

Biocontrol agent against Mexican sunflower released in South Africa

By Khethani Mawela and David Simelane

A decade of research on biocontrol of the invasive Mexican sunflower, *Tithonia diversifolia* (Asteraceae: Heliantheae), has finally paid dividends following the release of the first biocontrol agent against this invader. The leaf-defoliating tortoise beetle, *Physonota maculiventris* (Coleoptera: Chrysomelidae: Cassidinae), originally from Mexico, was finally approved for release in July last year, and researchers are currently hard at work mass-rearing the beetle for release and distribution throughout the country.

Aggressive, invasive weed

Mexican sunflower is an aggressive, invasive weed that is naturalised in Southeast Asia, South America and tropical Africa, including South Africa. Initially introduced into South Africa during the 1930s as an ornamental plant, Mexican sunflower has become invasive in the tropical and

subtropical provinces, including Limpopo, Mpumalanga and KwaZulu-Natal.

It is rapidly invading farms, forest margins, disturbed lands, railway lines and roadsides, outcompeting native flora by transforming landscapes into a monoculture. Because of its perennial and allelopathic properties, the Mexican sunflower is able to maintain monocultures throughout the year, making it impossible for native flora to reclaim the space at those sites. Its ability to reproduce through seeds and vegetatively makes it a highly aggressive weed. Branches that have been cut off and discarded during mechanical control may regenerate and produce new plants, while wind-dispersed seeds enable it to colonise remote, new sites. Mexican sunflower is classified as a category 1b and 1 weed by the *National Environmental Management: Biodiversity Act, 2004* (Act 10 of 2004, or NEMBA Act) and the *Conservation of Agricultural*



Khotso Malatji releasing *Physonota maculiventris* on Mexican sunflower at Umkomaas in KwaZulu-Natal.

Resources Act, 1983 (Act 43 of 1983, or CARA Act) of South Africa, respectively.



Adult *Physonota maculiventris* and the larvae of *P. maculiventris*.

Biological control programme

Although mechanical and chemical control measures are often applied by land owners in South Africa, these measures are expensive and unsustainable. As part of control efforts to contain the Mexican sunflower, a biological control programme was launched in 2007 by the Agricultural Research Council's Plant Health and Protection Institute through funding by the Natural Resources Management Programme (NRMP) of the Department of Environmental Affairs (DEA). This programme resulted in the collection and identification of the leaf-defoliating tortoise beetle *P. maculiventris* in Mexico in 2009, and its subsequent development as a biological control agent in South Africa. Extensive evaluation of host-specificity and potential impact of the beetle were

conducted over a four-year period to determine its safety for release and effectiveness in controlling the Mexican sunflower in this country. The beetle was eventually recommended for release, and permission for its release was granted by the Department of Agriculture, Forestry and Fisheries (DAFF) in July 2018.

The female beetle lays batches of around 30 eggs on the lower leaf surface. Each female may produce at least six egg batches during her lifetime. As the eggs hatch, early instar larvae feed gregariously, which makes the larval stage the most damaging stage of this beetle. Thereafter, late instar larvae feed solitarily and pupate mostly on dry, damaged leaves that are still attached to the plant.

The damage by larvae and adults of *P. maculiventris* often results in skeletonisation of the leaves, leaving only the leaf veins behind. This damage leads to substantial loss of photosynthetic area, resulting in loss of biomass and reproductive capacity of the plant.

Mass-rearing of the beetle has been initiated at Roodeplaat and Tzaneen. The

conditions in gauze-covered tunnels appear to be conducive for the beetle to multiply, and it is anticipated that thousands of beetles from the Tzaneen tunnels alone will be distributed throughout the country before winter. Adult beetles, bred in the quarantine facility in Pretoria, have already been released at 21 sites in KwaZulu-Natal, Mpumalanga and Limpopo since August 2018, with 200 to 1 000 beetles released per site.

We anticipate that, having been reunited with its host plant in the wild, the tortoise beetle will multiply and build up populations big enough to



Mexican sunflower skeletonised by the larvae and adult beetles.

reduce the fitness and invasiveness of Mexican sunflower in South Africa. 🌱

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