

# Canker disease in eucalyptus in the Basque Country

September 28 2009

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The first experiences with exotic species in the Basque Country, and alternative to *Pinus radiata*, were undertaken in 1957, concretely in Laukiz, Lezama and Alonsotegui (Muro, 1975) where the eucalyptus, amongst other forest species, was introduced. The expansion of rapid growth plantations such as those of eucalyptus came about in order to meet the needs of the growing paper pulp industry. Blights and diseases arose as one of the main threats to the plantations based on non-native species (Wingfield, 2003; Old et al., 2003).

The most well-known eucalyptus disease in the Basque Country occurs when the leaves undergo defoliation by *Mycosphaerellas*. Researchers at Neiker-Tecnalia, Ms Belén de Blas and Ms Eugenia Iturritxa recently identified 11 species of the tree, 9 of which are of new introduction into Spain (De Blas, Iturritxa et al., 2009). For the first time the appearance of apparent cankers in the trunk, in both young and adult eucalyptus, are beginning to be detected.

Cankers are infections of the bark and the cambium, sunken necrotic lesions produced by the disintegration of the plant tissues as a result of the infection (Federation of British Plant Pathologist, 1973). In severe cases they cause the death of the branches and even of the tree crown and trunk distortion.

Cankers are common in various species of trees and normally of limited size given that the fungal invasion triggers a process of cell and tissue response in the floema, cambium and the wood, and which restricts

further fungal invasion (Boyce, 1961).

Damage to the cambium of the eucalyptus often results in the formation of veins of kino, a secretion rich in an ample range of polyphenolic compounds with fungistatic activity (Hart and Hillis, 1972; Tippett, 1986).

The capacity of the fungus to cause canker is determined by the pathogenicity of the fungus and by the speed of response of the tree to the infection. The rate with which the tree responds to the invasion of the canker fungus can be modified by the environmental stress conditions, such as those caused by defoliators and by water and nutritional stress (Shearer et al, 1987).

Amongst the fungi indicated as causes of canker in eucalyptus are *Erythricium salmonicolor*, *Cryphonectria cubensis*, *Bothryosphaeria* spp. and *Endothia gyrosa* (Old and Davison, 2000).

## **Materials and methods**

A sample survey was drawn from eucalyptus [plantations](#) in the Basque Country during the Spring and Summer of 2009. Samples of trees with clear symptoms of canker disease were taken.

## **Isolation and identification**

Samples were kept in paper bags and transferred to the laboratory. When the sample presented fructification structures, the spores were transferred to 2% MEA (Biolab malt extract agar) using a fine needle. When fructification was not observed, portions of tissue of the damaged zone were sterilised (the sample was also sterilised superficially) and these were cultured in Petri dishes of MEA.

To identify *Botryosphaeria* spp., sporulation is induced by culturing the samples in water agar supplemented with sterilized pine needles. The conidia thus produced on these needles are examined under the microscope.

## Results

To date cankers have been observed in eucalypti on 17 plantations in the Basque province of Bizkaia, which has a long tradition in growing this forest species. The size of the cankers observed oscillate between 1.3 cm to more than 2 metres length (219.2 cm), the average size being 41.8 cm.

The damage to the timber is fairly superficial, but in 58.8 % of the cases, discolouring and degeneration in the interior of the trunk was observed.

Fungal isolates developed abundant, aerial mycelium that became dark gray after 2-3 days and formed black picnidia after 2 weeks. Conidia were hyaline, aseptate, not becoming septate or darker with age, thin walled and fusiformed and measured 18.93 to 23 X 4 to 4.86.

Based on the symptoms, mycelial and conidial characters the fungus was identified as *Botryosphaeria dothidea*.

Right now the name of *B. dothidea* belongs to several cryptic species. It is needed to sequence DNA, it has been established a collaboration with Mike Wingfiel, Mondi Professor of Forest Protection (FABI) South Africa, to carry out this part of the diagnosis.

Amongst detected using morphological methods were: *Bothriosphaeria dothidea* (the main cause of canker) and *Phellinus torulosus*; both are pathogens. Saprophytes such as *Pestalotiopsis funérea*, *Epicoccum nigrum* and *Trichoderma viridae* were also detected, these appearing when there is dead wood and to feed off.

## Discussion

As regards the rest of the eucalyptus forests in the world, those in the [Basque Country](#) are relatively recent. One of the biggest threats to this kind of plantation are blights and diseases, both native as well as those introduced by means of seeds and other material for propagation. One of the problems initially detected by this research group on the plantations was that of defoliations as a result of leaf spot disease caused by *Mycosphaerella*. Besides this problem, cankers in the main trunk of the trees are now beginning to appear and, in many cases, these are due to the stress initially generated by the mentioned defoliation.

The appearance of cankers, together with the size reached by some of them, are indicators of the stress conditions in which the plantations are undergoing. The weak response of the trees to the advance of the disease causes its manifestation and the considerable size of the cankers. Stress in forest masses may be due to the intrinsic susceptibility of a plant to the disease, nutritional deficiencies, water stress or a previous attack by defoliating fungi such as *Mycosphaerellas* and that cause leaf drop - in turn triggering a series of deficiencies in photosynthetic activity and associated nutritional deficiencies - and incrementing the susceptibility of the trees to attack by canker fungi.

It is of particular importance to select species, their origin and even eucalyptus clones well adapted to the climate conditions and to the location of the plantations, in such a manner that environmental stress can be minimised. It is possible to undertake a selection of genotypes resistant to the disease in such a way that plantations can be established with a genetic base which reduces their vulnerability to pathogens of this type.

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Source: Elhuyar Fundazioa

Citation: Canker disease in eucalyptus in the Basque Country (2009, September 28) retrieved 5 May 2024 from <https://phys.org/news/2009-09-canker-disease-eucalyptus-basque-country.html>

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