The Accidental Introduction of the *Chromolaena* Mite, *Acalitus adoratus*, Into South-East Asia

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The very host-specific eriophyid mite *Acalitus adoratus* occurs in the Neotropics on its host plant *Chromolaena (Eupatorium) odorata*. No deliberate introductions of this mite have been made in south-east Asia where the weed is a major problem, but *A. odoratus* is now widespread on *C. odorata* from northern Thailand to Indonesia, the Philippines and the Caroline Islands. It is suggested that *A. odoratus* was accidentally introduced when field-collected adults of the seed-feeding weevil *Apion brunneonigrum* were released in Sabah in the 1970s and has since spread naturally. This accidental introduction has been beneficial, but illustrates the dangers of direct field-releases of non-quarantine material.

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**Introduction**

The eriophyid mite *Acalitus adoratus* Keifer was first collected from *Chromolaena (Eupatorium) odorata* (L.) King & Robinson (Asteraceae) (Acari: Eriophyidae) in Trinidad in 1968, and described from these specimens (Keifer 1970). The specific name *odoratus* derives from a misreading of the specific name of the plant on the hand-written specimen label. *A. odoratus* has also been found on *C. odorata* in Florida and is probably widespread in the native range of *C. odorata* in the Neotropics.

The mite causes abnormal growth of the epidermal hairs on young leaves and stems. The resulting tangled masses of thickened and deformed hairs are called “erineum patches” and are visible without magnification as whitish patches 1-4 mm in dia, usually on the leaf underside and often accompanied by a convexity of the upper leaf surface. The mites, 0.14-0.18 mm long, live within the erineum patches protected by the abnormally dense hair growth. The damage caused to the plant is usually slight, but heavy attack can cause deformation and stunting of both leaves and stems (Cruttwell 1977).

Gall-forming eriophyid mites are usually extremely host-specific. *A. odoratus* was host-tested against a number of plants closely related to *Chromolaena*, and its introduction into south-east Asia and Africa was recommended as a biological control agent against *C. odorata* (Cruttwell 1977, Cock 1984). However, no deliberate releases have ever been made.

**Discovery of *A. odoratus* in South-east Asia**

The presence of a mite causing erineum patches on *Chromolaena* in south-east Asia was first noted in the Philippines in 1987 and reported at the 1st International Workshop on the Biological Control of Chromolaena, held in Bangkok, Thailand in March 1988 (Aterrado, personal communication, 1988). At the same Workshop, the mite was observed on *C. odorata* growing in the Khao Yai National Park north-east of Bangkok. Specimens from Malaysia and Indonesia were then sent to Dr Don Macfarlane at the CAB International Institute of Entomology who identified them as *A. odoratus*.

Dr Banpot Napompheth has confirmed that the mite has only recently arrived in Thailand, where it was definitely absent in 1974 when a survey of insects on *Chromolaena* was made, was first seen in the south in 1984, and is now moving progressively north (B. Napompheth, personal communication, 1991). In the Philippines, the mite occurs throughout the country and has probably been present for
some years (D. Torres, personal communication, 1991). The mite arrived in Yap in the Caroline Islands in 1988, almost certainly from the Philippines as it was not then present in the main island of Palau (Muniappan et al. 1988). Acalitus is widespread in Java and Sumatra; there is no information from the other Indonesian islands (R. Desmier de Chenon, personal communication, 1991). It is definitely not present in India (Muniappan and Viraktamath, 1986) but was present in Hainan in southern China in 1991 (P. Ooi, personal communication, 1991).

Mode of Introduction

As this mite is both specific to C. odorata and unable to survive away from the plant, the question arises of how did it travel from the Americas to south-east Asia. The most probable explanation is that it was accidentally introduced with the seed-feeding weevil Apion brunneonigrum Béguin-Billecoq (Coleoptera: Curculionidae) when this was sent from Trinidad in the 1970s.

The other insect released on C. odorata, Pareuchaetes pseudomuflata Rego Barros (Lepidoptera: Arctiidae), was sent to India, Sri Lanka and Sabah, Malaysia between 1970 and 1976, but only eggs were sent from Trinidad and these were never directly field-released. All releases consisted of insects reared in the laboratory after importation. A. brunneonigrum on the other hand, is difficult to rear as it only has a single generation/yr (Cruttwell 1973), and therefore field-collected adults from Trinidad were shipped to south-east Asia for direct field release. The adult weevils were packed with fresh shoots of C. odorata as food material, and it is likely that A. adoratus was present on some of these shoots, as the mite was common on plants in the grounds of the laboratory in Trinidad at the time. As the plant material dried out or rotted during the 5-12 d journey (Syed 1977), it is likely that the adult mites left the erineum patches and crawled onto the bodies of the weevils. This phoretic behaviour may be one of their normal methods of distribution from plant to plant. In Sabah, the beetles were directly field-released onto young flower buds, and the accompanying plant material was destroyed, but mites on the bodies of the weevils could have transferred onto young stems and leaf buds to establish a new colony.

Releases of A. brunneonigrum were made in Sabah in 1970, 1971 and 1972 (Syed 1977), in Sri Lanka in 1975, and in Ghana and Nigeria in 1971, 1972, 1974 and 1975 (CAB-CIBC Annual Reports 1970-1975). A. brunneonigrum was received by India but never released. As the mite is not present in West Africa or Sri Lanka, establishment cannot have occurred from these releases. It is therefore probable that the initial establishment occurred in Sabah from one of the six releases made between December 1970 and February 1972 (Syed 1977).

Once established in Sabah, the mite would have spread southward through Borneo and thence to Java, eastwards to the Philippines, and west into Peninsular Malaysia and thence north to Thailand (Fig. 1). This pattern is at least consistent with the scanty data available on its arrival in the different countries.

Discussion

It is not known why A. adoratus established in Sabah but not in Sri Lanka or West Africa, although A. brunneonigrum adults from Trinidad were released in all three places. In Sri Lanka, it is possible that none of the Trinidad material was directly released, but rather was kept for additional host-specificity tests. In West Africa, it is certain that direct field releases were made (CAB-CIBC Annual Reports, 1971-5), but presumably none of the shipments were contaminated with the mite. Indeed, it is possible that only 1 of the 7 shipments released in Sabah (Syed 1977) was thus contaminated.

Phoretic behaviour by mites is a well known phenomenon (e.g., Houck and O’Connor 1991), but has not been specifically recorded in the eriophyds. It seems unlikely that these delicate soft-bodied mites frequently abandon the protection of their erineum patches to "hitch a ride" on plant-feeding beetles, yet the speed with which A. adoratus has spread from Sabah across the sea to the Philippines and the Caroline Islands (Fig. 1), as well as to Sumatra and Java, suggests that they may be better able to survive away from their host than previously thought. Alternatively, the mite may be
Figure 1. Spread of Acalitus adoratus on Chromolaena in South-East Asia.

dispersed on leaves and shoots of C. odorata, which are used by inter-island traders in Malaysia, Indonesia and the Philippines as packing material around fruit and other produce packed into wicker baskets (P. Ooi, personal communication, 1991). C. odorata leaves are used because the plant is common in the villages and has no other value. The leaves are discarded when the produce is unpacked at its destination, thus providing an effective dispersal method for this mite, or any other insects or diseases on the plant.

Another similar example of the accidental but beneficial introduction of a host-specific agent was the fungus Cercospora eupatorii Peck on the weed Ageratina (Eupatorium) adenophora (Sprengel) King & Robinson (Asteraceae) in Australia in the 1950s. Spores of the fungus were almost certainly carried on the bodies of the stem-galling tephritid Procecidochares utilis Stone (Diptera: Tephritidae), the adults of which
were field-collected in Hawaii, where C. eupatorii already occurred, and released directly onto the weed in Australia. C. eupatorii was first noticed 2 yrs later at the original tephritid release site (Dodd 1961) and it seems certain that it was introduced with the flies.

Like C. eupatorii, A. adoratus is host-specific and its presence in south-east Asia and the Pacific islands is of benefit, but this confirms yet again the need for the utmost care when undertaking direct field releases of imported insects. If direct field releases are unavoidable, the insects must be reared in quarantine conditions in the country of origin or in a third-country quarantine, so that any fellow-travelers can be eliminated first.

References


