

The Hakea Gummosis Fungus, *Colletotrichum acutatum*

A fungal pathogen of Silky Hakea (*Hakea sericea*) in South Africa

Andries Fourie
Plant Protection Research Institute, Private Bag X5017, Stellenbosch, 7599



Description

The hakea gummosis fungus, *Colletotrichum acutatum* J.H. Simmonds ex J.H. Simmonds, is indigenous to South Africa and was therefore not intentionally introduced, as is the case for most other weed biocontrol agents. It causes a serious disease of silky hakea with characteristic stem and branch cankers as well as gummosis (the oozing of gum). The fungus produces masses of orange asexual spores (conidia), which are hyaline and oval in shape, 0.009 – 0.016 mm long and 0.004 mm wide. These fungal spores have been developed into various mycoherbicide formulations and can be used as an effective biocontrol agent against both seedlings and mature plants of silky hakea.

Life cycle

Spores of *C. acutatum* on the plant surface germinate in the presence of free water, for instance following light rain or dew. The optimal temperature for spore germination is between 16 to 32 °C at a high humidity (above 95%) and about 24 °C for optimal fungal growth. The spores are dispersed over short distances (less than 1 m) by rain splash.

Mycoherbicide formulations are best applied at the beginning of the rainy season to maximise the amount of disease developing. In the Western Cape (winter rainfall region) they should be applied at the beginning of winter, and during spring in the Eastern Cape (summer rainfall region). Penetration of the young leaves is mainly through stomata. Infected shoot tips of mature plants die back progressively and growth tips of seedlings die back. Infected seedlings which are no more than 10 cm in height will die. The bark of mature plants is only infected via wounds to the bark. The affected areas become flattened or swollen, the bark splits and a distinctive oozing of gum occurs. The gum is originally colourless, but becomes reddish brown later on. These cankers girdle the stems and branches, killing the plant beyond the infection. Where this occurs at the base of the main stem, the plant is killed.



Packets of dried spores of the hakea gummosis fungus
Colletotrichum acutatum

Oozing gum on mature hakea tree, after stem inoculation with the gummosis fungus

Mature hakea trees killed by the gummosis fungus *Colletotrichum acutatum*



Method of application

A number of application methods and formulations have been developed for the use of the hakea gummosis fungus as a mycoherbicide against hakea. The most useful of these include using an aqueous spore suspension of the fungus to wound-inoculate the stems of larger silky hakea trees, hand spreading a bran formulation for treating small seedlings, as well as coating the lead pellets of shotgun cartridges with the spores in a cellulose paste and firing them into inaccessible stands of silky hakea. All inoculation methods are effective, but new succulent growth of silky hakea is the most susceptible to the hakea gummosis fungus. Young hakea seedlings that emerge following fire must therefore preferably be targeted (cotyledon to 20-leaf stage, no higher than 10 cm).



Left: Jab inoculating the base of larger plants with an aqueous spore suspension of the hakea gummosis fungus



Distributing bran with the hakea gummosis fungus amongst young emerging hakea seedlings, following fire

The spores should be stored in the fridge until the day they are used. The most commonly used application methods are discussed in detail below:

- **Mature plants**

The best time for inoculation is during the beginning of the wet period of the year, to allow for successful spread of fungal infections, although inoculations can be done throughout the rainy season. Inoculations done during hot dry seasons will be largely ineffective. Suspend each spore packet in 1 litre of water. Jab once the base of the stems of mature silky hakea trees using a hand-held device (design available from ARC-PPRI), which lightly wounds and inoculates the plants. If jabbed higher, the top parts of the plant will die but the plant will regrow from the base, making treatment ineffective. Monitor the spread of disease and re-introduce the fungus in areas as necessary, for instance after fires or hot dry summers. Move through the stands in a zig-zag pattern, inoculating selected plants.

- **Newly emerged seedlings**

Distribute bran (on which the fungus has been grown) as supplied, evenly at a rate of 1 g per square meter (10 kg/ha) where seedlings are emerging in mass (from cotyledon to 20-leaf stage), usually at the beginning of the rainy season. An epidemic is initiated which causes 98 – 100% mortality.

Impact on hakea

Seedlings as well as mature silky hakea plants are affected by the gummosis fungus. Although the effects manifest slowly over several months, the fungus is still capable of killing large stands of hakea trees, it is cost effective and it reduces the need for herbicide use and labour-intensive mechanical control procedures. This isolate of *C. acutatum* is highly host specific to *H. sericea* and is not a threat to any of the indigenous South African flora, nor does it infect other *Hakea* species.

Rainfall favours the spread of the fungus, therefore it is most effective in high rainfall areas and becomes progressively less effective the drier the area. This reduced spread of the fungus in drier regions needs to be compensated for by inoculating more plants, and by more frequent applications.

Obtaining the fungus

The fungus is obtainable from the Plant Protection Research Institute in Stellenbosch. Place orders a month before the intended application, to allow sufficient inoculum to be produced. All orders must be directed to Ms Gwen Samuels, Plant Protection Research Institute, Private Bag X5017, Stellenbosch, 7599. Phone: (021) 887 4690. Fax: (021) 886 6479. E-mail: SamuelsG@arc.agric.za.