PHOMA SORGHINA, ONYALAI AND INDIGENOUS TREES: WHERE IS THE LINK?

Prepared by Ariska van der Nest

Phoma sorghina is a seed- and soil-borne fungus that can also invade weakened or stressed plants. Although it is mainly associated with plants in the Gramineae group (*e.g.* sorghum, millet, rice and sugarcane), it has been reported to infect more than 80 different plant hosts throughout the world. These include indigenous southern African *Acacia* (see Figure 1), *Podocarpus*, and *Aloe* species as well as other tree species such as *Cichorium, Citrus* and *Eucalyptus*. Intriguingly, *P. sorghina* has also been reported to occur on thatch roofs and animal feed in southern Africa.

Besides the fact that *P. sorghina* is a pathogen of plants this fungus can also affect human and animal health. This fungus can cause red lesions when infections occur on the skin (*e.g.* broken skin), and it has been shown to produce mycotoxins in sorghum and millet. Mycotoxins are secondary metabolites that, when ingested, negatively affect human and animal health by harming various organs, influencing the immune system and causing cancer. One such mycotoxin (that is also produced by *P.sorghina*) is tenuazonic acid, which inhibits protein synthesis in cells, leading to growth disorders especially in children and young animals.

Phoma sorghina is also associated with a disease known as onyalai. This disease causes the development of blood blisters in the mouth, throat and under the feet of patients (see figure 1 and figure 2) consuming contaminated food such as sorghum and millet. Due to a drop in the blood platelet count of patients, blisters bleed continually and internal bleeding is seen in severe cases. As soon as the consumption of contaminated food is stopped the patient can recover without any obvious side effects. The disease is only associated with people living in southern and central Africa, although the fungus has been reported to occur worldwide.

Due to the wide host range of *P. sorghina* and its localised disease symptoms in Africa, the question arises whether this fungus truly represents only a single species or whether it is a complex of species occurring all over the world. Another important issue is whether fungal isolates from indigenous plants from southern Africa are related in any way to *P. sorghina* occurring in grain crops such as sorghum and millet.

To address these questions, we used DNA sequence analysis to study a large collection of isolates from around the world. Our findings showed that all isolates from southern Africa indeed forms part of a single diverse assemblage distinct from other *Phoma* species elsewhere in the world. It therefore seems that there is a link between the species that occur on indigenous trees and the species in grains that cause onyalai. Although there were smaller clusters of isolates within the larger *P. sorghina* group, no correlation with plant host and the toxicity were apparent.

As there is a link between the grain and indigenous tree samples from southern Africa, one cannot help to ask the next question: Do the isolates from the indigenous trees have the same ability as the isolates from grains to cause onyalai or is this a trait that is “switched on” when this fungus occur on certain hosts? This question will be addressed in the future by looking at physiological characteristics of the different isolates.

Ariska van der Nest hard at work in the lab

Figure 1. ***Phoma sorghina*** **sporulating on** ***Acacia karroo***

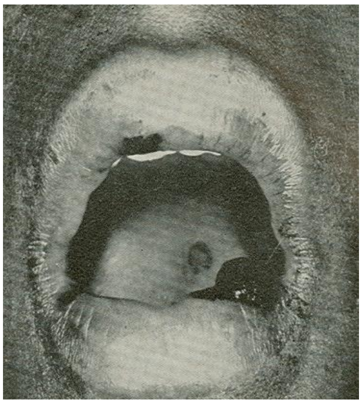

Figure 2. Hemorrhagic bullae formed inside the mouth of an onyalai patient (From M.B. Harris, S. Murphy, F.A. Oski, 1972)

Figure 3. Blood blisters formed underneath the feet of an onyalai patient (From M.B. Harris, S. Murphy, F.A. Oski, 1972)