

choice of insects for biological weed control.

There would appear to be excellent prospects of finding new, potentially useful *lantana* insects in areas hitherto little investigated. In this regard it has been said that the surface has been scarcely scratched. So far exploratory work has been confined mainly to Mexico and Central America, and south-eastern Brazil is thought to be a likely base for future exploration. In general, the prospects of controlling *lantana* by introduced insects are encouraging, and adequate strategic efforts should be directed to this end.

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BIOLOGICAL FACTORS AFFECTING CROFTON WEED IN QUEENSLAND

Crofton weed (*Eupatorium adenophorum* Spreng.) was probably introduced to Australia prior to 1920 as an ornamental plant, although the first record in Queensland was in 1930; the first record as a weed was in 1938. Shortly after 1949 the population of the weed 'exploded' and large areas of high-quality mountain pasture in the south-east corner of Queensland were overrun. Because of the potential danger to other high-rainfall areas of Queensland, and because of the plant's high resistance to herbicides, a stem-gall-forming fly (*Procecidochares utilis* Stone) was introduced in 1953 from Hawaii; this fly had been shown to attack only *E. adenophorum*. The fly became established immediately, and, with three small exceptions, dispersal soon became complete.

In 1954 a fungous disease (*Cercospora eupatorii* K.) was collected from several points where *P. utilis* had been liberated, and it seems likely that this American disease, which is present in Hawaii, was accidentally introduced as spores with the gall-fly. The disease, which is normally disseminated by wind-borne spores, dispersed quickly and is now found wherever Crofton weed occurs.

A third factor which first became evident in 1950 is *Dihammus argentatus* Aurio., a crown-boring beetle native to Australia. This insect is present in all areas infested with Crofton weed.

These three factors act on the plant in different ways and can be considered separately. The presence of the fly larvae causes galls to form on the stems and this prevents, temporarily at least, the translocation of nutrients in these stems. The effects of galls present at one time are cumulative, but it has been found that even the maximum fly population present at any time in Queensland is not sufficient to kill the plant. However,

there is a continuous, though fluctuating, population of galls and a degree of plant suppression is certain.

The fungus acts on the plant in two ways - by reducing the leaf area to the point of defoliation on established plants and by killing seedlings by defoliation.

Damage by the crown-borer is confined to the basal part of the stems where conducting tissue is reduced, major roots killed, and stems structurally weakened.

None of these organisms alone could offer much suppressing effect on Crofton weed, but it is considered that the three acting together have reduced the vitality of the plant in all but the most favoured localities, and have limited its powers of dispersal. No new major infestations of Crofton weed have been found since 1952 and many dense infestations have been reduced in area by the landholders - a project considered almost impossible 15 years ago. However, local spread of Crofton weed is still occurring in shaded, wet areas of Springbrook, and in surrounding valleys.

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INSECT INTRODUCTIONS FOR THE CONTROL OF NOOGOORA BURR

The country of origin of Noogoora burr (*Xanthium pungens* Wallr.) is disputed by authorities, both the Near East of Asia and the Americas being favoured; consequently, search for enemies of this plant for introduction to this country has been in both these areas.

It is unfortunate that most of the insects found to date on *Xanthium* are not restricted in their feeding to this plant, the only exception being *Euaresta aequalis* Loew., a seed fly, which was introduced to Queensland in 1932 and which, although it has remained established around Brisbane since that time, has offered no control of the weed.

A new series of investigations was initiated in 1957 by the Queensland Department of Lands and CSIRO, and two beetles, *Mecas saturnina* Le C. from North America and *Nupserha antennata* Gahan from India, were introduced. These beetles were host-tested against a wide range of plants and, although their attack was not confined to *Xanthium*, it was confined to a few related genera of the family Compositae. Because of the dearth of insects available, and because, although a risk of attack on other plants existed, field records from America and India did not include economic plants, permission to import both of these insects for experimental liberation was granted by the Commonwealth Department of Health.