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Plant Protection Service
Secretariat of the Pacific Community

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Chromolaena (Siam) Weed

Chromolaena odorata (L.) R.M. King and H. Robinson is one of the world's worst tropical weeds (Holm et al 1979). It is a member of the tribe Eupatorieae in the sunflower family Asteraceae. The weed goes by many common names including Siam weed, devil weed, bizat, tawbizat (Burma), tontrem khet (Cambodia), French weed (Laos), pokpok tjerman (Malaysia), communist weed (West Africa), triffid bush (South Africa), Christmas bush (Caribbean), hagonoy (Philippines), co hoy (Vietnam). In October 2000 'chromolaena' was adopted as the standard common name by the International Chromolaena Working Group[1].

DISTRIBUTION

The native range of chromolaena is in the Americas, extending from Florida (USA) to northern Argentina. Away from its native range, chromolaena is an important weed in tropical and subtropical areas extending from west, central and southern Africa to India, Sri Lanka, Bangladesh, Laos, Cambodia, Thailand, southern China, Taiwan, Indonesia, Timor, Papua New Guinea (PNG), Guam, the Commonwealth of the Northern Mariana Islands (CNMI), Federated States of Micronesia (FSM), and Majuro in the Marshall Islands.The Majuro outbreak is being targeted for eradication. An outbreak found in northeastern Australia during the mid 1990s is also being eradicated.

Chromolaena is absent from Vanuatu, Solomon Islands, Fiji Islands, New Caledonia, all Polynesian countries and territories including Hawaii, and New Zealand.

DESCRIPTION, BIOLOGY AND ECOLOGY

Chromolaena is a much-branched perennial shrub that forms dense tangled bushes 1.5–3 m in height in open conditions (Fig. 1), and occasionally reaching 6–10 m by scrambling up other taller vegetation. The stems are circular, hairy or almost smooth and much branched. The leaves are opposite, triangular shaped, young ones slightly reddish purple, have toothed margins, with three main veins, and give off a pungent odour when crushed. The flowers are pale blue to white (Fig. 2a). Seeds are borne in the composite flower heads (Fig. 2b). The individual seed is about 5 mm long, with a pappus with angled hooks to aid seed dispersal.

Figure 1: Mature chromolaena can grow up to 3 m in open space (above). Regrowth from stump (below).

Chromolaena favours a wet–dry seasonal climate, grows well in well-drained open areas and can tolerate all soil types and altitudes up to 1200 m above sea level. Chromolaena flowers once a year, May to August south of

[1] International Chromolaena Working Group of the International Organisation of Biological Control

the Equator and October to April north of the Equator. It produces massive amounts of seeds: 93,000 to 1,600,000 viable seeds per plant (Blackmore 1998). The seeds germinate during the rainy season. The lightweight, parachutal structure of mature seeds (Fig. 2b) can be wind blown and spread over short distances. It can spread over long distances by attaching to clothing, vehicles, road works and farm machinery, seed contaminants, etc. Seed longevity can be up to 4 years.

Under favourable conditions, single seeds can quickly give rise to infestations, which may spread further and become difficult to manage if unnoticed. Once established, chromolaena is difficult to eradicate because of the large number of seeds, rootstocks that regrow and the difficulty of finding isolated plants, some of which can grow in inaccessible places like steep cliff faces.

Figure 2: (a)Chromolaena flowers and buds (above). (b) Many mature seeds are produced per flower head and the parachutal seeds (insert) can be dispersed by various means including wind, people, water and vehicles *(Photos by W. Orapa, insert adapted from Soerjani et al. 1987)*

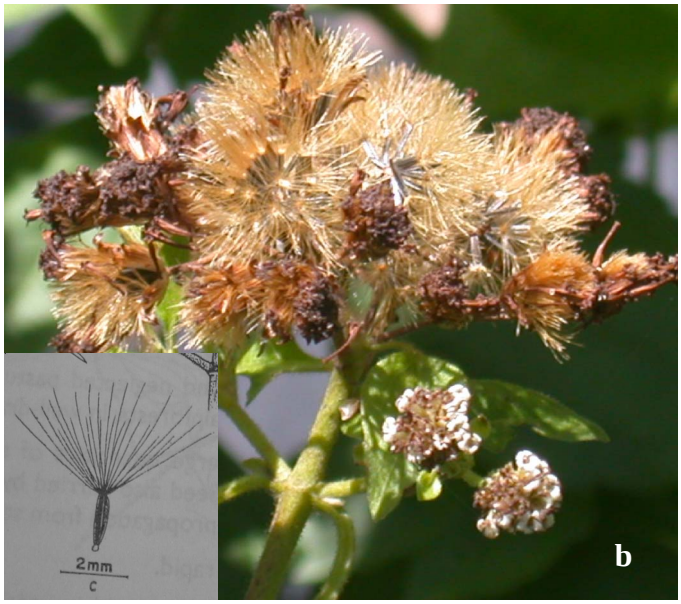

Figure 3: (a) Chromolaena infested paddock (above), and (b) burnt chromolaena (below). After flowering chromolaena becomes a fire hazard. (*Photos by W. Orapa*)

SIGNIFICANCE

In its native range Chromolaena is not a weed so no control is required (McFadyen 1991). In contrast, it is a serious weed in many of the countries where it has been introduced: Africa, South and Southeast Asia. It is increasingly becoming important in the western Pacific region. It has the potential to expand its range further into the small central and southern Pacific countries and territories if not prevented.

Chromolaena can grow rapidly and form infestations that can affect agriculture, pastures and biodiversity, as chromolaena interferes with the functions of natural ecosystems. It can be very invasive, forming impenetrable thickets in open areas such as pastures and around villages and settlements, along roadsides, fallow areas, and disturbed forests. It can suppress crops and other plants by competing for nutrients and water, over-shading and allelopathy (releasing growth-inhibitors). Chromolaena leaves, especially the young ones, are toxic due to high levels of nitrate. Thus grazing animals avoid it; if forced to feed animals can develop liver sclerosis and even die.

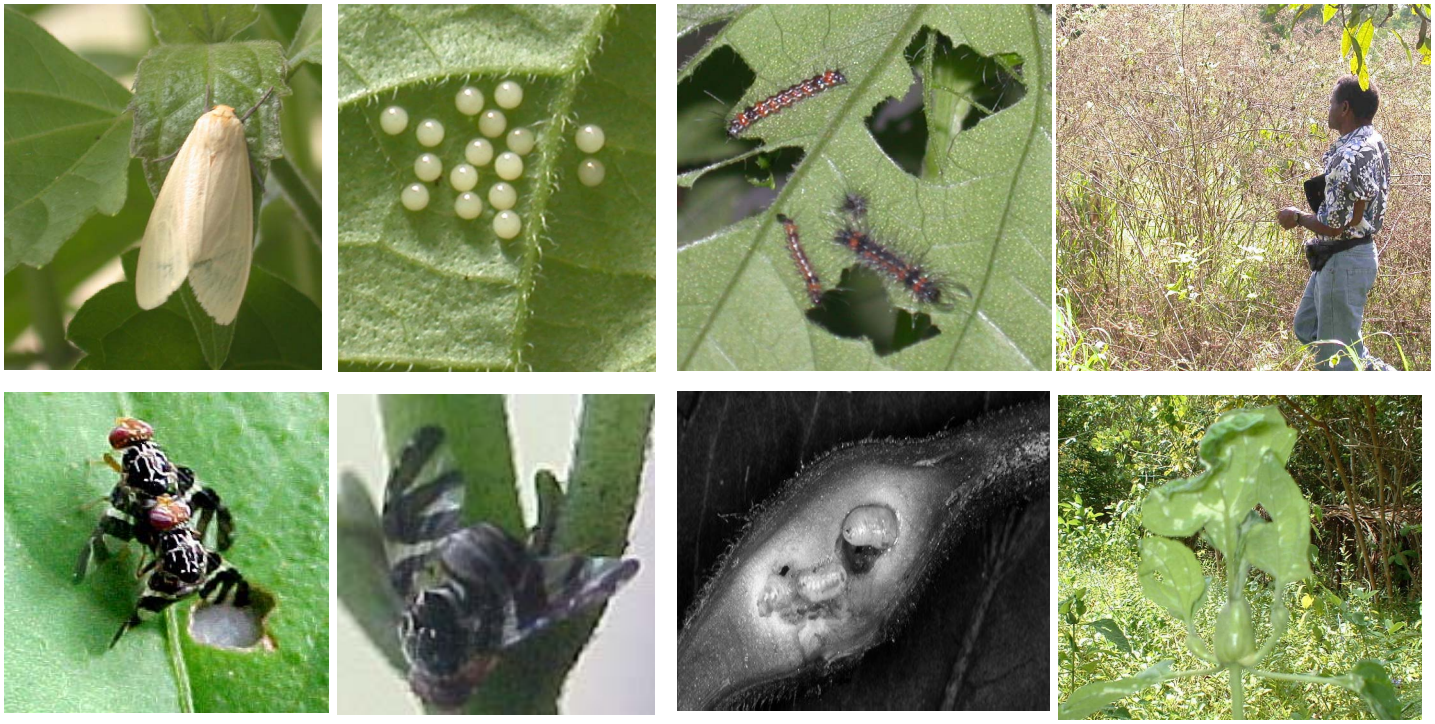

Figure 4: Biocontrol agents at work. (*Top left to right)*: Leaf feeding moth *P. pseudoinsulata* adult moth, egg cluster, 2nd instar larvae feeding, and defoliated chromolaena stand. (*Bottom left to right)*: Stem galling fly *C. connexa* mating adults, adult female ovipositing eggs in axillary buds, galls cut open to show maggots and young chromolaena plant stunted by gall formation. (*Photos by W. Orapa*)

In seasonally dry areas, chromolaena can fuel hot bushfires after it dies back following flowering and seeding (Fig 3). This can lead to the death of other native flora and fauna. Homes and other property close to infestations can be at risk from such fires.

In addition, chromolaena can harbour pests such as locusts, rats, wild pigs and crop diseases. In West Africa the spread and increase of chromolaena resulted in the increase of the pest grasshopper *Zonocerus variegates* due to ingested alkaloids that protected the grasshoppers and their eggs from other natural predators and parasitoids (Boppré 1991).

MANAGEMENT

The ideal strategy is **prevention**. Pacific islands are fortunate as great sea distances prevent the free dispersal of weeds like chromolaena. Movement of seeds may occur due to increasing trade, travel and accidental introductions from countries or islands with the chromolaena problem. Looking out for possible unwanted movement of seeds or arrival of chromolaena at borders should be everyone's responsibility. Any occurrence of chromolaena or similar looking plants should be reported immediately to local quarantine authorities. Early detection means eradication can be possible.

Mechanical and cultural control

Hand weeding, slashing, digging and uprooting of young plants can suppress chromolaena. Brush cutters, lawn mowers, tillers, ploughs and other tractor-drawn equipment can be used. Slashing and burning reduces the standing biomass but regrowth will occur from rootstocks, usually more profusely. Mechanical control provides short-term control but can be effective if infestations are small and accessible. Applying mulch, planting cover crops such as desirable pasture grasses and legumes, or shading out with canopy forming crops has shown success in reducing chromolaena.

Chemical control. Triclopyr is suitable at early seedling or regrowth stage. A combination of 2,4-D amine and picloram can be effective in killing the above-ground parts as well as the underground parts. Herbicides are effective but pose some personal and environmental risks and are expensive over large areas. However, use of herbicides is encouraged when the purpose is to eradicate new outbreaks of the weed or when control of chromolaena is necessary in cropping or grazing situations.

Biological control. Several natural enemies of chromolaena are known from the native range. Only the moth *Pareuchaetes pseudoinsulata* Rego Baros (Lepidoptera: Arctiidae) (Fig. 4) has been released widely. *P. pseudoinsulata* larvae feed on the leaves of chromolaena. Under high densities and suitable environmental conditions, defoliation by this insect can suppress chromolaena. The moth has established and given good control in Ghana, Sri Lanka, Indonesia (North Sumatra, Kalimantan and Sulawesi) and partial control in India, Malaysia and eastern Indonesia (Julien and Griffiths 1998). In the Pacific the moth is established and giving some control in CNMI, Palau, Guam, FSM and isolated pockets at one site in PNG.

A second biological control agent, the stem-galling fly *Cecidochares connexa* Macquart (Diptera: Tephritidae),

has also been released and established in Indonesia, PNG, FSM, Palau, Guam and CNMI. Adults lay eggs in soft apical parts of the plant, and the feeding and development of the larvae induces the formation of galls on the stems and branches. Gall formation stunts plant growth, reduces seed production and under heavy attack kills whole plants (see Fig 4).

Results from countries where both the moth and the gallfly have been released and established have been mixed. *C. connexa* is spreading in Indonesia (C. Wilson, pers. comm.) and PNG (Orapa et al. 2002) and appears to be a more promising biocontrol than the moth.

Additional natural enemies of chromolaena tested and found to be host-specific in recent studies include two butterflies, *Actinotes anteas* and *A. thyla pyrrha*, the tiny leaf-mining fly *Calycomyza eupatorivora* and the stem-feeding beetle *Lixus aemulus*. Research on these agents and others has been conducted in South Africa by the South African Plant Protection Research Institute. Biocontrol agents found to prefer chromolaena should be considered for introduction, further testing and release in the Pacific countries with chromolaena, if suitable.

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