

4. BIOLOGICAL CONTROL OF SOLANUM WEEDS (FAMILY SOLANACEAE: POTATO FAMILY)

 4.2 The satansbos leaf beetles (*Leptinotarsa texana* and *Leptinotarsa defecta*)

ORIGIN

The satansbos leaf beetles are indigenous to North America.

Life cycle

The adults are dome-shaped, up to 8 mm in diameter, pale yellow beetles with prominent, black stripes along the front wings. The two species are easily distinguishable because *L. texana* (figs. 1a and 2) has four dark stripes on each wing while *L. defecta* (fig. 3) has two stripes per wing.

The adult beetles emerge from their pupal chambers in the soil when conditions are favourable, and immediately start feeding on the leaves of satansbos. The beetles may mate several times with different partners and the females start laying eggs about two weeks after emergence.

The adult female lays clusters of about 20 to 40 eggs, which are attached to the lower surface of satansbos leaves (fig. 1b). Each female produces about 300 eggs in her lifespan of 3 to 4 months. The eggs of *L. texana* are pale yellow, almost cream coloured and are larger than the bright yellow eggs of *L. defecta*.

fruit. The young larvae are soft and almost black (figs. 1c and 4), but the colour changes first to dark grey and later to light grey (figs. 1d and 5), with two rows of black dots along the sides of the body.

After having moulted (shed their skins) three times, the larvae of *L. texana* have orange heads and can be easily distinguished from *L. defecta* larvae which have black heads. After 12 to 14 days and four moults the larvae stop feeding and become prepupae, which leave the host plant and burrow into the soil where they pupate (fig. 1e). Adults emerge after approximately 10 days. Several generations can be completed during the summer months and the beetles therefore become extremely abundant under favourable conditions.

Because the two beetle species are host-specific and can only survive on satansbos, which dies back during winter, the insects have to overwinter without feeding. During autumn, when the days become shorter and the quality of the satansbos leaves deteriorates, the adult beetles burrow into the soil where they enter into a winter sleep (diapause) until the following spring. They normally emerge shortly after the first spring rains (in summer rainfall regions), or when satansbos plants start to produce new growth.

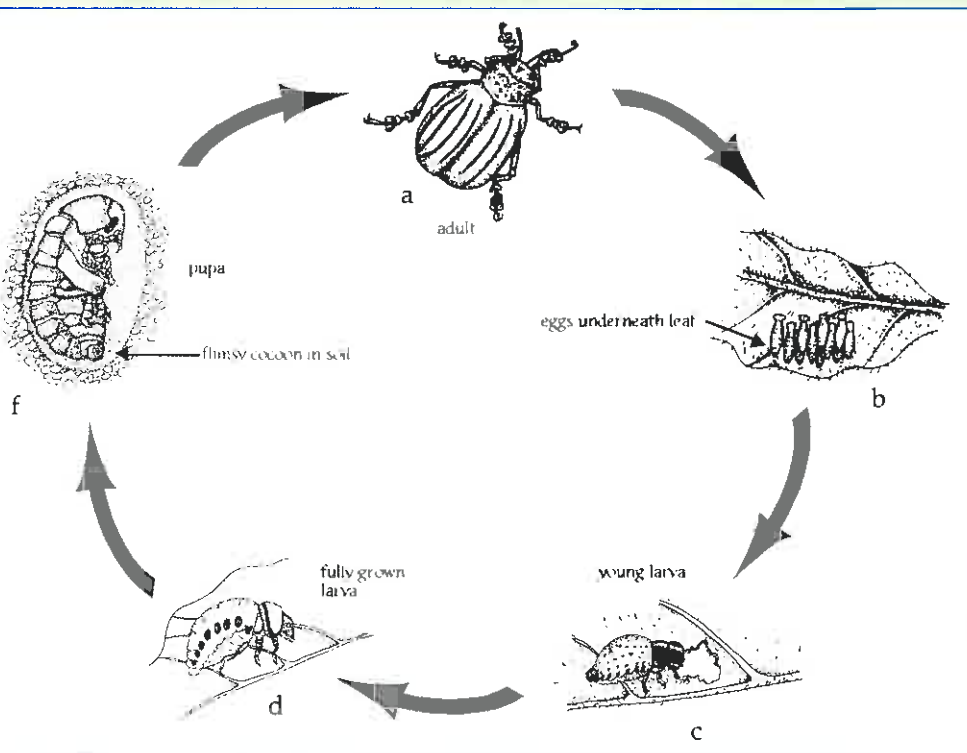


Figure 1. Life cycle of a satansbos leaf beetle.

Larvae hatch from the eggs after approximately 4 days and feed on the eggshells from which they have just emerged. They then start feeding on the satansbos leaves. All the larvae from an egg batch normally remain together and feed as a group until the final stages of development when they split up and feed on their own. The larvae feed mostly on leaves but also destroy flowers and buds but not the

around the plants. On closer examination, fine, light brown to green faeces may be noticed scattered on the damaged leaves and around the plants. When beetle densities are very high, all the leaves and even the bark are stripped from the plants, leaving only skeletonised stems (fig. 6) with the fruit intact.

The two *Leptinotarsa* species have very different dispersal abilities. *Leptinotarsa texana* is a reluctant flier and does not move much. As a result, the beetles may become extremely crowded in certain areas and their food supply becomes exhausted. At this stage, dense aggregations of beetles begin to move outwards forming a "wave" and stripping the satansbos plants as they move. By contrast, *L. defecta* flies readily and the adults disperse widely. Consequently, *L. defecta* does not reach high densities. This type of behaviour allows *L. defecta* to use isolated plants as a food source without having to compete with *L. texana*.

How to tell whether the satansbos leaf beetles are present

Yellow beetles with black lines along their wings are conspicuous on the satansbos plants. The pale yellow egg clusters of *L. texana* or the bright yellow ones of *L. defecta* are easy to find on the underside of satansbos leaves, as well as the large, grey larvae on the leaves. Irregularly-shaped feeding damage is noticeable on the leaves and partially-eaten leaves lie scattered on the ground

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Leaf beetle damage to satansbos

In the northern part of the country, where satansbos is mainly a problem in dryland conditions, the insects have only recently started reaching high population numbers and up to now, the damage has been insignificant. In the Eastern Cape, however, the beetles (mainly *L. texana*) have periodically caused complete defoliation of patches of plants, in cases extending over several hectares. The beetles do not damage the fruit or the root system, and damaged plants usually resprout from the extensive rootstocks. However, plants that have been defoliated repeatedly by the beetles are usually stunted and produce few fruit. This reduces the abundance of satansbos and alleviates the problem to some extent.



Figure 2. Adult of the leafbeetle, *Leptinotarsa texana*, with four black stripes per wing.



Figure 3. Adult of the leafbeetle, *Leptinotarsa defecta*, with two black stripes per wing.



Figure 4. Young leafbeetle larvae (black) feeding on a leaf of satansbos.



Figure 5. A fully-grown larva (light grey) (left) and adult beetle (right) of *L. texana*.



Figure 6. A satansbos plant that has been defoliated and stripped of its bark by larvae and adults of the leaf beetles.

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Collection and redistribution of leafbeetles

The beetles should be collected during mid or late summer in an area where they are already abundant. Contact D:LRM, North West Province, to find out where to collect them. Adult beetles as well as larvae should be collected in ventilated containers or cheesecloth bags containing a few leafy stems of satansbos and a sheet of crumpled paper towel. Do not handle the larvae more than is necessary, but rather collect them together with the entire leaf. Do not leave the container in direct sunshine or in a hot car. If kept cool and dry, and supplied with food, the insects can survive in a container for about a week. A few drops of water can be sprayed into the container once a day for the beetles to drink, but make sure that enough paper towels are supplied to absorb any excess moisture. Ventilation is important because decaying plant material produces fumes that can be lethal to insects.

When releasing the beetles, select a site that will not be ploughed, mowed or treated with herbicides within at least the next 2 years, to give the insects a chance to become well established. Gently shake the insects out of the container onto healthy satansbos plants, making sure that all the larvae land on plants. Release as many beetles as possible at one spot, rather than distributing them more widely.

CONTACT PERSONS

Consult leaflet 1.4 in this series for the most updated contact details.

- Biocontrol research: Weeds Research Division, ARC-PPRI (Rietondale), Private Bag X134, Pretoria 0001; Tel (012) 329 3269; Fax (012) 329 3278; e-mail weeds@plant2.agric.za.
- Supply of biocontrol agents: National Department of Agriculture, Directorate of Agricultural Land Resource Management (D:LRM), North-West Province.

FURTHER READING

OLCKERS, T., HOFFMANN, J. H., & MORAN, V.C., IMPSON, F.A.C. & HILL, M.P. 1999. The initiation of biological control programmes against *Solanum elaeagnifolium* Cavanilles and *S. sisymbriifolium* Lamarck (Solanaceae) in South Africa. In: Olckers, T. & Hill, M. P. (Eds) *Biological Control of Weeds in South Africa (1990-1999)*. *African Entomology*. Memoir No. 1. 55-63.

OLCKERS, T. & ZIMMERMANN, H.G. 1991. Biological control of silverleaf nightshade, *Solanum elaeagnifolium*, and bugweed, *Solanum mauritianum* (Solanaceae) in South Africa. *Agriculture, Ecosystems and Environment* 37: 137-155.

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