The host range of *Tetranychus lintearius* (Acarina: Tetranychidae)

R.L. Hill* and D.J. O'Donnell*

*DSIR Plant Protection, Private Bag, Christchurch, New Zealand
*CABI Institute of Biological Control, Silwood Park, Ascot, SL5 7TA, UK

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ABSTRACT


The host range of *Tetranychus lintearius* was examined experimentally to determine if the mite could be safely introduced into New Zealand for the biological control of gorse, *Ulex europaeus* (Leguminosae: Genisteae). The rationale for choosing test plants was the same as that employed for testing insect species as biological control agents. Outdoors, mite colonies could be transferred successfully from gorse plant to gorse plant, but could not re-establish on any of 39 other plant species tested. In the laboratory, the ability of adult mites to settle on plants and to lay eggs, and for resulting progeny to develop, was measured on 58 plant species other than gorse. Apart from *Ulex europaeus* and *U. minor*, development was completed only on *Phaseolus vulgaris* and *Glycine max*. Further experiments using 22 bean cultivars showed that mites could not complete a second generation on detached leaf cultures, could not form permanent colonies on potted plants in the glasshouse, and remained only a short time when transferred to bean plants in the field.

*Tetranychus lintearius* has never been recorded from any plant but *Ulex* species. This fact, coupled with the results of host-range testing, suggests that the mite is sufficiently host-specific to be safely used as a biological control agent for gorse in New Zealand.

INTRODUCTION

Gorse, *Ulex europaeus* L. (Leguminosae: Genisteae) has become a serious weed in many countries including New Zealand, U.S.A., Chile and Australia. It is a tall thorny shrub which forms dense thickets on grazing land and forest plantations (MacCarter and Gaynor, 1980). Chemical control of gorse has become uneconomic in many instances, and so biological control is now being considered.

A survey of the phytophagous insects which attack gorse was carried out by Zwölfer (1963), who found that a mite, later identified as *Tetranychus telarius*, caused more damage than any other single species. He observed that this might be a race which fed only on gorse, and suggested that it be consid-
ered more closely as a potential biological control agent for this plant. Since then this mite has been restored to specific status as *T. lintearius* Dufour (Van Eyndhoven, 1967). It is morphologically distinct from closely related members of the *T. urticae* complex of species (Stone, 1982, 1986), and is reproductively isolated from at least two species of that complex (Hill and O'Donnell, 1991). *Tetranychus lintearius* also varies from other tetranychids in its colonial behaviour. Mites of all stages gather closely together in groups which can number many thousands inside a heavy communal web (Van Eyndhoven, 1967).

Tetranychid mites have never been introduced into any country for the purpose of weed control. Hill and Stone (1985) have suggested that the methods employed to test the suitability of insect species as biological control agents are valid for mites as well. This paper describes laboratory and field experiments to find the potential host-range of *T. lintearius* in order to determine its suitability as a biological control agent for gorse in New Zealand.

**MATERIALS AND METHODS**

Colonies of *T. lintearius* for these tests were obtained from Porthtowan, Cornwall and Chobham Common, Berkshire, Great Britain. The species of plants used in the tests which were chosen using the principles described by Wapshere (1974), are listed in Appendix I.

*A) Oviposition and survival tests on a range of plant species*

Three series of tests were carried out. The initial test (an establishment test) used either potted plants in field cages or mature plants growing in the field. Small portions of infested gorse shoots bearing at least 100 mites were tied onto the test plants with cotton thread. Colonies were also transferred into gorse plants as controls. Plants were examined every two days. A colony was judged to be dead when no living mites could be seen in or around the colony. Thirty-two plant species were tested.

Further tests were carried out in the laboratory. For test plants with large leaves, single leaves were placed dorsal-side-down on a large wad of wet cotton wool in a 10-cm diameter plastic dish with 5-cm-deep sides and perforated base. Dishes were placed in a tray of water to keep the cotton wool wet. Controls contained five small gorse spines with their bases pushed into the cotton wool. For plants with small leaves or woody stems, an 8-cm length of shoot was cut, inserted through a small hole in a sponge plastic stopper and into a small 5-cm-tall vial of water. Each shoot survived long enough to support one complete generation of the mite.

Oviposition and survival tests were carried out as follows. Ten mated adult female mites were placed on each leaf or stem. They were immediately trans-