SMALL FLY HAS ITS SIGHTS ON BLACK WATTLE

Enhancing biological control of *Acacia mearnsii* in South Africa.

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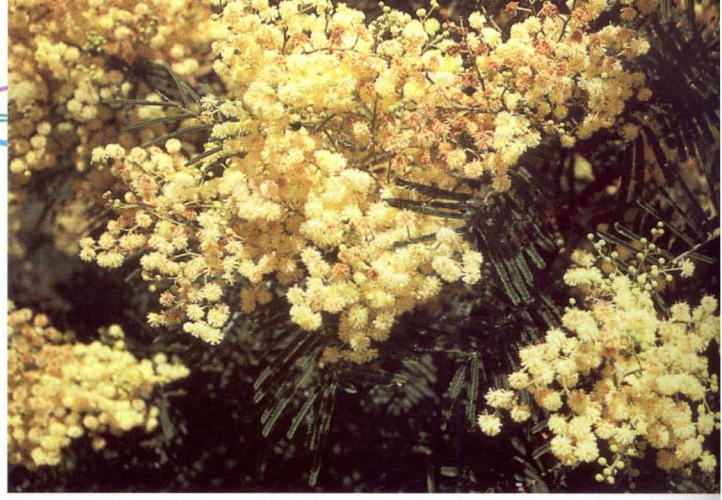

Close-up of the flowers of black wattle. The tiny podlet galler (a gall midge) lays its eggs in open flowers. Photo: R. Adair.

Acacia mearnsii or black wattle is a desirable and useful plant in its country of origin - Australia. It is fast growing, forms a shapely shade tree, makes good braai wood and improves biodiversity by encouraging wildlife. After a wildfire, black wattle is often one of the first species to regenerate from seed and can form healing forests on fire-scared landscapes by slowing down erosion, adding organic matter and providing shelter for less robust plant species. The tree is commonly used in re-vegetation programs in nature reserves and often used by farmers as windbreaks and along freeways. Australians have looked at the economic potential of black wattle and have attempted to produce timber products such as pulp and tannin. Although the world market for black wattle products is strong, an armada of indigenous insects, mites and diseases feed on and damage this plant in Australia. These organisms debilitate black wattle, yet they are also the reason for the plant's ecological importance in providing a habitat for other forms of life.

The first record of black wattle in South Africa is its listing in a Cape Town Botanic Gardens catalogue in 1858. However, commercial use of black wattle probably started in 1865 when John Vanderplank first introduced the tree to KwaZulu-Natal from Australia. One hundred and thirty-six years later, black wattle has been planted over 130 000 ha and is the basis of a valuable timber and wood product industry that provides substantial foreign revenue and employment. One reason for the success of black wattle in South Africa is that damaging insects and diseases, so prevalent in Australia, are much less abundant. A few pests do plague the wattle industry in South Africa, but these come from indigenous African acacias and not from Australia. The wattle bagworm (*Chaliopsis junodi*) and wattle mirid (*Lydidolon laevigatum*) normally feed on bushveld trees such as *Acacia caffra* (the common hook-thorn) and *A. karroo* (sweet thorn) but have also found black wattle to their liking, forcing wattle growers to apply insecticides to protect their trees.

Things start to go wrong...

In well-managed commercial plantations in KwaZulu-Natal and Mpumalanga, black wattle is a relatively innocuous timber crop, but outside these areas things start to go wrong. In the Western Cape and Eastern Cape in particular, black wattle is not intensively farmed and huge populations of wild trees have become established in native vegetation communities. Unlike in Australia, black wattle is the grim reaper of biodiversity and South African plants and animals drastically decline as a result of its invasion. If loss of biodiversity isn't enough, black wattle is also causing serious degradation of water catchments. As a high water-user, dense stands of black wattle trees reduce stream flow rates and deprive us of that essential resource – water (see accompanying box).

Controlling black wattle in South Africa is no easy task. Although herbicides and physical methods, such as fire and hacking, can be used to destroy it, particularly when used with re-vegetation using competitive native plants, black wattle is so widespread and aggressive that the 'war' is not being won.

Introducing bio-control

After a long debate on whether biological control of black wattle should be attempted in South Africa, agreement between commercial wattle growers and biological control advocates was reached in 1992, when it was accepted that seeds of black wattle could be targeted for biological control using natural enemies from Australia. By subjecting only the seeds of black wattle to biological control and not leaves or stems, the benefits to the wattle industry could be maintained while the negative environmental impacts could be alleviated.

This approach saw the liberation of a seed-feeding weevil (*Melanterius maculatus*) in South Africa in 1993. This beetle is small and not easily seen on the trees, but has the potential to cause high levels of seed destruction, as related species have done on rooikrans (*Acacia cyclops*), blackwood (*A. melanoxylon*), long-leaf wattle (*A. longifolia*) and stinkbean (*Parasieranthes lophantha*). However, black wattle is not an easy target for biological control as seed production occurs over an extended period of the year, out-of-season fruiting is common and the plant occurs over a large latitudinal and altitudinal range, providing opportunities for the tree to escape the seed-feeding beetle. The weevil is showing signs of natural dispersal in the Western Cape, but its slow movement has restricted biological control efforts so far.

Evaluating a better bio-agent

A new seed-reducing insect is currently under evaluation in quarantine in South Africa and may eventually supplement

Left **Galls caused by a gall midge, the tiny podlet galler, on the inflorescence of black wattle shortly before the emergence of the larvae.**
Right **Heavy galling caused by the tiny podlet galler on black wattle inflorescences.**
Photos: R. Adair.

THE PRICE WE PAY FOR WATTLES

A recent study has estimated that because of the high water using capacity of black wattle, they are costing South Africa the equivalent of $US 1426 million annually in lost water. Water has a value in South Africa as it is a limited resource. As water is used for agriculture and manufacturing it generates an income. If wattle takes away this water and deprives these industries then a cost is involved. This is basically how this figure was calculated as wattles use an estimated 577 million cubic meters of water each year.

the seed weevil in controlling black wattle. This potential agent, a small gall midge with the ability to cause extensive reduction in seeding, was discovered in Western Australia in 1998. The adult midge lays eggs in wattle flowers and the young larvae cause the formation of a small gall. The larvae live within the gall and induce the plant to provide protection from predators and food for nourishment. These galls prevent seed production and, if damage is extensive and consistent, could eventually lead to the depletion of seeds stored in the soil beneath wattle trees.

Gall-forming bio-control agents have been spectacularly successful in controlling Australian wattles in South Africa. Most people will have noticed the large fungal galls on Port Jackson (*Acacia saligna*) that have been so successful in controlling this tree in dry areas of the Western Cape. The conspicuous galls on the shoots of long-leafed wattle and golden wattle are caused by small wasps (*Trichilogaster* species) that manipulate their plant hosts to divert valuable resources into gall production instead of leaves, stems and roots. In the case of black wattle, gall-forming bio-control control agents that cause this sort of damage would not be acceptable to the wattle industry because the growth of black wattle is adversely affected.

By contrast, the new gall midge on black wattle forms a gall around 3-4 mm diameter and although large numbers are produced, their cost to the plant does not exceed what the trees would naturally incur in producing seed pods. It seems this small fly may have the ability to reduce the high seeding capacity of one of South Africa's worst weeds, but at the same time avoid damaging the black wattle industry. Research in assessing the suitability of this insect, referred to as the 'tiny podlet galler', is being undertaken at the Agricultural Research Centre at the Plant Protection Research Institute in Stellenbosch. So far we know that none of the African *Acacia* species are susceptible to this insect and that the wattle crops of KwaZulu-Natal and Mpumalanga are probably safe.

Further investigation however, is required before any attempts to release this insect in South Africa are made. As our research continues we move closer to the time when another insect ally may be recruited to overcome the invasive tendencies of black wattle.

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About the author
Robin Adair was born and raised in the home of black wattle - eastern Australia and now works as a research entomologist with the Plant Protection Research Institute at Stellenbosch, on loan from Victoria's, Keith Turnbull Research Institute. He is devoted to finding a solution to the black wattle problem in South Africa. A keen interest in botany and entomology is helping build a solution to this complex problem.