Witches' broom and decline of *Eucalyptus*, A Serious Disease in Syria, Likely caused by Mycoplasma

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Abstract

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A widespread disease, most probably caused by mycoplasmas and hitherto unreported in Syria, is described. It was observed in Aleppo, Saraqueb, Idlib, Ariha, Jesr El-Shoghour, Lattakia, Hama, Homs and Damascus. The most characteristic symptoms observed were witches'broom growth and suppression of flowering. Witches' broom growth is especially conspicuous in parts of the tree that die and are defoliated. The other symptoms associated with the disease, such as overall chlorosis of foliage and more or less progressive decline and final death of trees, can be ascribed to degeneration of phloem tissue, characteristic of mycoplasmas. Systemic infection of trees seems to be a time- consuming process. Control should be by removal of infected trees, continuous roguing, particularly in nurseries, and by checking the health status of imported planting material.

Key words: *Eucalyptus*, mycoplasmas, Syria.

During the senior author's recent visit to Aleppo, Syria, May 1990, a severe decline often with final death of most of the *Eucalyptus* trees was noticed in the park in front of Aleppo National Museum, and around the city and usually with high incidence. Later on the disease was also observed in different locations in Syria such as Saraqueb, Idlib, Ariha, Jesr El-Shoghour, Lattakia, Hama, Homs and Damascus. At closer observation it was found to be mainly characterized by witches' broom growth and other abnormalities, typical of infection by mycoplasmas.

Eucalyptus camaldunesis is a well established plant species in Syria, commonly grown as a windbreak around orchards ands along the sides of the highways. The disease reported here may be a threat to this forest tree in Syria. This paper is meant to draw attention to the «new» disease by describing its symptoms and providing some further information on its distribution and on possibilities of control.

The most characteristic feature of the disease is the systemic, though often somewhat irregular, witches' broom growth, i. e. the more or less profuse development of slender, often erect sprouts with small to very small leaves throughout large parts of affected trees and occasionally in more localized witches' brooms along the trunks. Tiny sprouts may also occur in small tufts (Fig. 1.1). Diseased trees usually do not flower, especially when branching is excessive. The excessive branching is always associated with a striking chlorosis of the newly formed leaves and often with the entire foliage of an affected tree. The abnormal leaves are sometimes slightly reddish.

The abnormal growth is commonly accompanied by gradual failure of the plant health up to partial mortality and often death of the whole trees. The disease basically goes systemic in trees, once they are affected, but symptom severity may vary in different parts of the trees. Mildly affected trees may still have branches with normal flowers and normally green leaves.

Trees of all sizes show disease, and diseased ones readily attract attention from a distance by dead parts, profuse and dense unchy growth combined with overall chlorosis of the foliage, remarkably contrasting with the usually dark green of healthy trees (Fig. 1.2).

Thus the disease is characterized by yellowing and a more or less rapid decline, while witches' broom growth is the most diagnostic symptom. The profuse branching is especially conspicuous in dead parts of the tree.

The distribution of symptoms in affected trees strongly suggests the activity of a pathogen, more or less rapidly moving through the host's vascular system. The excessive development of buds into sprouts or tufts of sprouts and suppression of flowering indicate a hormonal disturbance in diseased plants. The small tufts of branches (Fig. 1.3) may well represent quasi floral structures, where all floral parts have been replaced by foliage leaves, and buds, theoretically present in the axil of all leafy plant organs, have developed into small sprouts.

However, the complex of morphological abnormalities, such as excessive, mostly erect branching, suppression of flower-

ing and replacement of flowers by tufts of leafy branches are highly characteristic, if not the most characteristic, symptoms of diseases due to infection by mycoplasmas, hence their name witches' broom diseases (2, 3, 4, 6). Physiologically similar but more localized hormone-induced growth abnormalities or witches' brooms are known to be caused by mites and fungi.

The whole complex of symptoms observed in *Eucalyptus* is strongly indicative of infection by mycoplasmas. Probably similar diseases of *Eucalyptus* have been reported from a number of other countries, although in this genus not associated with plant decline and dealth. Sastry et al. (11) briefly described a graft- but not sap- transmissible little- leaf disease occurring in India in young trees of *E. citriodora.* Main symptoms are reduced leaf size, leaf chlorosis, excessive branching and plant stunting. A disease with similar symptoms was later studied in nuseries and one to five-year-old plantations of *E. tereticornis,* and *E. globulis* in Kerala State, India (12). However, their attempts at graft transmission failed. Ghosh et al. (8) mentioned the occasional occurrence of little leaf of *Eucalyptus* in Haryana, Rajasthan, Uttar Pradesh, Tamil Nadu, Karnataka and Kerala States, India and on several species of *Eucalyptus*, such as *E. grandis* and *E. eugenoides,* in various parts of Kerala. They also reported sterility of infected trees. Their histological studies revealed phloem necrosis and abnormal increase in quantity of phloem. Reaction to Dienes' stain suggested infection by mycoplasmas. Mycoplasmas were indeed recently detected by electron microscopy in the phloem of little- leaf- diseased trees of *E. microtheca* in the Sudan where the disease occurred in low incidence near wad Medani and at many nearby locations (7).

In nature all mycoplasma diseases are spread by phloem-feeding Homoptera *(Psylla pyricola* for pear decline, and leafhoppers for all others as far as studied) and in the persistent manner. For leafhoppers, multiplication in the vector has been demonstrated (1) explaining why vectors may remain infective for life. In their systemic relationship with plants and way of transmission by phloem- feeding vectors mycoplasmas resemble viruses, that is why they have long been mistaken for viruses.

Mycoplasma's are not transmissible mechanically (in plant sap) and they fortunately do to pass via seed of infected plants. Similar to phloem- limited viruses they cannot move from the mother plant's vascular system into the embryo (5). Spread of the *Eucalyptus* agent in nature must be by an insect vector of by man when distributing planting material. Artificial transmission, to prove the infectious nature of the disease, is by grafting onto young healthy trees of with phloem-«feeding» parasitic dodder (*Cuscuta* spp.), bridge-connecting the phloem vessels of a healthy plant with a diseased one. Symptom development thereafter may take a long time in woody plants and fully systemic infection of large trees may take a number of years.

Mycoplamas's usually have wide host ranges. Some differ in host range, but such difference may be more caused by vector specificity and preference rather than pathogen specificity. Reliable distinction between plant mycoplasma's remains difficult. For the time being it remains uncertain whether infection of *Eucalyptus* in Syria has come from other plant species, may be a sources which threatens other plant species, or has been introduced into Syria with infected plant propagation material.

Plants infected by mycoplasmas are hard to cure from infection.In contrast to virus diseases, mycoplasma- infected plants react to application of tetracycline antibiotics with remission (temporary suppression) of symptoms. Pear decline damage can be reduced by tetracycline treatment, but this has to be regularly repeated and is costly (10). Budwood of diseased woody plants can be freed from infection by heat treatment, as for peach yellows (9).

Present incidence and severity of the disease in Syria are alarming. systemic removal of diseased trees and continuous roguing are advised. Nurseries should carefully be inspected for symptoms, and (in case of vegetative propagation(diseased mother plants be destroyed. Care should be taken when propagation material is imported.With such measures, if applied consistently, control should not be difficult.

الملخص

بوس، لوت وخالد مكوك وبسام بياعة. 1990. مكنسة الساحرة وتدهور اليوكاليبتوس، مرض خطير في سورية ويعتقد بأنه ميكوبلازمي المنشأ. مجلة وقاية النبات العربية 8(2): 133-135.

تهتم الدراسة الحاليّة بتوصيف مرض جديد يعتري أشجار «اليوكاليبتوس» وينتشر في سوريا. فقد تم رصده في حلب، وسراقب، وإدلب، وأريحا، وجسر الشنور، واللاذقية، وحماه، وحمص، ودمشق. ومن أبرز الأعراض المميزة للمرض مظهر مكنسة الساحرة «فرط النمو»، وتثبيط الإزهار، وتحوّل الأجزاء الزهرية إلى نموات ورقية. ومن الأعراض الأخرى اصفرار عام يعتري معظم المجموع الورقي، وانحطاط تدريجي يؤدي في النهاية إلى مدق الأشجار المصابة؛ وهي مظاهر تُعزى لاضمحلال نسج اللحاء المصاحبة للإصابة بالميكوبلازم. ويبدو أن الإصابة الجهازية للشجرة تستغرق وقتاً طويلاً. لعل من أهم إجراءات المكافحة إزالة الأشجار المصابة بشكل مستمر وبخاصة في المشاتل، ومراقبة الحالة الصحية لمواد الإكثار المستوردة.

كلمات مفتاحية: اليوكاليبتوس، ميكوبلازما، سوريا.

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المراجع

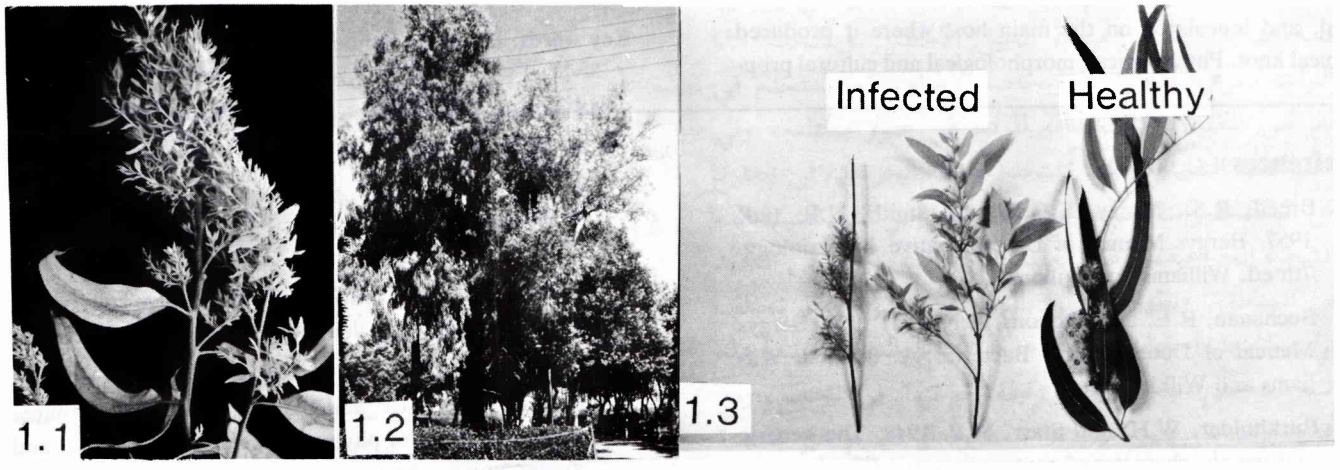

Figure 1. sympotms of withches broom disease on *Eucalyptus* in Syria. characterized by excessive production of tiny sprout and witches broom growth (1.1),declining trees (1.2) and profuse branching especially in dead parts of the tree (1.3).

شكل 1. أعراض مرض مكنسة الساحرة على أشجار «اليوكا ليبتوس» في سورية. والمتسّم بإنتاج غزير لنموات دقيقة وفرط النمو (1.1). وانحطاط الأشجار (1.2)، والتفرّع المنتشر وبخاصة على الأجزاء الميتة من الشجر (1.3).