NOTE

A METHOD FOR CULTURING *STETHORUS* SPP. (COLEOPTERA: COCCINELLIDAE) ON *TETRANYCHUS URTICAE* (KOCH) (ACARINA: TETRANYCHIDAE)

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Abstract

A method of culturing 3 *Stethorus* spp. on *Tetranychus urticae*, two spotted mite, is described. *T. urticae* raised on potted bean plants were removed from the leaves using a mite brushing machine and transferred to 2 litre plastic containers holding the *Stethorus* cultures. A 3 to 4 fold increase per month occurred at 16 to 23°C with the three species.

Introduction

The use of broad spectrum insecticides for control of codling moth, *C. pomonella* (L.), and other pests in commercial apple orchards can result in the elimination of predators of *Tetranychus urticae* (Koch), two spotted mite (Lloyd *et al* 1970, Readshaw 1971, Unwin 1972). This, along with the ability of *T. urticae* to develop resistance to various acaricides (Readshaw 1971, Unwin 1972) has lead to the build up of large populations in apple orchards. In the absence of broad spectrum insecticides Readshaw (1971) reported that Coccinelid beetles, *Stethorus* spp., were "the only predators of practical significance". At present, biological control of *T. urticae* is being investigated at Bathurst Agricultural Research Station, as part of an integrated control programme. Three species of *Stethorus* have been found: *S. loxtoni* Britton and Lee; *S. nigripes* Kapur and *S. vagans* (Blackburn).

Stethorus spp. have been reared on a range of mite species overseas. These include *Paratetranychus citri* (McGregor) (Fleschner 1950), *Tetranychus pacificus* (McGregor) (Scriven and Fleschner 1960) and *Panonychus ulmi* (Koch) (Colburn and Asquith 1971). The method described by Scriven and Fleschner (1960) to produce 20,000 *Stethorus* per month required complicated equipment.

The following method requires a limited amount of equipment. The technique has proved successful and has enabled toxicological investigations to be conducted with 26 chemicals against these important predators of *T. urticae*.

Methods

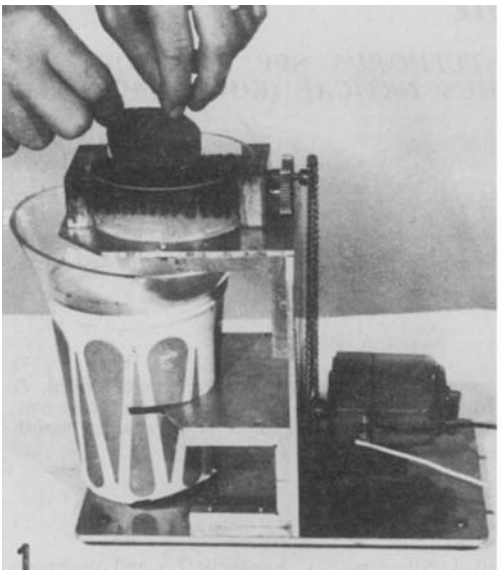
A regular and predictable supply of prey, in this case *T. urticae*, is necessary. Ten bean seeds, *Phaseolus vulgaris* (L.) variety Brown Beauty, were sown per week in each of 20 pots of soil to which a balanced fertiliser had been added. The pots were maintained in a glasshouse until the plants reached a height of approximately 30 cm. They were then moved to a constant temperature room at 25°C ± 3°C under constant illumination and 30 to 40% R.H. Leaves infested with *T. urticae* were placed on the new plants, whereupon the mobile stages of the mite transferred onto the fresher leaves. The wilted transferred leaves were removed after 24 h, leaving the mites to multiply on the fresh plants.

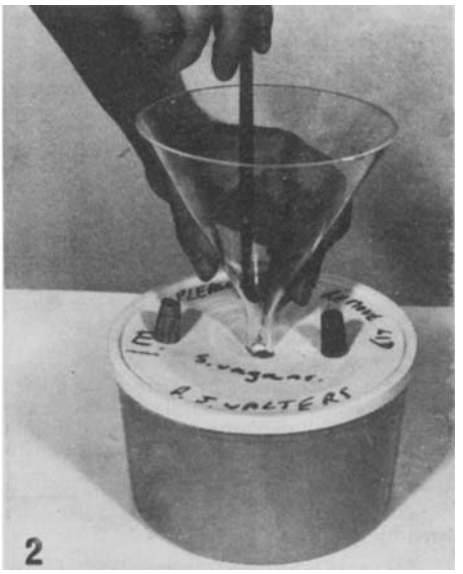
The 3 *Stethorus* spp. adults were collected at Bathurst, identified (Britton and Lee 1972) and segregated by species into three 2 litre plastic ice cream containers. Each container initially held 10 pairs of adults. The container lids were perforated for aeration, with holes small enough to prevent mites escaping, together with one larger rubber stoppered hole approximately 1 cm in diameter, through which prey was added.

A mite brushing machine (Henderson and McBurnie 1943) was constructed and operated without the sides and revolving plate (Fig. 1). All stages of *T. urticae* were brushed from infested leaves and collected in a stoppered glass funnel. From the funnel the mites were added to a *Stethorus* culture by inserting its neck into the aperture in the lid of the container and gently brushing the mites from the sides (Fig. 2).

Initially, 9 heavily infested bean leaves per container supplied enough prey to satisfy the predators, when fed each Monday, Wednesday and Friday. As predator numbers increased additional mites were needed and more leaves were required.

Bean leaves infested with mites should not be placed in the container. This was done initially to provide mite eggs and as reported by Putman (1955), *Stethorus* larvae were killed through the action of the hooked trichomes on the foliage, tearing the integument of the coccinellids. Adult longevity was shortened by laceration of the delicate membranes of the terminal abdominal segments when these were everted and pressed to the leaf surface as an adhesive organ and during defecation.





FIGS. 1, 2.—(1) Two spotted mite being brushed from bean leaves and collected in glass funnel. (2) Two-spotted mite being fed to culture of *Stethorus vagans*.

First instar larvae of *Stethorus* spp. feed mainly upon *T. urticae* eggs as they are initially incapable of overpowering nymphs and adults. Therefore the leaves must be brushed thoroughly to ensure a supply of mite eggs to the culture. Adult female mites survived for 4 to 5 days in the plastic containers and laid eggs in their webbing thus providing additional eggs for first instar *Stethorus*. The cultures were held at 16 to 23°C and under natural illumination. No fungal growth occurred if the containers were perfectly dry at the commencement of culturing and the humidity was not excessively high.

Stethorus should be transferred to clean containers every 4 to 6 weeks due to the accumulation of dead mites impairing their search for prey. *Stethorus* were found to be non-discriminatory in their selection of oviposition sites and eggs laid on the lids or close to the rim of the container were prone to damage when lids were removed for inspection of the cultures.

Results

At 24°C ± 0.5 C the number of days taken from egg to egg for *S. loxtoni* was 11 to 14, *S. nigripes* 13 to 16 and *S. vagans* 16 to 18. The time would be longer for the cultures as they were held at room temperature. In one, a container of 29 *S. vagans* adults on day 1 increased to 210 adults by day 43 when held at 20°C ± 3°C and 50 to 70% R.H. This represents approximately a 7 fold increase in 2 generations.

Laboratory observations (unpublished data) have revealed that adult female *Stethorus* spp., given an excess of mites, lay an average of 5 to 8 eggs per day. However, only a 3 to 4 fold increase was obtained per generation due probably to the high mortality of first instar larvae and possibly some cannibalism.

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