CHROMOLAENA
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Fifth International Workshop

on Biological Control and Management of *Chromolaena odorata*

October 23 - 25, 2000

Durban, South Africa

SUMMARY

SESSION 1
Country and Regional Reports

Chairperson – J. A. TIMBILLA

There were 5 presentations on country and regional reports.

R. E. Cruttwell McFadyen presented the first report entitled "An Overview of *Chromolaena odorata* in Asia and the Pacific". She touched on the history, spread, methods of control, future prospects and problems of *C. odorata*. She intimated that there is a new infestation of *C. odorata* in Tully (Australia). Among methods of spreading of seeds of *C. odorata* are the movement of military vehicles (up to 1/2 kg of seeds were found in one vehicle). Funding for the present project will end in 2001.

The second presentation was by Graham Donnelly on the distribution of *C. odorata*, in Papua New Guinea. He showed slides on infested provinces and talked about the origin of the outbreak and dispersal of *C. odorata*. As part of an extension program they have put in place displays on weed awareness. Logging activities, construction of new roads and mining were some of the factors leading to the spread of *C. odorata*.

Jesse Bamba talked about the distribution of chromolaena in Micronesia. *Pareuchaetes pseudoinsulata* has established and effected control in Guam. *P. pseudoinsulata* has also established in Kosrae, Pohnpei, and Yap, but not in Palau. *Apion brunneonigrum* did not establish in Guam. Currently, *Cecidochares connexa** has established in Palau and it is being reared in the quarantine laboratory in Guam.

Azmi Bin Man said that in Malaysia, nine major crops are of economic importance. *C. odorata*, also known as aeroplane plant, depresses the growth of rubber. The weed, however, has uses as a green manure crop, helps reduce nematode populations in the soil while also having medicinal uses. These notwithstanding, farmers abandon coconut farms because of dense thickets of *C. odorata*. At the moment control of chromolaena is by the use of herbicides and manual weeding. Very little research has been done on the ecology and biological control in Malaysia.

The session ended with a presentation by Barbara Waterhouse titled "On the brink: the status of *C. odorata* in northern Australia". She stated that the Tully District of North Queensland, Australia has scattered infestations of *C. odorata*. Australia wants to eradicate chromolaena and prevent invasion, however biocontrol may be implemented if methods planned for eradication of the weed fails.

* *Cecidocares connexa* has been referred to as *Procecidochares connexa* by other researchers but was accepted as the former by the workshop.

SESSION 2
Country and Regional Reports (cont.)

Chairperson – R. E. CRUTTWELL McFADYEN

Five speakers presented talks on the impact and management of chromolaena in their regions. Costas Zachariades talked about the weed's introduction into South Africa at Durban in about 1940 and its progressive spread along the coast and north into Northern Province, Swaziland and even Mozambique. He mentioned problems with management of the weed, resulting from initial failures to recognize the importance of the weed and then from lack of resources.

Warea Orapa summarized the impact of the weed in Papua New Guinea and the management methods used. The biocontrol program commenced in 1998 and is on going, with the introduction and establishment of *P. pseudoinsulaa*. The gall fly *C. connexa*

will be introduced shortly.

R. Desmier de Chenon then reported on the biocontrol program in Indonesia carried out by the Oil Palm Research Institute in Sumatra over the last 10 years. Three agents have been introduced, tested and released, with both *P. pseudoinsulata* and *C. connexa* now widely established.

This was followed by a report by Colin Wilson on the program in eastern Indonesia, where *P. pseudoinsulata* has not been successful but *C. connexa* is doing very well in moist areas.

Finally, H. Braimah summarized the biocontrol program in Ghana over the last 10 years. *P. pseudoinsulata* is now spreading very widely and having a significant impact on the plant.

SESSION 3
Country and Regional Reports (cont.)

Chairperson - S.R. AMBIKA

There were three speakers and 2 posters

James Timbilla and Haruna Braimah presented their paper entitled "Successful biological control of *C. odorata* in Ghana: a potential for a regional program in Africa". *P. pseudoinsulata* was imported from Guam, USA and was established in Ghana in 1994/95. It could effectively defoliate and suppress *C. odorata*. The successful control of *C. odorata* with *P. pseudoinsulata* has had a positive impact on plant species diversity with an increase in plant species per unit area from 3 to 6. The authors felt that the success achieved in Ghana could effectively be used for regional biological control of *C. odorata*.

Gregoire Bani was translated by Peter Neuenschwander. He spoke on activities of biological control and management of *C. odorata* in Congo, Brazzaville. The plant was first collected in 1965 in the Congo. Later it started spreading and disturbances were the main cause for spreading. In sugar cane and oil palm plantations, the farmers use herbicides to control *C. odorata*. Fire is also used to clear the bush of *C. odorata*. *C. odorata* increases soil fertility when used as a compost and the local people use it for wound healing. Considering the pros and cons, the negative aspects prevail. Chemical, mechanical and biological control methods are being practiced and integrated control projects started in 1996.

Lorraine W. Strathie-Korrûbel and Costas Zachariades presented a paper entitled 'Control of *C. odorata* in South Africa: developments in research and implementation'. The insect species on *C. odorata* were prioritized for investigation in the South African program in 1997 based on severity and damage caused and ease of culturing. Host specificity testing has been completed on *Actinote thalia pyrrha* (butterfly), *Lixus aemulus* (stem-boring weevil) and *Calycomyza* sp. (leaf mining fly) with encouraging results. The host range of *A. thalia thalia* has also been investigated. Rearing techniques and biologies have been determined for the stem galling weevil *Conotrachelus reticulatus* and the root-mining flea beetle *Longitarsus horni*, and they have initiated host-specificity testing on these. *Pareuchaetes pseudoinsulata* larvae were released in the Northern Province of South Africa but did not establish and another strain that was introduced to overcome possible seasonality problems also became diseased. The origin of the South African form of *C. odorata* is being investigated and the recent discovery of a morphologically similar form in Jamaica suggests a Caribbean origin.

Two posters were presented:

Peta Campbell exhibited a poster titled "An extension tool with guidelines for rehabilitation after alien plant control" and explained that after the alien species are cleared ground cover should be rehabilitated. The ARC-PPRI has developed a research project to collate the known expertise and fill in the research gaps identified during five workshops. Two extension tools developed from this project:

1) Rehabilitation recommendations Handbook
2) Grab-a-Grass dials

Target users for the products include farmers, municipalities, non-governmental organizations, conservation authorities, the forestry industry, WFW project managers and other agencies actively involved with alien plant control.

Rachel McFadyen exhibited a poster and explained the details of the ACIAR (Australian Centre for International Agricultural Research) project on biocontrol of *C. odorata* involving 5 different organizations in Indonesia (Marihat, Bogor, Kupang), Papua New Guinea (Bubia), and the Philippines (Davao). In Indonesia *P. pseudoinsulata* and *C. connexa* have established and *A. anteas* is being field released. *P. pseudoinsulata* has established in the Philippines and PNG. *C. connexa* is being reared in the quarantine laboratory in the Philippines and it will be imported to PNG in the near future.

Calycomyza sp. leaf mines on Chromolaena

SESSION 4
Taxonomy, Ecology & Impacts of Chromolaena

Chairperson – J. M. GOODALL

Elizabeth Retief spoke on the tribe Eupatorieae in Southern Africa. Four genera, viz. *Ageratina*, *Ageratum*, *Campuloclinium* and *Chromolaena* are aliens. *Mikania* are indigenous to Africa but are important weeds in other tropical countries in the Asian Pacific. The tribe is made up of various growth forms including herbs (*Ageratum*), shrubs (*Ageratina* and *Chromolaena*) and suffrutices like *Mikania*. Features of the anthers, pappus and involucral bracts distinguish between different genera. Chromolaena is distinguished by achenes with pappi of many capillary bristles and involucral bracts with coloured tips.

In the second presentation, Inge von Senger said that Chromolaena in South Africa was morphologically different from other forms of the weed in Asia and Australasia. Accounts from entomologists on expedition in the Neotropics and of herbaria have led to much confusion regarding the exact home location of the South African form of chromolaena. Preliminary data from genetic fingerprinting shows that the KwaZulu-Natal (KZN) and Tzaneen infestations have different home ranges. KZN are close to the West Indian types and the Tzaneen type closer to the Venezuelan type.

S. R. Ambika covered environmental factors relating to seedling growth of chromolaena. Optimum growth conditions include high light intensity, high moisture availability and temperatures between 20º and 28º C. Growth is most rapid in the first 30 days after germination. Relative growth rate declines subsequently with increased effort put into root production.

Changes in density, biomass, seed production and soil seed bank of chromolaena in different age stands in sun, semi-shade and shade was discussed by Ed Witkowski. Self-thinning occurs in older stands as a result of intra-specific competition. Consequently young infestations are denser. Biomass is greater in younger stands and infestations become more 'inactive' (moribund) with age. Seed production was much greater in plants in the open. Viable seed banks were, however, lower in full sun than in semi shade. Soil seed is sensitive to temperatures. Seedlings in the soil were killed at 100º C in ovens. Implications are that intense fires will be effective in killing the soil seed bank.

Alison Leslie spoke on the Chromolaena infestations that threaten the breeding habitat of the Nile Crocodile in the Greater St Lucia system. Crocodiles rely on open sand banks for egg-development and balanced sex ratios. Temperatures of nests under chromolaena stands are lower by 5-6º C and this is sufficient to induce female biased sex ratios, but may also prevent embryonic development altogether. Chromolaena is also a barrier plant that reduced the spatial extent of potential breeding sites.

SESSION 5
Impacts & Management of Chromolaena

Chairperson – S. NESER

Speakers
Owen Howison, Jeremy Goodall, Paa-Kwesi Entsie and Stephan Weise

The impacts and management of *C. odorata* infestations in both


South African form of Chromolaena

natural and agricultural contexts were considered and the most useful recommendations were made for both situations in lessening the adverse impacts of the weed.

In the first paper the dramatic increase in the incidence of the weed over a 15 year period was graphically demonstrated, as it occurred in spite of attempts to control it, and to keep up with follow-up work, leaving the question whether the efforts should not have been concentrated on preventing spread, rather than attempting to "eradicate" the weed at the densely infested areas.

The second paper, using clever interpretations of the natural plant successions in grassland, savanna and forest in the absence and presence of *C. odorata*, and the effects of fire under different situations, demonstrated that the use of regular fires, when a certain minimum grass cover is present, could lead to a return to chromolaena-free grassland/savanna situations, provided that management is judiciously directed.

Judicious guidance also proved to be of great importance in the last two papers, in the first by specifically trained extension officers who could relay information to resource-poor farmers on the use of *P. pseudoinsulata* and their education through the Farmer Field School principle, and in the second, by not upsetting the traditional utilization of *C. odorata* during the short fallow period. This could be achieved by promoting the use of alternative plants, such as legumes, which were shown to be equally as good as, or better than, chromolaena for this purpose. It would however be necessary to prevent undesirable complications should *C. odorata* be suppressed sufficiently by biocontrol agents to allow other, more undesirable weeds or pioneer plants to take its place.

The information in the four papers provides a useful basis for future integrated management of *C. odorata*, especially when additional biocontrol agents could be brought into play.

SESSION 6

Biological Control of Chromolaena

Chairperson – L. STRATHIE-KORRÛBEL

Four papers were presented on *C. connexa* and one paper on *Pareuchaetes aurata*.

R. Muniappan reported that the gall fly *Procecidochares connexa* was imported into Guam in 1998. A tephritid expert has re-identified this fly as *Cecidochares connexa*. Species in the genus *Cecidochares* are very host specific. Host specificity testing of *C. connexa* showed that it is host specific and permission to release is being applied for.

Emmanuel Aterrado reported that *P. pseudoinsulata* had not established in many areas in the Philippines, thus *C. connexa* was imported. Host specificity testing was conducted and *C. connexa* shown to be host specific. Permission to import has been obtained after much delay. The biology of the insect was reported. Chromolaena plants are heavily galled and approximately 60% of galled branches die.

Soekisman Tjitrosemito reported that *C. connexa* was imported into Indonesia in 1993. Where the fly has been released in 1995 in the eastern part of Java it has established slowly, whereas it has established more rapidly and readily in the western parts. Climate affects plant growth, determining the number of growth tips, which in turn affects the number of galls produced. Thus plants which grow better in the west have a higher degree of galling.

R. Desmier de Chenon reported that *C. connexa* was released in Indonesia in 1995. The biology of the insect was reported on. Gall size is related to meristematic function of the plant (actively growing plants produce large galls). Spread of 900 m occurred within one generation after release, and up to 200 km 5 years after release. Up to 400 galls per plant have been observed. Growth, flowering and seeding are affected. *C. connexa* can occur up to 1200 m altitude and particularly attacks plants which have been slashed and are resprouting.

Des Conlong reported on the techniques used to mass-rear *P. aurata*. He emphasized the importance of trained staff, division of the labs into clean and dirty rooms, distinct workflow, and high levels of hygiene with regular cleaning and the use of different disinfectants.

SESSION 7

Biological Control of Chromolaena (cont.)

Chairperson – C. WILSON

The five speakers, Costas Zachariades, Alana den Breeÿen, Desmier de Chenon, Des Conlong and James Timbilla, followed a natural progression in biological control from testing potential insects and pathogens, looking at the biology of an agent being released, examining the impact of a released agent on flowering and foliage, and seeing the impact of an established agent on land management practices. A couple of significant issues to arise were the potential of pathogens, and the explanation for the failure in some circumstances of *Pareuchaetes* spp. moths to establish.

RECOMMENDATIONS

1. To change the name of the future workshops to "International Workshop on Biological Control and Management of *Chromolaena*".

2. To adopt as the common name "chromolaena" in future literature for *Chromolaena odorata*.

3. That other specialist tephritid taxonomists be approached to sort out the generic placement of (*Pro)Cecidochares connexa* Macquart and its relationship to *Procecidochares alani* and *P. utilis*.

4. Cooperative International work should be encouraged especially in the aspects of foreign exploration and preliminary screening of candidates.

5. As a follow-up to the 1993 recommendations of the *Chromolaena odorata* workshop held in Abidjan, West and Central Africa stakeholders should hold a regional meeting in 2001 to assess the expansion of the biological control effort across the region. The recommendations of this meeting will be tabled to the regional governments.

6. That an integrated weed management strategy including eradication where applicable (countries where the weed has only been found), slashing, burning, cultural, chemical and biological control be developed for the management of *C. odorata.*

STATUS OF BIOLOGICAL CONTROL OF CHROMOLAENA

Pareuchaetes pseudoinsulata

Established	Like to introduce
Mariana islands	Swaziland
Philippines	Mozambique?
Malaysia	West Africa?
Indonesia	Congo, Brazzaville
India	
Sri Lanka	
Ghana	
Papua New Guinea	
Pohnpei	
Kosrae	

Cecidochares connexa

Established	Like to introduce
Indonesia	Ghana
Palau	PNG
Guam	Cocos Island? (Australia)
(in quarantine)	West Africa?
Philippines	East Timor?
(in quarantine)	Congo, Brazzaville
	South Africa - compatibility
	Thailand

Actinote sp

Introduced	Like to introduce
Indonesia	Ghana
	PNG

Quarantine Laboratory in S. Africa

AGENTS AVAILABLE FOR BIOLOGICAL CONTROL OF CHROMOLAENA

1. *Pareuchaetes pseudoinsulata*
Guam
Indonesia
Ghana

2. *Cecidochares connexa*
Indonesia
Philippines
Guam ?

3. *Actinote* sp.1
Indonesia
Actinote sp.2
South Africa

4. Other agents available from South Africa
Calycomyza sp.
Lixus aemulus
Longitarsus horni?
Conotrachelus reticulatus?
Pareuchaetes insulata

BIOCONTROL OF CHROMOLAENA

NATIONAL

YES	NO
Indonesia Philippines Guam Micronesia Ghana Ivory Coast S. Africa PNG Thailand India Sri Lanka Malaysia Congo, Brazzaville Nigeria?	

REGIONAL

YES	NO
West/Central Africa? Southern Africa? Southeast Asia South Asia	West/Central Africa?

POSSIBLE FUNDING SOURCES

National:
Local Govt., World Wide Fund for Nature, DFID (England for Commonwealth Countries), Other specific funding agencies, National Agricultural Industries, Bilateral funding

Regional:
ACIAR (only Asian Pacific region), InterAfrican Development Bank, Asian Development Bank, FAO Regional Office, CIDA, GTZ, European Union,

International:
USAID, FAO, CIDA, CTA, World Bank, GEF, UNEP, WTA

About this newsletter ...

The *Chromolaena odorata* newsletter is produced at irregular intervals. If you wish to contribute any articles pertaining to the biological control of C. odorata, please send them to: R. Muniappan, Agricultural Experiment Station, University of Guam, Mangilao, Guam 96923 U.S.A. E-Mail: rmuni@uog.edu • Produced by: Agricultural Experiment Station, University of Guam in cooperation with the U.S. Department of Agriculture. Jeff D.T. Barcinas, Dean/Director, College of Agriculture and Life Sciences, Agricultural Experiment Station, University of Guam. Financial support for this newsletter was provided by the Grant 98-34135-6786 of Tropical and Subtropical Agricultural Research program, Special Grants, CSRS, USDA. • The Guam Agricultural Experiment Station is an equal opportunity employer. All information gained through its research program is available to anyone without regard to race, color, religion, sex, age, or national origin. • Trade names of products are used to simplify the information. No endorsement of named products is intended. • Any opinions, findings, conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the U.S. Department of Agriculture or the University of Guam. • Design and layout by A.J. Rosario.

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