

# Release strategies for the establishment of the leaf spot pathogen, *Mycovellosiella lantanae* var. *lantanae*, on *Lantana camara* in South Africa

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## Summary

*Lantana camara* is a poisonous shrub from South and Central America that has invaded much of the moist, warm subtropical areas of South Africa. In the past decade evidence of a conspicuous and damaging mycobiota on *L. camara* in the Neotropics has persuaded researchers to consider fungi as potential biocontrol agents for this plant. Preliminary pathogenicity testing of several fungi isolated from diseased *L. camara* leaves collected during field surveys in South, North and Central America from 1987 to 1997 showed the leaf spot fungus *Mycovellosiella lantanae* var. *lantanae* to be a promising biocontrol agent against *L. camara* biotypes in South Africa. Results from host-specificity tests indicated a very restricted host range, making this pathogen a suitable candidate for use as a classical biological control agent. Permission to release *M. lantanae* var. *lantanae* in South Africa was granted in September 2001. Release strategies include the use of a combination of isolates to target a wide range of *L. camara* biotypes in the field, and releases under different environmental conditions ranging from tropical and subtropical to mediterranean in the KwaZulu-Natal and the Eastern Cape provinces. The impact of the agent on the growth rates and fecundity of individual plants, and on populations over time, will be monitored.

**Keywords:** *Lantana camara*, *Mycovellosiella lantanae* var. *lantanae*, release strategies.

## Introduction

*Lantana camara* L. (lantana; Verbenaceae), originating from South and Central America (Holm *et al.* 1977), is a cosmopolitan weed in the tropical and subtropical regions of the world. In South Africa it is presently naturalised in the subtropical and temperate regions of the Northern, Gauteng, Mpumalanga and KwaZulu-Natal provinces, as well as the southern coastal regions of the Eastern and Western Cape provinces (Fig. 1) (Stirton 1977). *Lantana camara* is a poisonous, but highly decorative garden plant, ranging in size from a compact shrub (< 1m high) to an untidy scrambler (≥ 3 or more metres high). However, it reduces the biodiversity of natural ecosystems, interrupts the regeneration processes through allelopathic suppression of indige-

nous plant species (Gentle & Duggin 1997) and rapidly invades disturbed areas, including areas cleared of other invasive weeds.

Declared a weed in South Africa in the early 1940s, *L. camara* has been targeted for classical biological control in South Africa since the 1960s. Cilliers & Naser (1991) and Baars & Naser (1999) reviewed the biological control program initiatives undertaken on *L. camara* in South Africa covering the period 1960 to 1999. Despite these efforts, biological control of the weed has had limited success. One of the main reasons for this is the genetic diversity of *L. camara*, which presents the natural enemies with several morphological and physiological barriers to utilisation (Cilliers 1983, Cilliers & Naser 1991, Baars & Naser 1999).

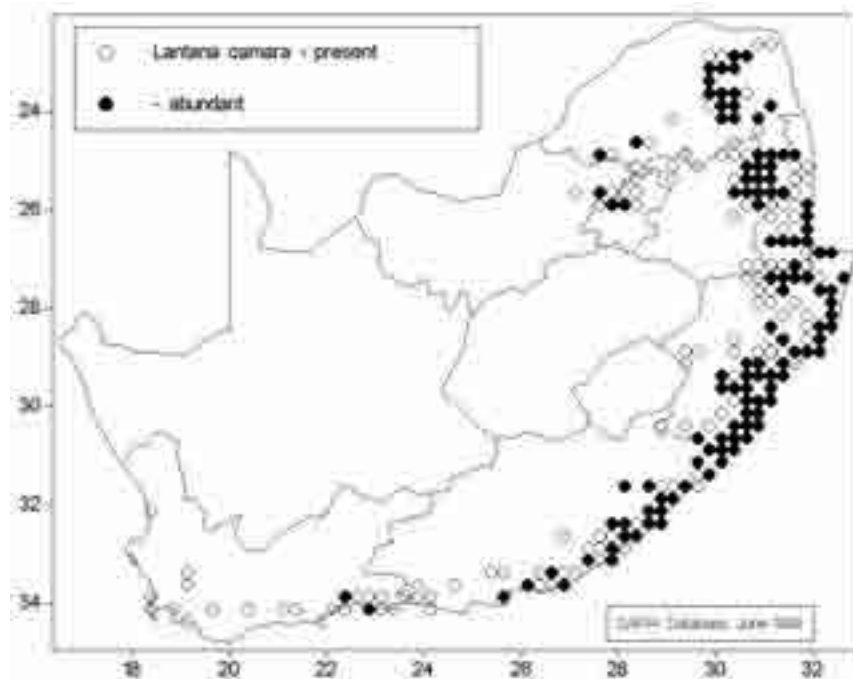
*Mycovellosiella lantanae* (Chupp) Deighton var. *lantanae* was selected as a potential biocontrol agent against *L. camara* in South Africa based on the research and field evidence of Evans (1987), Barretto *et al.*

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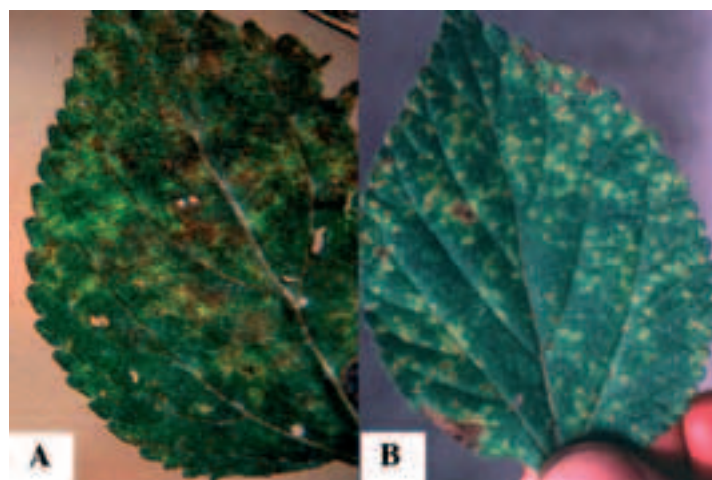
(1995) and M.J. Morris (pers. comm.). These authors undertook several field surveys to South, North and Central America from 1987 to 1997 to collect pathogens to test for potential as biocontrol agents on *L. camara* biotypes from South Africa (Fig. 2). Results indicated that *M. lantanae* var. *lantanae* was pathogenic on several South African *L. camara* biotypes and had a very restricted host range, making this pathogen a suitable candidate for use as a classical biological control agent (Den Breeÿen & Morris 2003). It is intended for release as a classical biocontrol agent because, according to Barretto *et al.* (1995) and the author's observations, all the isolates grow very slowly

and sporulate irregularly, making it unsuitable for mycoherbicide development.

Permission to release *M. lantanae* var. *lantanae* in South Africa was granted in September 2001. Releases were carried out in the KwaZulu-Natal (KZN) and Eastern Cape provinces. This paper reports on the release strategies for the establishment of *M. lantanae* var. *lantanae*. These include: i) the use of a combination of isolates in order to target a wide range of *L. camara* biotypes in the field; ii) two different inoculation methods, namely an oil-based spore suspension and an aqueous spore suspension; and iii) the initial monitoring of the first release sites in KZN.



**Figure 1.** Distribution of *Lantana camara* throughout South Africa (photograph courtesy of Lesley Henderson, SAPIA database)



**Figure 2.** Symptoms of *Mycovellosiella lantanae* var. *lantanae* on naturally infected *Lantana camara* in (A) South America and (B) Florida, USA.

## Materials and methods

Due to the variation in virulence of *M. lantanae* var. *lantanae* when tested for pathogenicity on South African *L. camara* biotypes (Den Breeÿen & Morris 2003), a combination of three isolates, C442, C470 and C493, was applied to target a wider range of biotypes in the field. Production of *M. lantanae* var. *lantanae* on a large scale was undertaken at the ARC-PPRI Vredenburg Production Laboratory in Stellenbosch. The three isolates were induced to sporulate on *L. camara* leaf decoction glucose agar (LDGA) plates by streaking the surface of these plates with mycelia from PDA slant cultures and incubating these at 19°C for 10 days under near UV and white light for 24 hours (Den Breeÿen & Morris 2003).

Six sites infested by *L. camara* were selected. These included sites in both coastal and inland areas. The fungus was released at these sites in December 2002. For the field releases, an aqueous spore suspension ( $2 \times 10^5$  spores/mL) and an oil-based spore suspension ( $1 \times 10^5$  spores/mL), was sprayed on 10 branches per treatment on successive plants at each of the sites. The release sites were monitored 12 weeks after release to assess establishment and local spread of the fungus. Inoculated *L. camara* branches, uninoculated branches within the same plant and *L. camara* plants within a 5–10 m radius were examined for symptoms of establishment. Where symptoms were found, samples of the diseased leaf material were collected. Leaves with typical *M. lantanae* var. *lantanae* lesions were incubated in dew chambers at 25°C for 24 hours and single-spore isolations were made.

## Results

Twelve weeks after its release, typical lesions were found on inoculated branches and neighbouring plants at three of the six release sites in KZN for both the oil-based and aqueous spore suspensions. At one site, infected plants were found up to 10 m away from the inoculated plants. Sites will be monitored again every three months for the first year post-release and then annually. *Mycovellosiella lantanae* var. *lantanae* was reisolated from symptomatic leaves and grew into characteristic colonies on PDA.

## Discussion

At three of the six release sites in KZN the fungus had established and caused secondary infections within 12 weeks. The three sites where no establishment was

recorded were sites further inland and at the time of release were undergoing a drought (i.e. no rain for up to 12 months). The best site was situated along the south coast of KZN. The impressive rate of spread at this site was probably due to the windy and humid conditions during the three months following the release. The fungus was released at a further seven sites in the Eastern Cape province and these will be monitored at the end of June 2003. While it is too soon to determine the likely impact of *M. lantanae* var. *lantanae* on weedy *L. camara* biotypes in South Africa, the results of monitoring of the first releases in KZN are promising.

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