear tendency of epidemic spread. It is expected that those species will interact with phytophagous insects and other pathogens in positive and negative ways (Hatcher, 1995 and Stout *et al.,* 2006), establishing complex networks. Pathogens have the potential to modify the structure of different plant feeding insects guilds: galling insects and mites, mining and free feeding insects or other pathogens (Stout *et al.,* 2006 and Tack *et al.,* 2012). Within the genus Microstroma (Basidiomycota: Exobasidiomycetes: Exobasidiomycetidae: Microstromales: Microstromataceae), 30 species of obligate pathogens were identified to date but the members of this 428 taxonomic group are extremely difficult to detect in the field (Begerow *et al*., 2001).

## MATERIAL AND METHODS

Downy leaf spot samples were collected from naturally infected *Celtis australis* leaves. The diseased samples were collected from the Agroforestry field of Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan of Himachal Pradesh, India. The infected leaves were examined primarily under a compound microscope for the presence of downy leaf spot symptoms. The microscopic observations were carried out for morphological characteristics of mycelia and shape of conidia, conidiophores and conidial size was measured with the help of micrometry (Burgess *et al*., 2006). The wet leaves of the *Celtis australis* were dusted particularly on the lower side with the spores of the pathogens by scarping and covered with the perforated polythene sheets and regularly sprayed with water to create the humidity for observation of the symptoms to prove the pathogenicity of the pathogen.

## RESULTS AND DISCUSSION

Symptoms of the disease on leaves appeared in the form of small, circular to irregular, whitish mouldy growth and spots surrounded by a yellow zone on the underside of the leaves (Fig. 1). *Microstroma juglandis* develops necrotic areas containing the white frosty spots corresponding to basidiomata which are located along the midrib or randomly on the leaflet. In heavy infections, the leaflets are deformed. The mycelium is endophytic but basidia are protruding through the lower epidermis. Basidiospores are hyaline, oval shaped with pointed apices, of 5-10 x 2-3 µm (Ellis and Ellis, 1990).

**Fig. 1: Disease symptoms on leaves of *Celtis australis***

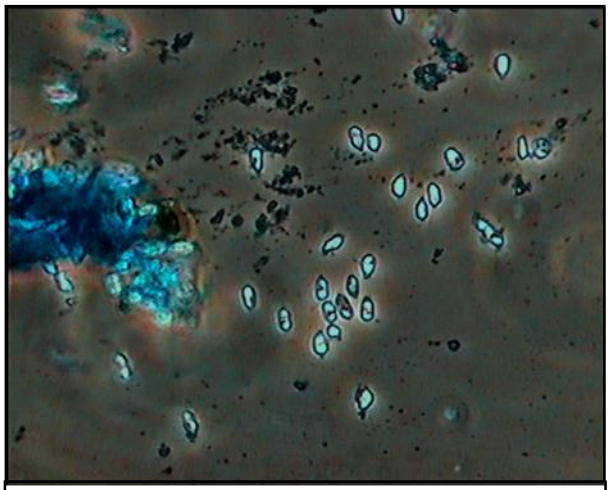

**Fig. 2: Microscopic details of mycelium, conidiophore and conidia of *Microstroma juglandis***

The fungus after inoculation produced typical symptoms of downy growth within 14-15 days and based on external appearance and morphological characters identified as *Microstroma* sp. These morphological characteristics of the isolate were consistent with the description of *Microstroma* sp. particularly of *M. juglandis* (Berenger) Sacc. The said fungus is reported in Kew catalogue of Life as being identified in Germany, Great Britain, Greece, Hungary, Kashmir, India, Italy,

Netherlands, USA and Romania on *Juglans regia, Carya ovata, juglans nigra, Carya tomentosa, Carya illinoensis, Hicoria glabra* and is considered an invasive species (Anselmi, 2001) called yellow blotch or white mould. On *Carya ovata,* it causes the development of witches' brooms. It was reported in Europe, North America and Eastern Asia (Kurt *et al.*, 2003; Garcia-Jimenez *et al.,* 1995 and Lee *et al.*, 2011). Recently it was reported also from Slovenia (Orig and Jurc, 2013). In reported countries, the disease was considered of special concern for walnut growers. In Romania it was mentioned on *Juglans regia* by Sãvulescu and Sandu-Ville in 1940 (Kew Herbarium IMI, no 15996), by Comes in 1964 in the locality Ocnele Mari (Kew Herbarium, IMI no. 135657) and more recently, in the metropolitan area of Oradea (Sturz and Cupºa, 2006). The species is included in the list of invasive species threatening natural and anthropogenic ecosystems of Europe (Drake, 2009). This is probably the first report of the *Microstroma juglandis* infecting *Celtis australis* from Himachal Pradesh, India.

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