INTERNATIONAL BIOHERBICIDE GROUP

IBG NEWS

VOL. 8 NO. 1 **June 1999**

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THE CHAIRMAN'S COMMENTS

Our next IBG Meeting will be held 4 and 5 June 2000 in Foz do Iguasso, Brazil. Our meeting will be a satellite meeting of the Third International Weed Control Congress being held in Foz do Iguasso, Brazil 6-11 June, 2000. It is time to start planning (and saving). More details will be forthcoming but I encourage you to check out the congress web site – www.sercomtel.com.br/ice/plantas. I hope as many of you as possible can attend and please also consider contributing your papers to the full congress as well as to our IBG Meeting. We have a great opportunity to show the progress and exciting results to the much wider weed science audience. Thanks to our editor, Maurizio Vurro for our new look Newsletter and to all the contributors.

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UPCOMING MEETINGS

III International Weed Science Congress

Iguassu Falls, Brazil

6-11 June 2000

BRAZIL IS WAITING FOR YOU IN THE YEAR 2000

Third International Weed Control Congress. 6-11 June 2000, Foz do Iguasso, Brazil. «Global Weed Problems: Local and Global Solutions for the Beginning of the Century». There will be seventeen main topics including Biocontrol (Louise Morin) and Global Aquatic Weed Problems (R. Charudattan). For details check out their web site: http://www.sercomtel.com.br/ice/plantas.

COST 816
Biological control of weeds in Europe

COST-816 CONFERENCE JOINTLY WITH THE 11TH EUROPEAN WEED RESEARCH SOCIETY SYMPOSIUM

JUNE 28 - JULY 1, 1999, BASEL, SWITZERLAND

The COST-816 Action "Biological Control of Weeds in Crops" is a coordinated European research programme that focuses on the regulation of 5 target weeds or weed complexes. In the framework of the 11th EWRS Symposium to be held in Basel, Switzerland, several meetings of COST-816 will take place.

OUTLINE OF THE PROGRAMME:

Saturday, 26.06.
Management Committee Meeting
9:00-16:00
Zoology Institute Basel, Rheinsprung 9, "kleiner Hörsaal"
contact: Heinz Müller-Schärer (e-mail: heinz.mueller@unifr.ch)

-or- Susanne Vogelgsang (e-mail: susanne.vogelgsang@unifr.ch)

Sunday, 27.06.
EWRS (European Weed Research Society) Working Group 'Biocontrol'
8:45-17:15
Zoology Institute Basel, "grosser Hörsaal"
Invited speakers: Dr. Mike Hutchings (UK), Dr. Jacco Wallinga (NL)
contact: Paul Hatcher (e-mail: p.e.hatcher@reading.ac.uk)

Tuesday, 29.06.
Joint EWRS/COST-816 Conference
9:00-12:15
UBS Conference Centre, Viaduktstrasse 33
Invited speakers: Dr. Roger Cousens (AUS), Dr. Meindert De Jong (NL)
contact: Heinz Müller-Schärer (e-mail: heinz.mueller@unifr.ch)

Joint Field Excursion to Zürich-Reckenholz
14:00-18:00
Demonstration field plots of the COST-816 action (see introduction below)
contact: Christian Bohren (e-mail: christian.bohren@fal.admin.ch)

Wednesday, 30.06.
COST-816 Working Group Meetings:
Amaranthus spp., *Chenopodium*, *Convolvulus*/*Calystegia*, *Orobanche* spp.
8:30-19:00
Zoology Institute Basel
contact: Heinz Müller-Schärer (e-mail: heinz.mueller@unifr.ch)
-or- Susanne Vogelgsang (e-mail: susanne.vogelgsang@unifr.ch)

Introduction to the COST-816 field excursion to Zürich-Reckenholz
June 29, 1999, 14:00-18:00

THE COST-816 DEMONSTRATION OF BIOLOGICAL WEED CONTROL RESEARCH IN THE FIELD

The COST-816 research programme has been most successful in bringing together several European research groups to their mutual advantage. In particular, the focus of the programme on only four (later five) important weeds has stimulated cooperation and facilitated technology transfer between the groups.

A major challenge to any basic research programme is to translate the results into the development of practical systems. This challenge has been met, at least in part, and the outcome is being demonstrated in the field at Reckenholz.

Four out of the five working groups of COST-816 will be demonstrating a series of plots that reflect their research and illustrate any potential practical developments that may ensue.

Amaranthus spp., serious weeds of several crops in Europe, can be controlled biologically and by modified cropping techniques. The demonstration shows two plant pathogenic fungi that are being developed as biocontrol agents. It also shows the use of a living mulch of *Trifolium subterraneum*, which appears to have allelopathic effects as well as suppressing the germination of the weed seeds.

The use of a fungus to control hedge bindweed (*Calystegia sepium*) is also demonstrated. There appears to be promising potential to develop this organism further due to its low cost production and its ability to control field bindweed (*Convolvulus arvensis*) as well. Possible applications of this potential mycoherbicide are parks and maize cropping systems where many weeds but not hedge bindweed are suppressed by a living green cover.

Chenopodium album, a serious weed of sugar beet and maize, is increasingly reported to be resistant to atrazine, the main herbicide used to control it. Thus, it is timely to consider the use of biological control. The plant pathogenic fungus used in the demonstration, *Ascochyta caulina*, is being developed further in an EC-funded project developed by the members of COST-816.

The system management approach is demonstrated using a rust fungus (*Puccinia lagenophorae*) against common groundsel (*Senecio vulgaris*). The aim of the system management approach is less to eradicate a weed as to manage the weed pathosystem and thus reducing the competition exerted by the weed on the crop. Stimulating epidemics of indigenous, or naturalised, pathogens by introducing small amounts of the pathogen at an early date of the growing season or facilitating epidemics in other ways (e.g. manipulating the environment) should reduce the competitiveness of the target weed.

Australasian Plant Pathology Society

Canberra 1999

12th Biennial Conference

Canberra Rydges Hotel
Canberra, ACT, Australia

27 September - 30 September 1999

Conference information

The 12th Biennial Conference of the Australasian Plant Pathology Society will be held at the Canberra Rydges Hotel between Monday 27 September and Thursday 30 September 1999. The program will have both offered papers and Symposia. The themes for the Symposia are:

- Asia/Pacific perspectives for plant pathology
- Trade policies and exotic plant pathogens

- Biodiversity and plant diseases

Several international speakers have been invited to present key papers at the Symposia. Speakers will provide an international perspective to their presentation. Offered papers will be either part of oral presentations or poster displays.
There will be a welcome reception, a conference dinner and a more informal social dinner that will be ideal for networking.

Workshops

The following workshops are being organised for the day(s) before or after the conference:

- Acquired resistance
- *Botrytis*
- Taxonomy of *Phoma* and *Ascochyta*
- Developing a practical companion to the textbook 'Plant Pathogens and Plant Disease"
- Nematode identification: morphological and molecular
- Quarantine and incursion management
- Scientific writing
- Bioherbicides

Accommodation

Accommodation will be available at the conference venue Canberra Rydges Hotel, overlooking Lake Burley Griffin and located near the city centre. University accommodation which is within easy walking distance of the conference venue will also be available.

Canberra Australia's National Capital

Canberra the 'Bush Capital' lives up to its name with pleasant leafy suburbs, numerous parks and a vibrant city centre. The average minimum temperature in September in Canberra is 6 degrees centigrade while the average maximum is 16. For those wishing to extend their stay after the conference, Canberra offers a wide range of art galleries, museums and other tourist activities.

Canberra's Floriade exhibition in nearby Commonwealth Park will be in full bloom at the time of the conference. Imagine yourself wandering through a field of one million spring bulbs as they burst into a myriad of colours.

Canberra is an ideal base to visit Namadgi National Park, the snowfields of the Snowy Mountains, Mount Kosciuszko and the beaches of the South Coast of New South Wales. Spring skiing is likely to be an attractive option for the adventurous after the conference.

Contact addresses

Pre-registration *Conference Logistics*
APPS Conference Secretariat
P.O. Box 505, Curtin, ACT, 2605, Australia
Tel: +61 2 6281 6624 Fax: +61 2 6285 1336
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Scientific Program *Dr Louise Morin*
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For more information

Visit the APPS website:
http://www.ozemail.com.au/~williap/Conference/Conference.html

17th APWSS (Asian-Pacific Weed Science Society) Conference

The final programme of the 17th APWSS (Asian-Pacific Weed Science Society) Conference that will be hold in Bangkok, Thailand on November 22-27, 1999 is available at the following WEB address: http://aggie.kps.ku.ac.th/apwss/index.html (Sombat Chinawong: agrsbc@nontri.ku.ac.th)

PEOPLE & PLACES

Dr. **Shane Hetherington** (NSW Department of Agriculture, Orange, NSW, Australia) and Dr. **Nguyen Van Tuat** and Mr. **Tran Huu Hanh**, National Institute of Plant Protection, Chem-Tu Liem, Hanoi, Vietnam visited the bioherbicide research group at the International Rice Research Institute in Los Baños, Philippines from 17-20 June 1999. The visit included sharing of approaches, methodologies, and progress in bioherbicide research. The groups share similar biocontrol interests, especially on *Echinochloa crus-galli*. (Alan Watson, International Rice Research Institute)

During a summer internship at the USDA, ARS, Southern Weed Science Research Unit, Stoneville, MS, Ms. **Kathryn Marchesini** worked with Dr. **Hamed K. Abbas** on research concerning biological control of weeds. She used procedures learned during her internship to conduct a science fair project at St. Joseph High School, Greenville, MS. Ms. Marchesini was awarded first place for this project at school, regional, and state Science and Engineering Fairs. As a result, she competed in the 50th Intel International Science and Engineering Fair, Philadelphia, PA, where she placed first ($3000.00) in the botany division out of 200 participants. Also, she was awarded $500.00 from WSSA for her project. The international fair drew 1,179 students from 47 countries.
(Alice Redditt: ReddittA@ars.usda.gov)

Dr **Helen Cole** was recently appointed as a plant pathologist at the Orange Agricultural Institute, NSW, Australia. Dr Cole is working with Dr Richard Medd to further assess the bioherbicidal potential of the seed-borne pathogen, *Pyrenophora semeniperda* for control of annual ryegrass (*Lolium*

rigidum). This weed is of particular interest as a target for biological control because of its increasing cross and multiple resistance to a wide range of commercial herbicides, including the non-selective glyphosate. While previous studies have shown *P. semeniperda* to be effective in the 'seed-kill' of several annual grass weeds, its ability to reduce emergence of annual ryegrass was, in comparison, much reduced. Thus the focus of this work is to examine factors conferring resistance of annual ryegrass to *P. semeniperda*. Factors to be investigated include isolate specificity, conduciveness of the infection environment to infection and the inherent resistance of ryegrass itself. Once identified, it is hoped that these barriers may be overcome by various means such as appropriate formulation or stressing plants prior to inoculation. As *P. semeniperda* is a non-specific pathogen any adverse effects it may have on 'non-target' hosts such as wheat will also determine its potential as a bioherbicide. Mycotoxin and grain quality testing will therefore constitute an important part of this project. Dr Maurizio Vurro, Istituto tossine e micotossine da parassiti vegetali, Bari, Italy, is kindly undertaking initial *in vitro* bioassay studies to establish if mycotoxins are involved. (Helen Cole: Helen.Cole@agric.nsw.gov.au)

Dr. **Robert Barreto** of the University of Viçosa, in Viçosa, Brazil, visited the Hawaii Department of Agriculture and the University of Hawaii Manoa in Honolulu, Hawaii, for one week in January, after he and his assistant explored the countries of the Dominican Republic and Costa Rica for pathogens of *Miconia calvescens* and *Tibouchina herbacea*. These two melastomes (Melastomataceae) are designated as noxious weeds in Hawaii and are high priority target weeds. As a result of Barreto's previous explorations in Brazil, a biocontrol fungus, *Colletotrichum gloeosporioides* f. sp. *miconiae* was shipped to Hawaii where host range tests proved its host specificity. *C. g. miconiae* was released in Hawaii in 1997. From Costa Rica, Barreto hand-carried many samples of diseased plant material, two of which have some potential as biocontrol agents. One is an unusual foliar-feeding nematode which causes an abnormal, fuzzy growth on the undersides of the *Miconia* leaves. The other is an obligate ascomycete identified as a *Coccodiella myconae*. In addition to visiting friends on Oahu, Barreto travelled to the Big Island of Hawaii to view the *Miconia* and *Tibouchina* infestations and to observe field release sites of *C. g. miconiae*. (Eloise Killgore: elopath@elele.peacesat.hawaii.edu)

Dr. **Cheryl Lennox** has moved from Oregon State University to the Weeds Research Division of the RC-PPRI in Stellenbosch, South Africa where she will co-ordinate the various ongoing projects on the biological control of alien plant invaders using pathogens. (Cheryl Lennox: vredcl@plant3.agric.za)

Dr. **Simon Francis Shamoun** was recently appointed as an Adjunct Associate Professor in 3 major universities in BC namely: University of Victoria- Dept. of Biology; University of British Columbia- Dept. of Forest Sciences; and Simon Fraser University-Dept. of Biological Sciences.

On April 01, 1999, Dr. **Simon Francis Shamoun** was promoted to Senior Research Scientist for his high productivity, research achievements and supervision of highly qualified people (4 M.Sc. and 5 Ph.D. candidates at UBC, UVic., SFU, and Univ. of Manitoba). Dr. Shamoun leads 3 major projects on biocontrol of forest diseses & weeds, is the Coordinator of the "Mycoherbicide program at CFS-PFC, Victoria, and PFC representative to national research network of Pest Management Methods. Also, Dr. Shamoun was selected to coordinate the "Fungal Expertise Group"- National Centres for Excellence, of a newly established Canadiam initiative on "BIOCONTROOL Network".
(Shamoun Simon: sshamoun@PFC.Forestry.CA)

During November and December 1998, **Raj Prasad** was invited to three International conferences in India. At the International Conference on Pest and Pesticide Management for Sustainable Agriculture and Forestry at Kanpur, Raj was presented with the "Distinguished Achievement Award" for his contribution to the field of weed science and biological control in forestry (Raj is a co-inventor of the new formulation of bioherbicide, *Chondrostereum purpureum*). According to an ancient tradition, the recipients of such awards were garlanded with flowers and a red vermillion spot was placed on their

foreheads. Raj was also presented with a plaque and pure cashmere wool shawl. This ancient tradition reflects the honor and respect bestowed upon highly educated members in the society. (Raj Prasad: rprasad@pfc.forestry.ca)

GRADUATE STUDENTS

PhD Thesis – **Hanspeter A. Pfirter** (e-mail: hanspeter.pfirter@ipw.agrl.ethz.ch)

The potential of *Stagonospora convolvuli* as mycoherbicide for field bindweed

Field bindweed (*Convolvulus arvensis* L.), a deep-rooted perennial of Eurasian origin, is most troublesome in cereals of the Temperate Zone. The control of the weed with chemical herbicides and mechanical practices is difficult. Further development of more ecological cropping systems intensified the interest in biological control of this weed. The aim of this thesis was to evaluate and improve the potential of a fungal pathogen as a biological control agent for field bindweed. In 1994, the foliar pathogen *Stagonospora convolvuli* strain LA39 was isolated from a field bindweed plant collected in Long Ashton (UK). All growth stages of the weed tested were susceptible to the pathogen. Disease symptoms were not only induced on field bindweed, but also on hedge bindweed (*Calystegia sepium* [L.] R. Br.), another important weed, and, far less severely, on some other Convolvulaceae species. No crop tested was susceptible to the fungus. Applied in a field trial in 1995, severe disease symptoms were observed on bindweed, and the increase of ground coverage by the weed was stopped. The formulation of the pathogen in a 10% oil-in-water emulsion significantly improved its efficacy. Shortening and delay of exposure to 100% relative humidity after inoculation did not affect disease severity, achieving high mean necrotic leaf area with 10^7 spores/ml in the oil-emulsion even in absence of exposure to 100% relative humidity. The solid state fermentation on cous-cous (cracked hard wheat) produced up to $4x10^8$ spores/g substrate, which were as pathogenic as those grown on artificial medium (V8-juice agar). The air-drying on kaolin followed by storage at 3°C kept spores viable and pathogenic for 140 days. The mass production of the pathogen on cous-cous, storage on kaolin and formulation in an oil-in-water emulsion seems to be an appropriate method for the development of a commercial product. An additional improvement may be achieved by applying a mixture of two *Stagonospora* sp., as demonstrated for *S. convolvuli* strain LA39 and *Stagonospora* sp. isolate LA30B. Distinct ecotypes of field bindweed reacted differently against six isolates of *Stagonospora* sp.. Only the biocontrol agent *S. convolvuli* strain LA39 was highly aggressive on all ecotypes. The development of genetic markers will allow tracking of the biocontrol agent once released in the field. Therefore, the genetic variation among *Stagonospora* sp. isolates collected in different European countries was studied using two different methods. Little variation was found with RFLP-analysis of the ITS-region, more with the RAPD-PCR assay. Groups determined with cluster analysis of the RAPD-PCR data and fragment pattern types of the RFLP-PCR were in agreement. As a next step, validity of these methods to identify and track *S. convolvuli* strain LA39 should be ensured in the field. Several crucial steps have been taken towards the development of a mycoherbicide for field bindweed. The potential of *S. convolvuli* strain LA39 as a biological control agent has been demonstrated. Further research should be focused on field trials under different environmental conditions and the incorporation of the mycoherbicide into integrated pest management systems. In addition, a suitable method to control the weed's extensive root system and thereby stop regrowth is still needed.

Dr. Lilian De Luna successfully defended her PhD thesis, «Pathogenicity of three *Curvularia* isolates to Cyperaceae weeds and rice (*Oryza sativa* L.)», at McGill University in April 1999. Results from this research indicate two isolates of *Curvularia tuberculata* and one isolate of *Curvularia oryzae* have potential to control *Cyperus difformis*, *Cyperus iria*, and *Fimbristylis miliacea* in rice. Cross-pathogenicity of the three *Curvularia* isolates to three other sedge weeds was demonstrated. However, *Cyperus rotundus* was resistant to infection. Most of the rice seedling varieties included in this study showed resistance to *C. tuberculata* and *C. oryzae*. Flecking on older, inoculated leaves occurred but

damage was minor and sporulation was not observed. Findings in this study indicate that *C. tuberculata* isolate 93-022 was safe to rice. A broad host range study is needed to accurately delimit host specificity of this candidate biocontrol agent. (Alan Watson, McGill University)

Dr. **Simon Francis Shamoun** is serving as a supervisor , co-supervisor or as a member of the advisory committee for the following graduate students:

** Shannon Deeks- M.Sc. candidate- Simon Fraser University, Dept. of Biological Sciences.: Thesis title: Tissue culture of Arceuthobium tsugense and development of in vitro boassays for rapid screening of the biological control agents for dwarf mistletoe. Supervisors: Drs. Simon Francis Shamoun and Zamir K. Punja.

** Peter Hollmann- M.Sc. candidate- Simon Fraser University, Dept. of Biological Sciences. Thesis title: Phytotoxins of Fusarium avenaceum and their potential as bioherbicides for invasive weedy Rubus spp. Supervisors: Drs. Simon Francis Shamoun and Stephen Lee.

** Gwen Lohbrunner- M.P.M. (Master of Pest Management)- Simon Fraser University- Dept. of Biological Sciences. Thesis title: Biological control of big leaf maple (Acer macrophyllum) with Canadian isolates of Cylindrobasidium laeve. Supervisors: Drs. Stephen Lee and Simon Francis Shamoun.

** Holly Williams- M.Sc. candidate- University of Victoria, Dept. of Biology. Thesis title: Isolation and transformation of the endopolygalactrunose enzyme from Chondrostereum purpureum. Supervisor: Dr. William Hintz. Dr. Shamoun serve on Ms. Williams advisory committee.

** Elisa Becker- Ph.D. candidate- University of Victoria, Dept. of Biology. Dissertation title: Molecular systematics of Chondrostereum purpureum and the environmental fate after deployment under field conditions. Supervisor: Dr. William Hintz. Dr. Shamoun serve on Ms. Becker's advisory committee.

** Brad Temple- Ph.D. candidate- University of Victoria, Dept. of Biology. Dissertation title: Molecular investigation , Tissue culture of elm tree and development of rapid screening assays against isolates of Ophiostoma ulmi. Supervisor: Dr. William Hintz. Dr. Shamoun serve on Mr. Temple's advisory committee.

** Tod Ramsfield - Ph.D. candidate- University of British Columbia, Dept. of Forest Sciences. Dissertation title: Biological control of lodegople pine dwarf mistletoe (Arceuthobium americanum). Supervisors: Drs. Bart van der Kamp and Simon Francis Shamoun.

** Samantha Hicks- Ph.D. candidate- University of British Columbia, Dept. of Zoology. Dissertation title: Potential use of insects and fungi as biological control of fireweed (Epilobium angustifolium) in British Columbia. Supervisor: Dr. Judith Myer. Dr. Shamoun serve on Ms. Hick;'s advisory committee.

** Cheryl Jerome- Ph.D. candidate- University of Manitoba, Dept. of Botany. Dissertation title: Molecular systematics and adaptation of infection of Arceuthobium americanum to different conifer tree species. Supervisor: Dr. Bruce Ford. Dr. Shamoun serve on Ms. Jerome's advisory committee.

BIOHERBICIDE RESEARCH - STATUS REPORTS

This is by no means a complete account of all research projects on bioherbicides.

Bioherbicide Research on Grass Weeds in Rice in China and Thailand. As rice production systems change from transplanting rice seedlings to direct seeding, grassy weeds, in particular *Echinochloa crus-galli* and *Leptochloa chinensis* are becoming increasingly troublesome in paddy rice fields throughout Southeast Asia. In collaboration with the International Rice Research Institute (IRRI) in the Philippines, scientists from the China National Rice Research Institute (CNRRI) in Hangzhou, China and from Chiang Mai University (CMU), Chiang Mai, Thailand are survey, collecting and evaluating pathogens on grass weeds in rice. Dr. Yu Liuqing (ylq@zgb.com) and his group at CNRRI have developed a simple, inexpensive means to mass-produce *Alternaria alternata* and *Curvularia lunata*, two promising pathogens of *Echinochloa crus-galli*. Dr. Prasertporn Smitamana (psporn@cmu.chiangmai.ac.th) and his team at CMU have a highly virulent isolate of *Exserohilum* sp. on *Leptochloa chinensis*. (Alan Watson, International Rice Research Institute)

Broom canker

For the past 3 years I have been watching a canker disease of Scotch broom (Cytisus scoparius) in the central Vancouver Island area of British Columbia, Canada, an area that was invaded by broom in the early part of the century. It appears as elongate lesions, 2 - 5 cm. long, on stems and branches. Black fungus fruiting bodies appear on the canker face during the spring months. The canker is associated with considerable dieback and mortality of shrubs of all ages and appears to be increasing in prevalence. In the spring of 1998, over 48 out of 54 of culture attempts from canker margins gave rise to a slow-growing fungus that eventually formed black fruiting bodies in culture. Accidental introduction? Adapted from native hosts? Bioherbicide or augmentative biocontrol candidate? Full time research could provide the answers.
(Ron Wall: rwall@island.net)

Landcare Research

Work continues towards developing the fungus *Fusarium tumidum* as a bioherbicide against two woody weeds, gorse (*Ulex europaeus*) and broom (*Cytisus scoparius*), in New Zealand. Two small field trials were conducted in April and November 1998 and results of the April trial were very promising. Young gorse plants (11B14 weeks old) were scored as alive or dead 2 weeks after treatment with either water, *F. tumidum* spores in water, *F. tumidum* spores in a water-in-oil invert emulsion, or the invert emulsion on its own. Half of the plants treated with *F. tumidum* spores in invert emulsion were dead within 2 weeks, whereas 11% died after application of the invert-emulsion alone. None were killed by application of spores in water or water alone. Larger gorse plants (18 months old) received the same treatments and have been monitored for disease symptoms at monthly intervals for 12 months. Disease rating of the inoculated plants was assessed using a scale of 0-4 where: 0 = no visible symptoms; 1 = 1-25% of tissue necrotic; 2 = 26-50% necrosis; 3 = 51-75% necrosis; and 4 = 76-100% necrosis. Disease ratings have been consistently higher in Aspores + emulsion@ treatments (average scores 1.5-3.2), compared with Aemulsion only@ treatments (average scores 0.07-2.8), Awater plus spore treatments@ (0.07-2) and Awater only@ treatments (0-2). One year after inoculation, the mortality of these plants was determined and none of them were found to be completely dead. However, 46.4% of the mature plants treated with Aspores + emulsion@ had suffered >75% tissue death.

Results to date of the second (November) trial have been less encouraging. Twenty-three treatments were applied to 9-week-old, 20-week-old and 20.5-month old gorse plants; 14-week-old broom plants; and 13-month-old pine (*Pinus radiata*) plants. The treatments included four solutions (water and three different invert emulsions, one of which was identical to that used in the first trial), containing three spore concentrations (no spores; 1×10^6 spores per ml. and 2×10^6 spores per ml) using two application rates (500 litres/ha and 1000 litres/ha). After 2 weeks, none of the inoculated weeds (or the pines) had died, and even plants treated with solutions containing the highest spore concentration, applied at the highest application rate, had on average less than 21% (mostly less than 10%) necrotic

tissue. We are still trying to determine the underlying causes for the very different results of the two trials.

Host range tests of *F. tumidum* are also in progress. To date, ten plant species that are closely related to the target weed (within the same family, the Fabaceae), and/or are of commercial importance in New Zealand, have been tested for susceptibility to the fungus. As expected, the plants susceptible to infection by *F. tumidum* were those most closely related to gorse and broom (within the same subtribe or tribe). Among the plants within the same tribe or sub-tribe as the target weeds, susceptibility was found to deacrease with increasing plant age and plants with a woody stem (eg. Laburnum) showed greater resistance than those with a fleshy stem (eg. tree lupin). A further 10 species will be tested in the next few months. If results from these tests show a similar correlation between the susceptibility of a plant and its relatedness to gorse and broom, then it should be possible to predict whether a given non-target plant is likely to be affected by our prototype mycoherbicide in the field.
This project was funded by the Foundation for Research, Science and Technology.
(Jane Frohlich: frohlich@landcare.cri.nz)

CABI Bioscience UK Centre, Ascot

Puccinia melampodii – an additional biocontrol agent for parthenium weed in Australia

In May 1999, the Australian Quarantine Authorities (AQIS) granted permission to import the neotropical rust *Puccinia melampodii* into Australia for biological control of the composite weed *Parthenium hysterophorus* which severely affects rangeland and annual cultivations, particularly in Queensland where it also poses a health threat to urban areas. The rust will be the latest addition to a suite of natural enemies previously introduced against this weed, which includes arthropod and fungal biocontrol agents, such as the chrysomelid beetle, *Zygogramma bicolorata*, the stem-galling moth, *Epiblema strenuana*, and the rust, *Puccinia abrupta* var. *partheniicola*..

Permission to introduce *P. melampodii* was given following rigorous host specificity testing according to the centrifugal phylogenetic method which was undertaken in the quarantine facilities at CABI Bioscience, Ascot, UK. Two strains of *P. melampodii* ex *P. hysterophorus* from Mexico were assessed and tests showed that, under greenhouse conditions, both strains are able to sporulate on *Flaveria australasica*, an Australian native and a minor weed in crops. Furthermore, abnormal, and mostly abortive sporulation was observed on certain varieties of sunflower, *Zinnia* and *Calendula*. Nevertheless, the benefit of *P. melampodii* as a biocontrol agent of *P. hysterophorus* was considered to far outweigh the risk of these plant species/varieties being attacked by *P. melampodii* under field conditions in Australia. This view is based partly on experiences with the rust *Puccinia xanthii*, which was accidentally introduced into Australia in the 1970s and is now an effective biocontrol agent against *Xanthium* species belonging to the Noogoora Burr complex. Under greenhouse conditions, this rust attacks a similar range of test species as *P. melampodii*, however, economic damage of important crop species (e.g. sunflower) or ornamentals or severe damage to *F. australasica* due to *P. xanthii* has never been reported from the field. From the results of this recent research, it is now considered that *P. melampodii* on *P. hysterophorus* should be assigned the rank of a *forma specialis* of *P. xanthii* (*P. melampodii* ≡ *P. xanthii* f. sp. nov.).

Puccinia melampodii is being investigated as a biological control agent for *P. hysterophorus* not only for Australia, but also for India, under a project funded by the UK, Department for International Development (DFID). However, at present the Indian authorities have yet to grant permission to introduce an exotic pathogen and concern about the specificity of exotic biocontrol agents prevails, based partly on the observations of sunflower varieties being attacked following the release of the parthenium beetle *Zygogramma bicolorata*. In order to avoid further controversy, a new follow-on

project has recently been approved by DFID in collaboration with PDBC (Project Directorate of Biological Control), Bangalore, India, which will be undertaken in Australia by scientists from the UK and India. This project will involve field trials with critical test species from India and Australia in order to compare their susceptibility to *P. melampodii* under field- compared to artificial greenhouse conditions.
(M.K.Seier: M.Seier@cabi.org)

Towards integrated control of (itch grass) weed

A project funded by the UK, Department For International Development (DFID) to evaluate the potential of the head smut *Sporisorium ophiuri*, as a classical biocontrol agent of itch grass weed (*Rottboellia cochinchinensis*) is now nearing completion. Permission is currently being sought from the Costa Rican quarantine authorities for introduction of the smut into Costa Rica. If permission is granted, then this will represent the first exotic plant pathogen to be officially released in the region and also the first time that a true smut fungus has been used in a classical biocontrol programme. As part of the project, electrophoretic techniques were used to characterise the genotypic variation of weed biotypes. The results suggested that the biotypes form a narrow genetic base with greater than 80% similarity. This high degree of similarity can be related to the predominately inbreeding nature of the weed and to the relatively recent expansion of its geographic range. Neotropic invasions of the weed appear to have been mainly from Africa, although biotypes in Brazil and Colombia probably originated in Asia. The Latin American biotypes form two distinct groups indicating that these populations probably arose from a relatively small number of introductions. This genetic homogeneity suggests that the smut should infect the majority of Latin American biotypes, some of which would be new associations. Host range screening of the pathogen showed that the smut was specific to *R. cochinchinensis*. Screening of the smut concentrated on graminaceous species to which the genus *Sporisorium* is restricted, and was undertaken using a Madagascan smut isolate. The smut is also capable of growth on artificial media and produces large numbers of sporidia in liquid fermentation. Sporidia are recognised as being the infective propagule for a number of smut species, including many belonging to the genus *Sporisorium*. Therefore, the possibility exists that the sporidia could eventually form the basis of a mycoherbicide formulation which would be applied inundatively. This would allow for a much faster spread of the biocontrol agent, and thus hasten the impact of the smut on the weed population.
(R.H.Reeder)

All-Russian Research Institute of Plant Protection, Saint-Petersburg, Russia

Elena L. Gasich successfully completed her dissertation "Mycobiota of weeds of the European part of Russia, and biological properties of *Septoria* spp. attacking field bindweed". Media and conditions appropriate for inoculume production were selected for *Septoria convolvuli, S.longispora and S. calystegiae* (=*Stagonospora calystegiae*). Their life cycles were described. Methods for distinguishing these species were developed (morphological, cultural and biochemical). On phytopathological tests the most aggressive fungus was *S.calystegiae*, which decreased plant dry weight on 35%, dry weight of shoots on 37%, height of shoots on 23% and number of flowers on 84% comparing to control. All the fungi have narrow host range restricted with the genera *Convolvulus* and *Calystegia*.

Alexander O. Berestetsky now studies infection process of *Cirsium arvense* and *Sonchus arvensis* by *Septoria cirsii* and *Ascochyta tussilaginis*, respectively, under several conditions of inoculation, using light and scanning electron microscopy. Previously, data on study of mass inoculume production both in liquid media and natural substrates demonstrated that S.cirsii has great opportunities for development a bioherbicide. It was observed that *A.tussilaginis* produces microsclerotia in culture, which could be explored as propagules. Number of experiments were carried out to select conditions

for phytotoxin production of these fungi. Both fungi are safe for crops. High levels of the *Septoria cirsii* leaf spot was demonstrated at 48 h dew period, 28 C during dew period, on plants in the stage of 5-6 truth leaves. During all experiments low older leaves were more susceptible than young leaves. Using staining techniques, it was observed that *S.cirsii* penetrates leaves through stomata mainly on low surface of leaves. Such conditions for the natural infection are possible in June when the plants are in the stage of rosette and their leaves are turned with low surface to the inoculume source, overwintered dry stems of *C.arvense*. Future investigations on S.cirsii should be directed on developing suitable formulation for the fungus to shorten its dew period requirement. *A.tussilaginis* requires 12 h dew period for minimal infection; at 48 h dew period considerable loss of fresh biomass (more than 50%) was observed.

In next issue of IBG we are going to present a database on mycobiota of weeds of the European part of Russia. Now a list of fungi identified is available in brochure published in All-Russian Institute of Plant Protection. Below its annotation is given.

Gasich Elena, Titova Julia, Berestetsky Alexander, Zharov Viacheslav
"Micromycetes of weed plants in European part of Russia: Totals of the research work carried out in 1993-1998". St.-Petersburg, All-Russian Research Institute for Plant Protection (VIZR), 1999.- 88 p. The scientific editors: Dr. V.A.Melnik (Komarov's Botanic Institute RAS), Prof. N.P.Cherepanova (St.-Petersburg State University). With the responsibility for issue - academician RAAS M.M.Levitin

Results of mycofloristic researches, carried out at the growing seasons of 1993-1998 in 39 areas, 18 regions of European Russia are submitted. The systematic list of micromycetes (411 species registered on 272 host plants) is given. For each consortive pair (micromycete - weed plant) the latin names, data and locality of collection, biotopes, and also the notes about mycosinusial structure are presented. The alphabetic indexes of host plants and bibliography are available. The report can be used by mycologists and phytopathologists, agronomists in the field of plant protection, specialists in the biocontrol of weeds and students. The work was carried out under the support of: Russian Fund of Basic Researches N 96-04-50287, and Russian Federal Program "Integration", project N 326.1.
Source: Berestetky Alexander, Gasich Elena, Titova Julia
(Berestetsky Alexander: ab227@MN1780.spb.edu)

Pacific Forestry Centre

Development and registration of *Chondrostereum purpureum* as a biocontrol agent for hardwood weeds in conifer regeneration sites and utility rights-of-way: efforts are underway as a result of the research agreement/collaboration between Canadian Forest Service (CFS)- Pacific Forestry Centre (PFC) and its industrial partner MycoLogic Inc., University of Victoria to register *C. purpureum* as "ECOclear" in Canada and USA according to the guidelines of the Pest Management Regulatory Agency and Environmental Protection Agency, respectively. By late, 1999, it is anticipated the finalization of registration of "ECOclear". For more information, please contact Dr. Simon Francis Shamoun- Research Plant Pathologist & Adjunct Professor at CFS-PFC at e-mail: sshamoun@pfc.forestry.ca or Dr. William Hintz, Associate Professor & President MycoLogic Inc. / Univ. of Victoria at e-mail: Whintz@uvic.ca. Also, for those who are interested in obtaining journal and technical publications, regarding the development and registration of "ECOclear", please e-mail either Dr. Shamoun or Dr. Hintz.

Development of *Fusarium avenaceum* as a biological control agent for invasive weedy *Rubus* spp. in riparian and conifer regeneration sites: A US and Canada patent were issued to Dr. Simon Francis Shamoun and Ms. Carmen Oleskevich for developing a new technology on the formulation of

Fusarium avenaceum for control of weedy *Rubus* spp. For more information regarding journal and technical publications on this project, please e-mail Dr. Shamoun at: sshamoun@pfc.forestry.ca

Biological control strategy for management of dwarf mistletoes: due to environmental and ecological reasons, forest industry companies in British Columbia (BC) are moving away from clear-cut to partial-cut harvesting system. This will intensify the dispersal of dwarf mistletoe inoculum (seeds) from retention trees (border trees) onto new planted or naturally regenerated conifer seedlings , which may result in plantation failure. Dr. Shamoun initiated this new project in 1996 and has made remarkable progress in developing *Colletotrichum gloeosporioides* and *Nectria neomacrospora* (Imperfect stage: *Cylindrocarpon cylindroides*) as potential biocontrol agents for management of western hemlock dwarf mistletoe (*Arceuthobium tsugense*) and lodegpole pine dwarf mistletoe (Arceuthobium americanum). For more information regarding journal and technical publications on this project, please e-mail Dr. Shamoun at: sshamoun@pfc.forestry.ca

CLASSICAL BIOLOGICAL CONTROL OF WEEDS WITH PATHOGENS

Landcare Research

Mist Flower Project:
Mist flower (Asteraceae) is a perennial herb or subshrub that grows 0.3-2m tall and produces numerous white flowers in the Spring. It is an aggressive, fast growing, shade tolerant plant that spreads easily through dispersal of its seed by wind and water. Mist flower is native to central America but has become a serious invasive weed in many tropical and warm temperate regions of the world. The plant infested about 52 000 ha of rangeland in Hawaii until a highly successful biological control programme was implemented there. Ten years after the introduction of a white smut fungus (*Entyloma ageratinae*), a plume moth (*Oidaematophorus beneficus*) and a gall fly (*Procecidochares alani*), weed-infested range land in Hawaii had been returned to productive use.

Mist flower was introduced to New Zealand around 1931 and has since become a serious problem in a wide range of habitats (eg. forest margins, stream edges, pastures, and road sides) across the North Island. The weed forms dense mats of semi-woody stems that displace and smother indigenous vegetation and limit regeneration. Landcare Research is undertaking a biological control programme using the two natural enemies that were most successful in Hawaii: the white smut fungus and the gall fly.

It was established that these biocontrol agents should be able to survive in New Zealand and host range tests, conducted in Hawai=i and in Quarantine in New Zealand, have shown that both are highly host specific. Permission to import and release *E. ageratinae* was sought from, and granted by, the New Zealand Ministry of Agriculture, and the fungus arrived in New Zealand for the first time in October 1998. Nine mist flower infestations were chosen as appropriate release sites for the fungus, and the white smut was subsequently distributed to these sites over November and December 1998.

It was found that *E. ageratinae* had established and caused secondary infections at all sites within 4-6 weeks of its release in New Zealand. While at eight of the sites, smut spores were not yet evident on plants further than 20cm away from the inoculated plants, at one site, spores were found 3-10 m from the inoculated plants in the field. While it is too soon to determine the likely impact of *E. ageratinae* on mist flower in New Zealand, the rapid establishment, and spread, of the fungus are a very promising. Host range testing of the gall fly has been completed, and an application for its release will soon be submitted to the Environmental Risk Management Authority, a new government authority created to regulate the import of hazardous substances and new organisms. If the gall fly can be released, and it is able to establish and reproduce with similar ease to the fungus, then there is a chance that Hawaii success in controlling mist flower will be repeated in New Zealand.

This project was funded by the New Zealand Department of Conservation (Northland branch) and the regional councils of Auckland, Northland and the Waikato.
(Jane Frohlich: frohlich@landcare.cri.nz)

Hawaii Department of Agriculture

After 2.5 years of review, USDA APHIS PPQ finally approved the permit to release a rust disease on gorse (*Ulex europaeus)* in Hawaii. This rust pathogen *Uromyces pisi* f. sp. *europaei* was discovered near Ludlow, England, and was host specificity-tested in Hawaii by the biocontrol Section of the Department of Agricutlure. Lupines were the only other host in the Fabaceae family but there are no indigenous lupines in Hawaii. Releases of this rust on gorse will be made in future months.
(Eloise Killgore: elopath@elele.peacesat.hawaii.edu)

University of La Réunion - CABI

Ligustrum robustum subsp. *walkeri* biocontrol programme on La Réunion (Mascarene archipelago).

More than 98 % of the archipelago's primary vegetation remnants are found in La Réunion (French Oversea Department of France), due to the fact that 40 % of the island are managed by the National Forest Office (ONF) and most of the native forest areas are protected. The native ecosystems of La Réunion are characterised by high levels of endemicity (72 % of the Angiosperm flora) and habitat destruction due to human activities as well as biological invasions. *Rubus alceifolius* (Rosaceae) and *Ligustrum robustum* subsp. *walkeri* (Oleaceae) are one of the worst alien invasive plants in the native forests. *R. alceifolius* has invaded Mauritius and La Réunion for a long time whereas *L. robustum* has recently been introduced into La Réunion.

In-depth ecological studies in La Réunion have revealed pure stands of *L. robustum* in disturbed forest patches and high seedling-banks in the least undisturbed patches. Its characteristic high germination levels, rapid growth rate, shade tolerance and very low mortality, combined with massive fruit production and dispersal by birds contribute to this weed's ability to invade intact forests. Mechanical and chemical control of privet is difficult, especially on steep mountain slopes and it remains a major threat to the indigenous montane forests.

Hence, it was decided that biological control would be the most appropriate option and a classical biological control programme was initiated in late 1997 by the ONF of La Réunion with the work being carried out by CABI Bioscience-UK Centre. This is thought to be the first biocontrol programme against environmental weeds for France and such an approach has never been used against any members of the Oleaceae. This project is funded by the Regional Council of La Réunion with support by the European Union (EEC) and is being run concurrently with that of CIRAD-Montpellier (France) against *Rubus alceifolius*. Collaboration with the Post-Graduate Institute of Agriculture (PGIA), University of Peradeniya, Sri Lanka should enable continued detailed surveying for natural enemies and a comparative study of the ecology of the plant in Sri Lanka and La Réunion to be undertaken. The first collaborative research project in the ecological aspect was initiated by a scientist from the University of La Réunion until 1996.

Using dried leaf samples collected during surveys in Sri Lanka, South-West India and North-East India, researchers at St Andrews University were able to apply molecular techniques to prove that Sri Lanka was the country of origin of the *L. robustum* biotype invading La Réunion and Mauritius. It is thought that the initial introduction in Mauritius was through Botanical Garden exchanges at the beginning of the century. The species group will probably need revision in the light of the DNA taxonomy findings.

Surveys in the Indian subcontinent showed that *Ligustrum* is an innocuous member of the native flora, attacked by a range of natural enemies, and several potential agents, both fungal and arthropod, have been collected and identified. Pathogenicity studies have begun on those plant pathogens collected (mostly hemibiotrophic members of the Dothideales) and host range experiments are underway on two moth species and several chrysomelid beetles. Further surveys are now planned to include the area of origin of the genus *Ligustrum*, believed to be South China and Vietnam, where the greatest diversity of natural enemies are likely to be found. Such surveys may also be of benefit to America and Australasia where other *Ligustrum* species are rapidly becoming serious invasive weeds.

The biological control programme for *L. robustum* in La Réunion will run until the end of 2002 by which time several biological control agents should have been screened for specificity.

Christophe Lavergne (University of La Réunion) E-mail : lavergne@engref.fr and Dick Shaw (CABI)

EDITOR'S CORNER

Dear Colleagues and Friends

First of all I want to thank you all for the kind help you have given, sending so many contributions to our newsletter, and making my job easier (or harder?).
I have tried to improve the look of the bullettin, mainly including some images and some interactive buttons, that will permit directly to send mail to the colleagues listed in the newsletter, as well as to open WEB pages. More efforts will be done in the future.
This bullettin has been sent by ordinary mail to those that not yet have Internet access or e-mail address, by e-mail to those have subscribed the ibg-news list, but will also be soon published for the first time on Internet at the following address: FTP://FTP.BA.CNR.IT/PUB/IBG-NEWS
if you have Internet access, please visit the "WEB" bullettin, that will have a nicer aspect and contains some pictures related to the bioherbicide research. I want also to thank my friend Henry Nelson, who is keeping previous issues of the newsletter in txt format on INTERNET, and who gave me precious suggestions about newsletter publishing on Internet.
Thanks again for your attention. I wish you all the best for the future and for your "Bioherbicidal" research

Maurizio Vurro