

## Distribution and Control of *Chromolaena odorata* (Asteraceae)

R. MUNIAPPAN AND M. MARUTANI

Agricultural Experiment Station  
College of Agriculture and Life Sciences  
University of Guam, Mangilao, Guam U.S.A. 96923

**Abstract**—*Chromolaena odorata* (L.) King and Robinson is a neotropical weed, spread all over the humid tropical regions of Asia, Africa and Micronesia. This paper reviews mechanical, cultural, chemical and biological control methods against this weed. Of these methods, biological control either alone or in combination with others seems to be the most promising one to suppress this weed.

### Introduction

*Chromolaena odorata* (L.) R. M. King and H. Robinson (Siam weed) is a neotropical weed. It is a perennial shrub with allelopathic properties (Ambika & Jayachandra 1980). The weed is widely distributed in the tropical and subtropical Americas from southern Florida to southern Bolivia (Cruttwell McFadyen 1989). The spread of this weed to Asia, Africa, and Micronesia has been reported by Biswas (1934), Bennett & Rao (1968), Ivens (1974), Muniappan & Marutani (1988), and Cruttwell McFadyen (1989). The importance of *C. odorata* as a weed in various agricultural fields has been reviewed by Holm et al. (1977) and Ambika & Jayachandra (1990).

*C. odorata* was introduced to Guam in early 1960's (Seibert 1989), and it has also established on the neighboring islands of Rota, Tinian, Aguijan, and Saipan in the Northern Mariana Islands. This noxious weed has become a problem on rangelands, roadsides and waste lands since early 1980's on these islands. It has also spread to Caroline islands: Yap and Palau (Muniappan et al. 1988) and Pohnpei and Kosrae in the late 1980's. The migration and spread of *C. odorata* in Micronesia has been steady and fast. Cruttwell McFadyen (1989) has warned of the possibility of introduction of this weed into Australia from Asia in the near future. There is also the possibility of *C. odorata* spreading to the South Pacific Islands from Micronesia and Asia.

### Mechanical Control

Manual slashing and use of motorized bushcutters and tractor drawn equipment are commonly used for clearing *C. odorata*. Olaoye (1977) found slashing to cause rapid regeneration even though repeated slashings eventually caused the death of this weed. Ojuederie et al. (1983) reported slashing of *C. odorata* 1.5 m

diameter around the coconut trees to increase the yield. Manual weeding is mostly done in places where cheap and plentiful labor is available. Use of motorized bushcutters and tractor drawn equipment is also limited because of the restricted accessibility of areas where this weed is growing (Erasmus 1988). Slashing and burning are carried out in some places. Top portions of *C. odorata* burn readily during the dry seasons, while bases of the plants are resistant to fire, and they coppice immediately after rains. Seeds also germinate well after a fire (Liggitt 1983).

### Cultural Control

Cover crops such as *Pueraria javanica*, *Pueraria phaseoloides*, *Calopogonium caeruleum*, *Desmodium ovalifolium* and *Moghania macrophylla* have been tried for suppression of *C. odorata* and found to be not effective (Ambika & Jayachandra 1990). However, Salgado (1972) reported that *Tephrosia purpurea* grown as a cover crop in coconut plantations was effective in suppressing *C. odorata* in Sri Lanka. In tropical southern China, kikuyu grass (*Pennisetum clandestinum*) and Surinam grass (*Brachiaria decumbens*) are grown as pasture crops to suppress the growth of this weed (Wu Renrun, pers. comm.).

### Chemical Control

In India, Nair (1973) reported that Gramoxone at 0.3% of the concentration was not effective in controlling this weed, however, Rai (1976) found that Gramoxone in combination with 2,4-D sodium salt was effective. Mathew et al. (1977) recommended a combination of 1.5 liters of Gramoxone and 0.75 kg Fernonoxone for control of this weed. Tumaliuan & Halos (1979) also reported that Gramoxone was effective in control of this weed in the Philippines.

Soerjani et al. (1975) found that Picloram was effective for control of *C. odorata* in Indonesia. Madrid (1974) reported that Picloram at 1 kg/ha and Dicamba at 2 kg/ha as the recommended rate to control the weed.

Erasmus (1988) and Liggitt (1983) reviewed chemical control of *C. odorata* in Africa. In general, timing of herbicide application was important in control of *C. odorata*. Plants were most susceptible when herbicides were applied at the young seedling stage or to the regrowth after slashing.

### Biological Control

Since *C. odorata* is an exotic plant and has become a serious weed in Asia, Africa and Micronesia, it is a good target for a classical biological control program. In 1966, the Nigerian Institute for Oil Palm Research requested the Commonwealth Institute of Biological Control (CIBC) to investigate the natural enemies of *C. odorata*. As an outcome of this investigation, several insects and mites were identified attacking *C. odorata* (Crutwell 1974). *Pareuchaetes pseudoinsulata* Rego Barros (Lepidoptera:Arctiidae) was introduced to Ghana, Nigeria, India, Sri

Lanka and Sabah (Malaysia) by the CIBC in the early 1970's (Julien 1987). The occurrence of *P. pseudoinsulata* in the Palawan Island of the Philippines was noted in 1985 (Torres 1986, Alterrado 1986) even though it was not introduced to the Philippines. Possibly, it was accidentally introduced from Sabah to the Palawan island. Since then, it has spread to Mindanao and Vasayas islands.

*P. pseudoinsulata* was introduced and established on Guam in 1985 (Seibert 1989) and subsequently in Rota, Tinian, Saipan and Aguijan islands in the Marianas. Laboratory rearing and field release of the insect are in progress in Yap, Palau, and Pohnpei and shortly to be taken up in Kosrae. *P. pseudoinsulata* cultures have been shipped from Guam to South Africa, Thailand and Ghana for multiplication and field release.

The seed feeding weevil, *Apion brunneonigrum* Beguin-Billecoq (Coleoptera:Curculionidae), has been related in India, Sabah, Sri Lanka, Ghana, Nigeria (Julien 1987) and Guam (Seibert 1989). No recoveries of this weevil have been made in these countries.

*Acalitus adoratus* Keifer (Acarinae:Eriophyidae) has been identified as one of the natural enemies of *C. odorata* in the neotropics and recommended as a biological control agent (Cruttwell 1977, Cock 1984). *A. adoratus* has been observed in Thailand even though it was not introduced for biological control (Napompeth et al. 1988). Similarly, Muniappan et al. (1988) observed this mite in Palau and Yap in Micronesia.

The larva of *Mescinia* sp. near *parvula* Zeller (Lepidoptera:Pyrilidae) bores into the stem of *C. odorata* (Cruttwell 1977, Cock 1984). A few moths of this species were released in Guam in 1985 (Seibert 1989). *Melanagromyza eupatoriella* (Diptera:Agromyzidae) was also identified as a natural enemy of *C. odorata* in the neotropics (Cruttwell 1974). Efforts to introduce *M. eupatoriella* into Guam were discontinued in 1987 as there was the high incidence of parasitism in Trinidad where the collections were made by CIBC.

The Institute de Recherche Pour les Huiles et Oleagineux (IRHO) in cooperation with CIBC is undertaking investigations for further exploration of natural enemies of *C. odorata* in the neotropics for eventual field release of suitable candidates in West Africa. The government of South Africa is also investigating in South America for promising natural enemies to be released in the Natal region.

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