

New biological agent curtails Rooikrans

By Judy Moore

The Cape Flats as we know them today, splitting the Cape Peninsula from the rest of the Cape mainland, are very sandy. This is because they were submerged under the sea during at least four known periods in comparatively recent geological history between 280 000 and, most recently, about 6000 years ago, when Table Mountain became an off-shore island. This was due to the melting of the polar ice caps which raised the sea level 100 metres or more during the Pleistocene.

With the settlement at the Cape, the original indigenous vegetation of the Cape Flats became denuded over time. This was due mainly to the collection of firewood, the removal of indigenous restios for thatch, the feeding and trampling by livestock, and the myriad tracks left by ox-wagons as each chose his own route.

Ox-wagons would travel from Stellenbosch and Franschhoek to Cape Town to deliver fresh produce to ships in Table Bay. This would necessitate crossing the Cape Flats, a drifting sand desert blown by persistent winds. By the 1840s, eight oxen were required to pull a wagon

even a short distance over the sand, and it took 7 hours to cover 24 km. Eventually the Hard Road was constructed along the higher ground east of the swampy course of the Kuils River where the sandy Flats were narrowest, and which today is Voortrekker Road which passes through Bellville and beyond. Similarly, the road to Simonstown was continually under threat by the drift sands.

At first Hottentot figs (*Carpobrotus edulis*) and then various exotic shrubs and trees, mostly from Australia, were planted to stabilize the dunes. By 1850, the Port Jackson willow (*Acacia saligna*) began to be planted extensively alongside the Hard Road and this was followed later by the planting of *Acacia cyclops*. Because these shrubs formed thickets which both stabilized the sand and acted as windbreaks, they were widely planted throughout the Cape Flats. *Acacia cyclops* originates along the sandy coasts in the winter rainfall region of Western Australia, and is therefore ideally suited to the conditions of the Cape. It has the added advantage of arriving without its natural enemies which had evolved with it in its natural habitat.

Acacia cyclops or rooikrans as it is better known, is now a highly invasive shrub in the coastal regions of South Africa from Port Nolloth near the Namibian border in the west, all the way to East London, on the south-eastern coast. Rooikrans invades agricultural land, native vegetation and conservation areas. While it readily colonises disturbed land, it maintains its dominance in indigenous vegetation by the extensive production of soil-stored, long-lived seed and its tolerance to soil moisture stress and salt-laden winds. The seeds germinate when they are stimulated by fire which is a natural and regular occurrence in the fynbos.

Conventional mechanical control techniques, such as chopping the trees or uprooting saplings, can be effective on a small scale, but are ineffective or unpractical over an extensive area. Chemical control is expensive and often has to be continually repeated.

Biological control, the introduction of natural enemies of rooikrans to South Africa from Australia, was contemplated, but because we have indigenous *Acacia* species, any potential agent would have

to be host-specific. Also, due to a conflict of interest with poorer communities who use rooikrans as a source of firewood and fuel, to import insects or diseases that feed on the vegetative parts of the plant would not be permitted. Agents had to be restricted to seed destroying insects only. This would lower the number of seeds being produced, thus resulting in fewer seeds in the soil, fewer seeds available to be dispersed by birds (particularly by the indigenous red-winged starlings, *Onychognathus morio*) and hence curtail the spread of rooikrans. At the same time rooikrans trees already present would remain unaffected and still be available as a source of fuel.

The biological control of rooikrans commenced in 1983 to suppress the rate of reproduction and spread of this species. A seed-feeding weevil, *Melanterius servulus*, was introduced from Australia, and released in South Africa in 1991 and has established at sites in the Western Cape. Seed destruction levels by *M. servulus* can be high. The Weeds Division at the Plant Protection Research Institute in Stellenbosch, and the University of Cape Town are monitoring the impact and dispersal of this beetle.

In February 2000, the tiny Small Fluted Galler midge, *Dasineura dielsi*, was released near Stellenbosch after being subjected to an environmental impact assessment and host specificity testing as well as other studies which confirmed it as safe for release. This midge was introduced to supplement the seed reduction achieved by the seed-feeding weevil. The action of the weevil and the galler midge is additive and contributes to better control of rooikrans than either one of the agents alone.

The female midge lays its eggs only on rooikrans flowers. Each female can lay up to about 300 eggs before it dies, with an average of about twelve eggs per flower. These eggs hatch into larvae which bore into the flower, causing it to gall instead of forming seed-bearing pods. These galls increase rapidly in size with the developing larvae feeding inside, and each gall cluster become conspicuous, green and spidery, up to 3 cm in diameter. In size they are similar to the familiar galls produced by the Trichilogaster wasp on the long-leafed wattle, *Acacia longifolia*, but dissimilar in that they are not smooth, but consist of numerous spiky tubules. The larvae eventually pupate within the galls and adult midges emerge from these galls mainly over the following three months. After a few months the gall dies and becomes brown but remains on the tree. Midges have still been observed to continue emerging from these brown galls but in much lower numbers within the next year or two. Each gall cluster, consisting of many individual galls each harbour-



Small Fluted Galler midge laying eggs on a rooikrans flower

450 km east of Cape Town. By January 2004, galls were found on Robben Island and as far as Port Alfred, 150 km east of Port Elizabeth. Today, galls can be found on rooikrans trees wherever the trees are found to occur.

A factor which could affect the success of the midge as a biological control agent, is the presence of certain indigenous and possibly exotic wasp parasitoids which have been discovered parasitising the midge. Over time, this could potentially result in a drastic reduction in the midge population, thus affecting its biological control of rooikrans because more seed pods, and hence seeds, would again be produced.

The Small Fluted Galler midge has made a spectacular start but seed production by rooikrans at this stage still appears to be fluctuating annually throughout the range of the weed. The effect this has on seedling survival and on the rate of spread of rooikrans is being monitored. Early indications are that the weed's invasiveness has been substantially curtailed. Whereas the large galls formed on other exotic *Acacia* species result in what is known as a nutrient sink where the plant's scarce resources are used to form these galls, galling by the small fluted galler appears to have no effect on the growth rate or survival of rooikrans. ■

The midge reproduces very rapidly and may have up to six generations per year depending on seasonal temperatures. Its dispersal has been very rapid due to its small size, the fact that it can be easily carried by wind, its large numbers, and the availability of *Acacia cyclops* flowers throughout the year in the western and southern Cape. In 2003, galls were recovered from trees throughout the Cape Peninsula and up the west coast as far as Hondeklipbaai, 435 km north of Cape Town, and at Keurboom River mouth,

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Rooikrans branches showing the Small Fluted Galler midge galls that formed instead of seed pods.



Rooikrans branches supporting many older, brown galls.