

The Weed *Sesbania punicea* (Leguminosae) in South Africa Nipped in the Bud by the Weevil *Trichapion lativentre*

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Abstract

Sesbania punicea is a South American shrub that has invaded riverine habitats and is expanding its range throughout South Africa. During 1982, four weevil species from Argentina, *Trichapion lativentre*, *Rhyssomatus marginatus*, *Diplogrammus quadrivittatus*, and *Eudiagogus episcopalis*, were imported for screening as biocontrol agents against *S. punicea*. Recently, *T. lativentre* was found to be established on *S. punicea* in South Africa. Adults of *T. lativentre* are leaf-feeders. Larvae develop in flower buds and prevent seed-set. Preliminary surveys during the 1983/84 summer showed that: (a) *T. lativentre* was abundant and widespread in the eastern parts of the country; (b) in the hinterland, *T. lativentre* destroyed most flower buds and no seeds were set; and (c) along the coast, some seeds were produced, even where weevil densities were high. *T. lativentre*, supplemented by other agents, if necessary, should bring *S. punicea* under biological control in South Africa.

La Plante Nuisible *Sesbania punicea* (Légumineuse) d'Afrique du Sud Détruite au Stade de Bourgillon par le Charançon *Trichapion lativentre*

Sesbania punicea est un arbuste d'Amérique du Sud qui a envahi les habitats riverains et dont l'aire de distribution s'étend de plus en plus en Afrique du Sud. En 1982, quatre espèces de charançons d'Argentine, à savoir *Trichapion lativentre*, *Rhyssomatus marginatus*, *Diplogrammus quadrivittatus*, et *Eudiagogus episcopalis*, ont été importés afin d'être mis à l'essai comme agents de lutte biologique contre *S. punicea*. On vient de découvrir que *T. lativentre* s'est établi sur *S. punicea* en Afrique du Sud. Les adultes de *T. lativentre* sont des insectes défoliateurs. Les larves se développent dans les bourgeons de fleurs et les empêchent de grener. Les études préliminaires effectuées pendant l'été 83 à 84 ont établi les conclusions suivantes: (a) *T. lativentre* était abondant dans les régions de l'est du pays où ses aires de distribution étaient vastes; (b) dans l'arrière pays, *T. lativentre* a détruit la majorité des bourgeons de fleurs et il n'y a eu aucun développement de graines; et (c) en bordure de la côte, certaines graines ont été produites, même dans les zones où les densités de charançons étaient fortes. L'introduction de *T. lativentre* et, au besoin, d'autres agents biologiques devrait permettre d'assurer une lutte biologique efficace contre *S. punicea* en Afrique du Sud.

Introduction

Sesbania punicea Benth. (Leguminosae) is a woody shrub that is native to Argentina, Uruguay and Brazil (Erb 1979). Approximately 25 years ago, *S. punicea* was introduced into South Africa, where it has since spread throughout the country, and has invaded disturbed areas and riverine habitats to the exclusion of indigenous vegetation. All parts of the plant, in particular seeds, have toxic properties that enhance its weed status. The spread of *S. punicea* has been greatly facilitated by its attractiveness as a garden plant and its efficient seed dispersal. Most pods drop from plants before releasing their seeds and, because plants often overhang flowing water (due to a high dependence on moisture for seed germination and growth), the buoyant pods are readily carried downstream for long distances.

Although *S. punicea* is widespread in South Africa and is still expanding its range, it has not yet achieved major economic importance. As a result, no herbicides have been registered for its control, and presently, the principal means of control is mechanical. This is only effective if the whole plant is uprooted and destroyed, making it very labour-intensive. These control limitations make *S. punicea* a particularly good candidate for biological control.

In 1982, four weevil species were collected in the Entre Rios Province of Argentina and imported into South Africa as potential biological control agents of *S. punicea*. They were the seed-feeder, *Rhyssomatus marginatus*, the stem-borer, *Diplogrammus quadrivittatus*, the root-feeder, *Eudiagogus episcopalis*, and the bud-feeder, *Trichapion lativentre*, which was subsequently found to be already well established in South Africa, over 1000 km from the quarantine facilities. The circumstances surrounding its introduction are obscure. Soon after its discovery in South Africa, surveys were conducted to determine the range over which *T. lativentre* had spread and to estimate the impact that the beetle was having on the reproductive potential of *S. punicea*. The results of these surveys are presented and discussed.

Biology of *T. lativentre*

Adults of *T. lativentre* feed on leaves of *S. punicea*, causing a shot-hole appearance of leaflets. Mating takes place soon after adult emergence and continues intermittently throughout the life of the adults (at least eight or nine months, since adults overwinter). Apparently, oviposition occurs whenever buds are available, although there appears to be a critical bud size of approximately 2 mm in length, below which the females will not oviposit. Larvae develop and pupate within the buds and adults emerge approximately 14 days after oviposition.

Sampling Methods

The impact of *T. lativentre* on the reproductive success of *S. punicea* was determined by measuring pod production by the plant in relation to density of adult weevils on plants at 11 different sites.

A box made from clear, expanded plastic, based on a design by Dempster (1961), was used to collect the weevils. The box is hexagonal in cross section (30 long \times 13 wide \times 11 cm deep). It is hinged along the longitudinal axis so that it can be opened into two halves and snapped shut around the branch to be sampled. Pyrethrum insecticide from an aerosol dispenser was sprayed into the chamber through a hole in one end of the box. This had a rapid 'knockdown' effect, and the dead beetles were then counted. Each sample collected the beetles that were present on the terminal 30 cm of the branch, corresponding to the length of the sampling device.

The number of pods and axils along the whole length of the sample branches were counted after the beetles had been removed. The number of pods/axil was then calculated to enable direct comparison of pod production on branches of different lengths. Any flower buds on these branches were collected and preserved for dissection, to determine the percent of buds in which oviposition had occurred.

Results and Discussion

Plants at three of the inland sites still had flower buds when first sampled in November 1983. Where beetle densities exceeded five adults/sample, almost 100% of the buds contained either eggs or larvae of *T. lativentre*. In terms of pod production

(Table 1), this meant that where the beetle densities had exceeded approximately two adults/sample, no pods were produced at the inland sites. However, at the coastal sites, pods developed on the plants even though beetle densities were higher than those at the inland sites.

The reasons for this difference are not clear but two possible explanations are: (1) the beetle numbers at the coast may have been much lower earlier in the summer when the plants were flowering and before any samples were taken; and (2) the earlier flowering season at the coast may have allowed pods to develop on the plants before the ovaries of the beetles matured following the winter dormancy.

To our knowledge, there is no record of a bud-feeding insect having yet been used for biological weed control (but see Naser 1985). Insects that reduce seed production are generally not considered to be successful control agents. A limitation often cited is that large seed banks in the soil may produce new plants for many years after the introduction of the agent. This should not be a problem with *S. punicea* because the seeds only remain viable in the soil for a maximum of two years (Graaff 1982). As a result, *T. lativentre* should have an immediate and lasting impact on the spread of *S. punicea*, providing the populations of the beetle remain at relatively high levels.

Table 1. *Sesbania punicea* Benth. pod production in relation to the density of adult *Trichapion lativentre*.

Location	Mean no.	No. pods/ ¹ 100 axils
	beetles/sample Nov. 1983	
Inland Sites	0.0	79
	1.0	31
	1.5	51
	3.8	0
	4.4	0
	5.8	1
	17.3	0
Coastal Sites	0.0	47
	2.4	30
	5.2	3
	46.8	23

¹ Inland sites - Jan. 1984; Coastal sites - Nov. 1983.

Further surveys are planned for the 1984-85 summer to establish the cause of the better performance of *T. lativentre* at the inland sites. If *T. lativentre* is still unable to check the spread and increase of the plant along the coast, its action will be augmented by the release of other seed-feeding insects, such as *R. marginatus*. The existing stands of *S. punicea* will hopefully also be reduced through the action of the stem-boring weevil, *D. quadrivittatus*. Specificity tests on *R. marginatus* and *D. quadrivittatus* have been completed and both insects should be cleared for release by October 1984.

The prospects are excellent that *S. punicea* will be brought under biological control by *T. lativentre* in the near future, and before the plant has realized its full potential as a weed.

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