

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

4.1 Silverleaf nightshade/satansbos (*Solanum elaeagnifolium*)

**ORIGIN OF THE WEED**

The satansbos (fig.1) is indigenous to Southern U.S.A. and Mexico.

**BIOCONTROL AGENTS**

Read more about biological control in general in leaflet 1.3 in this series.

**a. The satansbos leaf beetles, *Leptinotarsa texana* and *Leptinotarsa defecta***

Although these two leaf beetles do not have the potential to kill satansbos plants unaided, they are the most damaging natural enemies that are known not to pose a threat to the large number of crop plants in the family Solanaceae. As one component in an integrated control programme they can be very important, especially in dryland crops and in non-crop situations.

**Background information on agents**

Leaflet 4.2 in this series contains essential information on the life cycle of these insects, their potential as biological control agents and their implementation.

**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*) (fig. 3) have periodically caused complete defoliation of patches of plants (fig. 2), 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 1. Satansbos with its characteristic blue flowers and yellow fruits.



Figure 2. A satansbos plant that has been completely defoliated by the leaf beetles.

CONTROL STRATEGY	
In annual cash crops	<ul style="list-style-type: none"> <li>• Chemical control - one treatment of 2,4-D before planting.</li> <li>• Biocontrol using leaf beetles on fence lines between fields.</li> </ul>
In dryland crops	<ul style="list-style-type: none"> <li>• Transform field into permanent perennial pasture.</li> <li>• Reduce competitive ability of satansbos by chemical control (2,4-D) and repeated harvesting or controlled grazing.</li> <li>• Alternatively, reduce competitive ability of satansbos through biological control (leaf beetles) and controlled grazing.</li> </ul>
Beyond crop situations	<ul style="list-style-type: none"> <li>• Biological control (leaf beetles)</li> </ul>

The four available control methods (mechanical removal, herbicidal control, competition by crops or grasses, and biological control) should be combined in an integrated control strategy that will differ according to the situation.



## 4.1 Silverleaf nightshade/satansbos (*Solanum elaeagnifolium*)

**In annual cash crops:** One chemical treatment before planting and subsequent competition by the crop should control satansbos. The cost of the herbicide should be offset by higher crop yields. Where moisture is not a problem (e.g. under irrigation), competition by satansbos does not affect the crops as adversely as in dryland conditions and the weed can therefore be tolerated. Biological control is not an option within fields because ploughing destroys the pupae and adults in the soil and herbicides kill the insects on the plants. However, satansbos plants growing on fence lines between fields can foster a permanent population of beetles which will spread into the fields when conditions are suitable and therefore contribute, at least intermittently, to control of the weed.

**In dryland crops:** The low crop yields in these situations cannot offset the cost of chemical control, which is therefore not economically viable. The only method that will give permanent control is to transform infested fields into permanent, perennial pastures. Competition by vigorously-growing, permanent crops, can reduce the stands provided the crop plants are well established by the time that satansbos plants emerge in spring. Establish perennial pasture grasses such as Smuts finger grass (*Digitaria eriantha*) and blue buffalo grass (*Cenchrus ciliaris*) before satansbos starts growing actively, i.e. in autumn, winter or early spring. One application of an affordable broadleaf herbicide such as 2, 4-D (or two applications in exceptional cases) can be used to reduce the competitive ability of satansbos further. Satansbos has been known to disappear completely 5 years after this treatment. Dryland lucerne can also compete successfully with satansbos, and should be established in late summer or autumn. Because lucerne is a broadleaf crop, broadleaf herbicides cannot be used to reduce the competitive ability of satansbos. Repeated harvesting or controlled grazing can help to suppress the vigour of satansbos and to exhaust its underground nutrient reserves.

The two *Leptinotarsa* species serve the same purpose as a broadleaf herbicide, viz. to remove the above-ground growth and exhaust the root system. They remain in the area permanently and therefore cause repeated defoliation, apart from a broadleaf herbicide devouring the bark and stems. Therefore, their effect is more substantial than that of herbicides. Other management practices have to be adapted to accommodate the insects. If the fields are ploughed in winter, most of the beetle population in the soil will be destroyed. It is therefore recommended not to plough all fields at the same time. Alternatively, strips of infested land between fields should be left so that the insects can multiply undisturbed and spread into the arable lands once satansbos plants start growing. Biological control should be seen as part of an integrated approach and not as the final solution.

**Beyond crop situations:** Satansbos plants in non-arable areas could support permanent populations of the beetles. Because the cost of herbicides or mechanical operations cannot be defrayed, landowners usually do not tackle satansbos in these situations. It is essential to prevent seed production by the weed in non-arable lands, especially along watercourses, to contain the spread of the weed. Biological control is the most economical solution to the satansbos problem and the beetles should be introduced into these areas. Because neither herbicides nor clearing operations are justified in non-arable lands, these areas provide an ideal habitat for the insects.



Figure 3. An adult (right) and larva (left) of the leaf beetle, *Leptinotarsa texana* feeding on the leaves of satansbos.

### CONTACT PERSONS

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

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- 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.

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