INTERNATIONAL BIOHERBICIDE GROUP

IBG NEWS

VOL. 9 NO. 2 **December 2000**

TABLE OF CONTENTS

The Chairman's Comments……. 1
Contact Addresses.....1
Meetings……. 2
People & Places…….. 6
Bioherbicide - Status Reports……. 8
Classical Biocontrol……..... 11
Recent publications……. 13
Announcements… 15
Editor's Corner…….....16
Annual Meeting Registration 17

THE CHAIRMAN'S COMMENTS

We begin the New Year with several exciting activities and promising developments. A few new projects on biological control of weeds by pathogens are joining other longstanding projects in several countries. An African mycoherbicide project (the IMPECCA project) on waterhyacinth has been initiated and a new COST project on parasitic weeds (COST 849) has been approved by the European Commission. In the United States, the cooperative regional research project on bioherbicides (the S-268 project) is undergoing revision for possible renewal for a 5-year term. An announcement of the annual meeting of this group appears in the following pages. I hope many of you will be able to attend. A NATO Advanced Research Workshop titled "Enhancing Biocontrol Agents and Handling Risks," also announced in the following pages, promises to highlight recent attempts at genetic and biotechnological improvements of biocontrol agents and address important issues of risk management. Finally, two new bioherbicide agents, *Colletotrichum gloeosporioides* f.sp. *malvae* and *Alternaria destruens,* have been submitted for review by the U.S. EPA for possible registration in the United States. I therefore anticipate a high level of scientific activity as well as continued growth and success in the bioherbicide field.

In closing, I call your attention to the comments by the editor, Maurizio Vurro's, in the Editor's Corner. Please do send him news items about your programs, personnel, publications, and other information that could be of interest to our readers. Please remember that one of the prime purposes of IBG News is to promote exchange of information and ideas and stimulate discussion. Therefore, your contributions to the newsletter are vitally important to assure its continued relevancy and vibrancy.

I wish you all a successful year. - R. Charudattan.

CONTACT ADDRESSES

CHAIR
R. Charudattan (Charu)
1453 Fifield Hall, PO Box 110680, Plant Pathology Department, University of Florida, Gainesville, FL 32611-0680 USA
Phone: 1-352-392-7240; Fax: 1-352-392-6532; e-mail: rc@gnv.ifas.ufl.edu

VICE CHAIR
Alan K. Watson

Department of Plant Science, Macdonald Campus of McGill University, 21,111 Lakeshore Road, Ste-Anne-de-Bellevue, QC H9X 3V9 CANADA Phone: 1-514-398-7851 Ext. 7858; Fax: 1-514-398-7897; e-mail: watson@macdonald.mcgill.ca
OR
APPA Division, International Rice Research Institute, MCPO Box 3127, 1271 Makati City, PHILIPPINES
Phone: 63-2-845-0563; Fax: 63-2-891-1292; e-mail: a.watson@cgiar.org

NEWSLETTER EDITOR
Maurizio Vurro
Istituto Tossine e Micotossine da Parassiti vegetali - C.N.R. - Viale Einaudi, 51 - 70125 - Bari - ITALY
Phone: +39.0805486037 - Fax: +39.0805486063 - e-mail: ma.vurro@area.ba.cnr.it

MEETINGS

TOP

Annual Meeting of the
S268 Technical Committee

Evaluation and Development of Plant Pathogens
for Biological Control of Weeds

March 18-20, 2001

U.S. Horticultural Research Laboratory
2001 South Rock Road
Fort Pierce, Florida 34945

Welcome Reception to be held at
Holiday Inn Express
7151 Okeechobee Road
Fort Pierce, Florida 34945

Tentative Agenda

Sunday, March 18

9:00 p.m. **Registration and Reception**
Holiday Inn Express
Hot and cold hors d-oeuvres and wine, beer, and non-alcoholic beverages will be served

Monday, March 19

Conference Room (USHRL, Ft. Pierce)

8:30 a.m. Registration and Continental breakfast (provided)
Welcome and Opening Remarks
Erin Rosskopf

8:40 Welcome to the USHRL, USDA-ARS laboratory
New laboratory director-TBA

8:50 Comments by Administrative Advisor
Greg Weidemann

9:00 Comments by CSREES representative
Tom Bewick or *Jim Parochetti*

9:15 Continuation of Cooperative Research-A New Multistate Research Project-Status Report
R. Charudattan

Refreshment Break

10:00 Invited Talk-"Weed control needs in organic farming"
Rosalie Koenig-North Florida perspective
Kevin O'Dare-South Florida perspective

10:40 Invited Talk-"Status of biological control of weeds programs in Canada"
Sue Boyetchko

Invited Talk-"Weed control needs in a post-methyl bromide era"
Jim Gilreath

Lunch – provided at the laboratory

1:10 Invited Talk-"Status of integrating pathogens and insects for biological control of weeds"
Tony Ceasar

1:40 Reports from Participants

2:40 **Refreshment Break**

3:00 Resume Reports from Participants

4:00-6:00 Tour of building, research farms

DINNER ON YOUR OWN

Tuesday, March 20

Conference Room (USHRL, Ft. Pierce)
8:30 a.m. Continental breakfast (provided)

Reports from Industries and any additional reports from participants

Refreshment Break

Group Discussion
- Research Plans for 2001 selection of cooperative trials

1:30 p.m. **Lunch - provided**

1:30 Group Discussion
- Other business

*Tour of Adam's Ranch-This is an optional tour that begins at 2:30 sharp! The tour is about 3.5 hours and includes a traditional outside BBQ for dinner. The cost is $30.00 per person. If you are interested in the tour, please indicate this on your registration and pay in advance.

DINNER ON YOUR OWN

2001 meeting

Information on the S-268 Meeting

The S-268 meetings will be held March 18-20 in Fort Pierce, FL. The meeting will be held at the new U.S. Horticultural Research Laboratory. The opening reception will be held at the Holiday Inn Express, Okeechobee Road, which is located within one mile of the research station. Transportation will be provided to and from the hotel to the research facility and the farm tours.

Registration includes the evening reception on March 18, continental breakfast and lunch on March 19 and March 20, and coffee breaks during the meeting. The registration is expected to be **approximately $90 USD.** Registration materials will be sent separately in the very near future. At that time we will determine if we can establish some transportation from the airport. We encourage people to fly into the West Palm Beach International Airport as it is approximately 45 minutes from the lab. The Orlando International airport is sometimes less expensive for some flights, but is located approximately 1.5 hours from the laboratory. While we expect to be able to provide limited transportation from the West Palm airport, we will not be providing transportation from Orlando.

A block of rooms has been reserved at the Holiday Inn Express [Telephone 561-464-5000]. When making your reservation you must mention that you are attending the " USDA S-268" in order to get the special discounted room rate. The cost of a standard room with the discount is approximately $55.00 plus tax (unless you have a tax exemption form). **Hotel reservations must be made by February 23, 2001 to take advantage of the room rate. The room rate will go to $100 if you do not make your reservation by this date!**

Tours

We will take a tour of the research facility, the USDA farm site, and a second farm site that is our location for alternative cropping systems. We are also planning an optional tour of a local cattle ranch that is a very popular location to see "the Florida of old." Since this is an optional tour, it will not be included in the registration fee. Please indicate on the registration form if you are interested in this tour.

Independent Activities Available in the Area

NATO Advanced Research Workshop

Enhancing biocontrol agents and handling risks

June 9-15, 2001, Hotel Villa Pitiana, Donnini, Florence, Italy

Maurizio Vurro & Jonathan Gressel co-directors

The increased relevance given to life and food quality, and environment preservation must be balanced with the needs to produce enough food to sustain humanity. Food production without pest (weed, disease and insect) control is impossible. The environmental considerations as well as the evolution of pesticide resistances requires that chemical pest control be augmented and significantly supplanted by other procedures. Despite many promising results obtained using biological control agents, their utility is still quite limited, replacing only a small part of the market of chemical products. This is due to many reasons, such as difficulties to find new and suitable agents, technological limits in application, storage and formulation of organisms, environmental restrictions of application, costs of registering, producing and delivering biopesticides. The major reason though is that very few agents have the efficacy when compared to traditional chemicals, even at higher costs. It is this issue of biological efficacy and its enhancement that this NATO ARW will address. The advent of biotechnologies and molecular biology has opened new perspectives in using microrganisms in biocontrol, by allowing improvements in the properties of biocontrol agents. The potential new risks associated with the introduction of new genes and organisms must be adequately assessed, which is a recurring motif throughout the proposed program. It is only if these issues are fully and transparently addressed can the necessary lines of communication be opened to the public. The workshop has a subject-oriented structure to permit the meeting of the major exponents in the scientific community working with different biological agents (fungi, bacteria, viruses, nematodes, insects), on different targets (pathogens, insects, weeds). The lecturers have backgrounds in the different aspects (molecular biology, formulation, genetics, risk assessment, new technology, biochemistry, physiology) needed to design biocontrol agents with improved efficacy and safety.

NATO Advanced Research Workshop

Enhancing biocontrol agents and handling risks

June 9-15, 2001, Hotel Villa Pitiana, Donnini, Florence, Italy

Tentative speaker list
Session I. Needs for enhanced biocontrol agents and strategies for enhancement
Chairperson: Maurizio Vurro
Co-chair: David Sands

FRED GOULD - Building better transgenic pests for autocidal control
DAVE SANDS - Needs to enhance mycoherbicides against narcotic plants
BRUCE D. HAMMOCK - Scorpion venom proteins as enhancers
MAURIZIO VURRO - Microbial toxins in biocontrol enhancement strategies
DIRK SCHEEL - Strategies to suppress weed resistance to mycoherbicides

Session II. Risks from enhanced biocontrol agents and their mitigation
Chairperson: Jonathan Gressel

JULIAN KINDERLERER - Legal/ethical/political problems of introducing/managing biocontrol agents
JONATHAN GRESSEL - Mitigating spread and introgression of native and transgenic biocontrol agents
MARJORIE A. HOY - Horizontal gene transfer in insects – a real risk (!?)
GEORGE TZOTZOS – Decision trees for determining biosafety of transgenic biocontrol agents
LASZLO HORNOK - Risks of biocontrol agents changing host range
MICHAEL J WILSON - Risk assessment and fitness of a transgenic entomopathogenic nematode

Session III. Technologies of enhancing biocontrol agents
Chairperson: Tariq Butt
Co-chair: Gary Harman

TARIQ BUTT - Increasing the efficacy of entomogenous fungi
STEPHEN DUKE – Biocontrol without the biocontrol agents
ALAN WATSON - Better biocontrol of weeds with enhanced mycoherbicides
JOHN WHIPPS - Ecological and biotechnological considerations in enhancing disease biocontrol
GARY HARMAN - Enhancing crop pest resistance with genes from biocontrol agents.
CLAUDE ALABOUVETTE - Enhancing biological control by associating micro-organisms
PC QUIMBY Jr. - Enhancing biocontrol agents through superior formulations
SAMIR DROBY - Enhancing biocontrol activity of microbial antagonists of postharvest diseases"

Session IV. Genetics and molecular biology of enhancing biocontrol agents
Chairperson: Ray St. Leger
Co-chair: Donald Nuss

RAY ST. LEGER - Insect pathogenic fungi as a resource of genes for biotechnoloGY
DONALD NUSS - Engineering viruses to fine-tune fungal-host pathogenic interactions
MILTON TYPAS - Genetic fingerprinting tools and comparisons of entomopathogenic fungi
JAMES M. LIGON - Genetically increasing metabolite synthesis and biocontrol activity of a Pseudomonas
AMIR SHARON - Using ‘soft genes’ to disrupt host hormone balance
ILAN CHET – Enhancing the virulence of disease biocontrol agents
PETER J. KERR - Viruses as vectors for delivering fertility control antigens to wildlife.
ANDERS TUNLID - Application of genomics to the improvement of nematode pathogenic fungi
T.A. GRIGLIATTI - Using deleterious transposons for insect control.
MATTEO LORITO - Genetics and molecular biology of enhancing fungal biocontrol agents

OTHER CONGRESSES

Bioactive Fungal Metabolites: Impact and Exploitation, 22-27th April 2001, University of Wales, Swansea, UK.

VIIth International Symposium on Parasitic Weeds, 3-8 June, 2001, Nantes, France.

Dynamics of Forest Insect Populations, joint meeting of International Union of Forestry Research Organizations (IUFRO) and Royal Entomological Society, 11-14 September, 2001, Aberdeen, Scotland.

International Congress of Plant Pathology (ICPP 2003), 2-8 February 2003, Christchurch, New Zealand.

XVth International Plant Protection Congress (IPPC 2003), organized by China Society of Plant Protection (CSPP), 6-11 July, 2003, Beijing, China

GORDON RESEARCH CONFERENCE ON PLANT HERBIVORE INTERACTIONS, 25 February-02 March, Ventura, CA, USA. Contact: J. Schultz, Dept. of Entomology, Penn. State Univ., Univ. Park, PA 16802, USA.
E-mail: UJQ@psu.edu

FIRST INTERNATIONAL KNAPWEED SYMPOSIUM OF THE TWENTY-FIRST CENTURY, 15-16 March, Coeur d'Alene, ID, USA. Contact: L. Wilson, Univ. of Idaho, Moscow, ID 83844, USA.
E-mail: LWilson@uidaho.edu Phone: 1-208-885-9489.
Web: www.sidney.ars.usda.gov/knapweed/

INTERNATIONAL COURSE ON INTEGRATED PEST MANAGEMENT, 18 March-30 June, Wageningen, THE NETHERLANDS. Contact: H.A.I. Stoetzer, PO Box 88, 6700 AB Wageningen, THE NETHERLANDS. Fax: 31-317-495395. E-mail: iac@iac.agro.nl Phone: 31-317-495353.
Web: www.iac-agro.nl.

2001 AN INTERNATIONAL WEED ODYSSEY, 21-23 March, An International Invasive Exotic Species Conference, Athens, GA, USA. Contact: C. McCormick, Inst. of Ecol., Univ. of Georgia, Athens, GA 30602, USA. E-mail: cheryl@arches.uga.edu Fax: 1-706-542-4819. Phone: 1-706-542-2968.
Web: www.ecology.uga.edu/.

PEOPLE & PLACES

TOP

Dieter Schroeder retires

After more than 40 years in the service of biological control, Dieter Schroeder retired in September 2000. For almost all of this period he was based at the CABI Bioscience Centre Switzerland (formerly European Station of the Commonwealth Institute of Biological Control and then International Institute of Biological Control - IIBC). He was Centre Director for the last four years, a period especially noteworthy for the construction of an extension to the centre building increasing the accomodation by 50%. Dr Matthew Cock, formerly IIBC Deputy Director of Operations and CABI Bioscience Weed Biological Control Programme Leader takes over as Centre Director of the Switzerland Centre in Delémont, with its active and committed staff and strong research programme.

Dieter was born in Germany in 1935 and passed his youth in what was called eastern Germany after 1945. His wish to study biology could not be realised in the circumstances, but since he was trained lumberjack he was ordered to study forestry. Three months before his final examinations he was forced to leave eastern Germany and finished his studies in Göttingen, West Germany. Instead of becoming a forest district officer, he accepted an offer to become junior entomologist at the European Station of the then Commonwealth Institute of Biological Control (CIBC), working on biological control of forest pests, such as larch sawfly, pine sawflies, balsam woolly aphid and pine shoot moth. The latter species became the subject of his PhD thesis in 1962. In 1969 he joined Helmut Zwölfer in his work on biological control of invasive weeds, including leafy spurge, thistles, St. John's-wort, etc., and took over the Delémont weed Section in 1973, when Helmut Zwölfer left.

Before concentrating on weed biocontrol, he spent a year in Ghana, running the CIBC Ghana Sub-station, and working on pests of corn, rice, cocoa, and water weeds. Following his return to Switzerland in late 1970 he worked in close cooperation with Peter Harris in Canada mainly on knapweeds and leafy spurge, but also a number of other species, such as mullein, bladder campion, sow-thistle, toadflax and dandelion. Over the past twenty years, biological weed biocontrol developed to become a major component of the work of the Switzerland Centre in Delémont with six research scientists and a varying number of Diploma and PhD students. Dieter has written or co-authored well over 50 publications that have greatly stimulated ecological thinking in biological control.

Quite early on Dieter established close cooperation with the USDA-ARS and the CSIRO European Weed Biocontrol Laboratories, and initiated with Paul Dunn annual meetings of the three groups to exchange information, and to avoid duplication of work. Supported by Peter Harris, Dieter put much effort on encouraging Canadian and U.S. scientists and

sponsors to join forces and form consortia to enhance support and progress in biological control of invasive weeds. There are now several such consortia coordinating the biological control programme against different weed targets. In addition to his Europe-based weed work, Dieter travelled the world, participating in international training courses in Trinidad, India, Pakistan, and Kenya, acted as a consultant in North America, Africa, Chile, the Solomon Islands etc.

His contribution to weed biological control was recognised publicly by professional colleagues last year when Dieter was an honouree of the Xth International Symposium on Weed Biological Control at Bozeman, along with Peter Harris and Lloyd Andres.

This year his retirement was marked more informally at a party held at the Switzerland Centre in August. The staff and students of the Centre, together with collaborators and former staff from Switzerland, Germany, Canada and the USDA EBCL Montpellier, marked the occasion with one of the Centre's traditional barbecues, and the presentation of gifts and momentoes, including a book of personal memories, stories and pictures sent by more than 50 colleagues from around the World, and the Centre's last ash tray! Proceedings were further enlivened with the first public performance of « Dieter's Song », set to the tune of « Those Were the Days », with words by Hariet Hinz and sung by the centre choir. The entertainment continued with more songs, a display of salsa dancing by the centre dance troupe and an exhibition of juggling by a Swiss professor well known in the field of weed biological control, whilst giving a commentary in three languages.

Dieter will be remembered by those who worked with him for his enthusiasm, strong opinions, and certainly his humour and many jokes and stories. We all wish Dieter a long and fulfilling retirement, which judging by his plans will be no less busy than his career.

Matthew Cock m.cock@cabi-bioscience.ch, André Gassmann, CABI Bioscience Centre Switzerland, and Heinz Müller-Shärer, University of Fribourg.
(Reproduced from Biocontrol News and Information with permission)

Canadian Forest Service- Pacific Forestry Centre

Dr. Shamoun is very actively involved as an Adjunct Associate Professor with many Universities in Canada:

1. University of British Columbia (UBC) - Dept. of Forest Sciences. Drs. Shamoun and van der Kamp co-suprvise Mr. Tod Ramsfield, Ph.D. candidate- Forest Pathology.
2. UBC-Dept. of Forest Sciences. Drs. Shamoun and El-Kassaby co-suprvise Ms. Jennifer Wilkin, M.Sc. candidate- Forest Genetics.
3. Simon Fraser University (SFU)- Dept. of Biological Sciences. Drs. Shamoun and Punja co-supervised the following M.Sc. students: Carmen Oleskevich, Tod Ramsfield and Shannon Deeks. In Spring, 2001, Ms. Grace Sumampong will be officially a M.Sc. candidate working with Drs. Shamoun and Punja.
4. University of Victoria- Dept. of Biology/ Division of Forest Biology. Dr. Shamoun serve as a member of the graduate supervisory committees for the following graduate students: 1) Elisa Becker, Ph.D. candidate; 2) Brad Temple, Ph.D. candidate; and 3) Holly Williams, M.Sc. candidate.
5. University of Manitoba- Dept. of Botany. Dr. Shamoun serve as a member of the graduate supervisory committee for Cheryl Jerome, Ph.D. candidate.
   (Shamoun, Simon sshamoun@PFC.Forestry.CA)

Istituto Tossine e Micotossine – C.N.R – Bari - ITALY

Within the ongoing project funded by the Italian Ministry of University and Scientific Research entitled "Biological control of *Orobanche* by using fungal pathogens and phytotoxins", proposed within a framework on "Use of microorganisms and bioactive metabolites in crop protection", **Dr Angela Boari** from University of Bari, has received a grant and will be involved into the project, working at the Istituto Tossine in Bari, Italy, for two and half years. The first step of the project, a field survey to find fungal pathogens of *Orobanche* is in progress. Many promising strains have been isolated and their potential in biological control and production of phytotoxic metabolites is under evaluation.

Maria Chiara Zonno, a plant pathologist involved in several projects on weed biocontrol using fungi and their bioactive metabolites, working at the Instituto Tossine since 1989, first as fellowship holder and later as temporary researcher, has passed a national selection and obtained the permanent position as researcher.

Maurizio Vurro ma.vurro@area.ba.cnr.it

BIOHERBICIDE RESEARCH - STATUS REPORTS

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

Ecology, Biology and Management of Invasive Weeds in Forestry, Raj Prasad, Pacific Forestry Centre, Victoria, BC, Canada

Two exotic weeds, Cytisus scoparius and Ulex europaeus were introduced in British Columbia over a century ago and since then they have made rapid incursion into rangelands, right-of-ways,urban, industrial sites and forest landscapes affecting biodiversity and productivity of native species.Research was carried to measure their impacts on the native Douglas-fir (Pseudotsuga menziesii) under forestry conditions in Vancuover Islands as well as on possible control of these alien weeds by using bioherbicides. Results demonstrated that Cytisus scoparius competes with young Douglas-fir seedlings and interferes with light(PAR) infilteration.
Of the three fungi (Chondrostereum purpureum, Fusarium tumidum and Pleiochaeta setosa) tested for biocontrol, only two showed promise. Further work is in progress.
Prasad, Raj rprasad@PFC.Forestry.CA

The Shamoun's Research Laboratory "Biological Control of Forest Diseases & Weeds"

In accordance with the Canadian Forest Service (CFS) new research programs re-structuring and directions, Dr. Simon Francis Shamoun continues with enthusiasm his research and development in the area of "Biological Control of Forest Diseases & Weeds". Effective April 01, 2001, Dr. Shamoun's research program will be accordingly re-organized in harmony with the new directions of the CFS's research directions. As it stands, Dr. Shamoun's research program would fit in two of the five "CFS National Work Groups", namely, "Enhanced Timber Protection & Production" and "Conservation and Protection of Forest Ecosystems".
A web site is under construction for the "Shamoun's Research Lab." in both English and French languages. It will be posted on the internet on April 01, 2001. Research activities at "The Shamoun's Research Lab." including research program, research team members, research grant, international activities, refereed journal publications & patent, Academia (i.e. graduate students), are outlined below:

A)Research Program: Dr. Shamoun leads the following research projects:

1) Biological control of major forest weeds with special emphasis on Rubus spp. and Salal (Gaultheria shallon);
2) Biological control of forest diseases with special emphasis on dwarf mistletoes (Arceuthobium spp.); and
3) Continue working in the area of technology transfer of Chondrostereum purpureum project to private sector- MycoLogic Inc., as well as, conducting academic research only.

B) Research Team Members:

1. Dr. Simon Francis Shamoun- Research Scientist / Program Leader & Adjunct Associate Professor, CFS- Pacific Forestry Centre (PFC), and University of British Columbia (UBC)- Dept. of Forest Sciences & Univ. of Victoria- Dept. of Biology, respectively.
2. Ms. Carmen Oleskevich- Research Technologist, provides technical support to Dr. Shamoun, Visiting Research Scientists, and assists Dr. Shamoun's graduate students.
3. Dr. Susanne Vogelgsang - NSERC Visiting Scientist who is conducting research in the area of screening and development of biocontrol agents for Salal and Rubus spp. Dr. Vogelgsang joined Dr. Shamoun's research lab. in January, 2000, after spending one year as a Post-doctoral fellow at the University of Fribourg, Switzerland. During the last year, Dr. Vogelgsang has focused her research efforts on the biology, development of a novel formulation , and delivery technology of a very "unique" potential biocontrol agent (Valdensinia heterodoxa) for Salal. Also, Dr. Vogelgsang is screening potential fungal candidates for their use as biocontrol for Salmonberry (Rubus spectabilis).
4. Mr. Robert Countess- M.Sc. candidate at Univ. of Victoria- Dept. of Biology, provides knowledge in the area of identification of fungi isolated from forest weeds and assisting Dr. Shamoun and his co-workers in screening, formulation, greenhouse and field trials investigations.
5. Ms. Shannon Deeks- on April, 2000, Shannon completed her M.Sc. degree at Simon Fraser University- Dept. of Biological Sciences, working under the supervision of Drs. Shamoun and Zamir K. Punja. Her M.Sc. thesis entiteled:

Tissue culture of western hemlock dwarf mistletoe and its application in biological control. She joined Dr. Shamoun's lab. a "Forest Pathology and Biocontrol Research Technician" from May- December 2000. In January, 2001, Ms. Deeks accepted a new position at a private sector company in Malibu, California, USA. (Shannon's position will be filled sometime during January, 2001).

6. Mr. Tod Ramsfield- Ph.D. candidate at UBC- Dept. of Forest Sciences. Working under the supervision of Drs. Shamoun and Bart van der Kamp, Tod is conducting research in the area of biological control of lodgepole pine dwarf mistletoe. In November, 2000, Mr. Ramsfield passed the comprehensive- "qualifying" examination for a Ph.D. degree with flying colours!. In August, 2000 , a field trial was conducted to test the feasibility of using a novel formulation of Colletotrichum gloeosporioides for control of lodgepole pine dwarf mistletoe (Arceuthobium americanum). Results are very encouraging and a worldwide patent development is underway.
7. Ms. Jennifer Wilkin- M.Sc. candidate, Dept. of Forest Sciences- UBC. Working under the supervision of Drs. Shamoun and Yousry El-Kassaby, Jennifer will join Dr. Shamoun's research lab. during Spring semester, 2001, and conduct research in the area of " Genetic diversity and population structure of the potential biocontrol agent Valdensinia heterodoxa and its target weed Salal collected from the natural distributions througout BC."
8. Ms. Grace Sumampong- M.Sc. candidate, Dept. of Biological Sciences, Simon Fraser University. Working under the supervision of Drs. Shamoun and Zamir K. Punja, Grace will join Dr. Shamoun's research lab. during Spring semester, 2001, and conduct research in the area of "Charcacterization of the phytotoxins produced by the biocontrol agent Valdensinia heterodoxa and their potential use as bioherbicides for Salal".
9. Dr. Arkadiusz Pitrowski- Visiting Scientist, Gdansk University, Poland. Dr. Pitrowski and his mentor Dr. Renata Ochocka are currently collaborating with Dr. Shamoun in the area of genetic diversity of the European and North American Dwarf Mistletoes. Dr. Pitrowski will join Dr. Shamoun's research lab. in Spring, 2001.
10. Ms. Heike Seubert- Visiting Researcher from Dept. of Botany and Forest Physiology, Fribourg University, Germany, spent 3 months (October- December, 2000) at the "Shamoun's Research Lab.", where she worked with Dr. Shamoun on the "Histopathological investigation and elucidation of the defense mechanisms of big leaf maple (Acer macrophyllum) to infection by plurivorous wood rotting fungi".

Research Grant: Dr. Shamoun was awarded a research grant ($315,000/ 3 years) from Weyerhaeuser Canada Ltd. to conduct research on "Development of biological control strategies for management of Salal "Gaultheria shallon" and Rubus spp." in the conifer regeneration sites.

International activities:

1. During the period 13-18 August, 2000, Dr. Shamoun organized and chaired a session on "Application of Biological Control to Vegetation Management in Forestry" at the annual meeting of the Western International Forest Diseases Work Conference (WIFDWC) at the "Big Island of Hawaii". Drs. Don Gardner, Robert Anderson, Eloise Killgore and Simon Francis Shamoun were the speakers at the session. These presentations will be published as full manuscripts in the Proceedings of the WIFDWC in 2001.
2. Under the theme "Working Together for Healthier Plants", Dr. Shamoun chaired the scientific program and presented 3 papers with his co-workers at the joint meeting of the Canadian Phytopathological Society and the Pacific Division of the American Phytopathological Society at the Victoria Conference Centre in Victoria, BC, Canada, 18-21 August, 2000. More than 300 participants from 9 different countries (including USA, Canada, Japan, Korea, China, The Netherlands, Poland, Denemark, and Egypt) attended the meeting. There were numerous papers presented on biocontrol of weeds and diseases. The abstracts of this meeting are published in the Canadian Journal of Plant Pathology and Phytopathology.
3. Dr. Shamoun was invited speaker at the annual meeting of the Arab Society for Plant Protection which took place in Amman, Jordan in November 18-26, 2000.
4. In collaboration with North American and International Scientists, Dr. Shamoun published the following book chapters: 1) Evans, H. C., Frohlich, J. and Shamoun, S.F. 2000. Biological Control: Weeds. Pages 352-401. In:(Eds. Pointing, S.B. and Hyde, K.D.), Bio-Exploitation of filamentous fungi; 2) Shamoun, S.F. and DeWald, L. 2000. Management of dwarf mistletoes by biological, chemical and genetic control methods. In: (Eds. Geils, B., Tovar, J. and Moody, B.), Mistletoes of North American conifers. Sponsored by the North American Forestry Commission- NAFTA Agreement between the USA, Canada and Mexico; 3) Harris, P. and Shamoun.2000. Weed Biocontrol in Canada: Results, Opportunities and Constraints. (In press); and 4) Shamoun, S.F. 2001. Development of mycoherbicides for vegetation management in forestry. In: (Eds. Khachatourians, G.G. and Arora D.K.), Applied Mycology and Biotechnology, Elsevier Science (In press).
5. Dr. Shamoun was recently selected by the International Union of Forestry Research Organization (IUFRO)- Vienna, Austria, as a Coordinator for a new working group "Parasitic Plants of Forest Trees". Five deputies were selected for the group from USA, Poland, Asutria, Australia, and Argentina.

(Shamoun, Simon sshamoun@PFC.Forestry.CA)

Barnyard Control Research in Asia

In Japan
Mitsui Chem, Inc. is continuing prepare to registrate fungi (*Exserohilum monoceras*) for control barnyardgrass in paddy field. Now final stage of official field trial tests are hold at several locations in Japan. It will appear on the market in 2003.
Xanthomonas campestris (trade name is Camperico) is sold by Japan Tobacco Inc. for controling Annual Bluegrass (*Poa annua*) in golf courses.

In China
Huang ShiWen et al. at CRNNI also shows that *Exserohilum monoceras* control barnyardgrass very well in paddy field. *Exserohilum monoceras* shows better control than *Alternaria alternata*.

In Vietnum
Nguyen Van Tuat *et al*. at National Institute of Plant Protection also uses *Exserohilum monoceras* to control barnyardgrass in paddy field.

In Korea
Yang YoungKook at Seoul National University uses *Colletotrichum graminicola* to control barnyardgrass.

Prof. Masatoshi Gohbara gohbara@dd.catv.ne.jp
Tamagawa University Research Institute
Applied life Science Research Center

Landcare Research, New Zealand

Development of mycoherbicides for gorse (*Ulex europaeus*) and broom (*Cytisus scoparius*) in New Zealand.

Research continues on improving the efficacy of *Fusarium tumidum* as a mycoherbicide for gorse and broom, two of the worst woody weeds in New Zealand. The emphasis over the last year has been on developing more effective formulations (work conducted jointly between Landcare Research and Forest Research) and improving mass production and long-term storage. In July 2000, a joint project started between Landcare Research and AgResearch on the potential of *Chondrostereum purpureum* to infect and damage mature gorse plants. *Fusarium tumidum* is most effective against young, herbaceous tissues; so *C. purpureum*, which predominantly attacks old, woody tissues, should be complementary in activity.

Formulation of F. tumidum: A breakthrough in methodology was made when George Zabkiewicz, Zhi Qian Liu and Stefan Gous (all of Forest Research) developed a bioassay for quickly screening potential formulations. During host range testing of *F. tumidum*, conducted by Jane Fröhlich and Alison Gianotti of Landcare Research, it was discovered that tree lucerne (*Chamaecytisus palmensis*) was highly susceptible to damage by the fungus. Tree lucerne is very closely related to gorse and broom and has larger, more fleshy foliage on which it is easier to see disease symptoms. Liu used detached tree lucerne leaves (which are abundant and available all year round) to test the phytotoxic effects of various formulations and their ability to enhance infection by *F. tumidum*. It takes 7–9 weeks to grow gorse from seed to a stage when it can be used for formulation testing, so the new bioassay has made testing a lot quicker and easier.

A large number of formulations were tested on tree lucerne leaves and most could be quickly rejected due to high phytotoxicity without *F. tumidum* spores and/or poor levels of infection with spores. Forest Research staff then tested the six best formulations on gorse seedlings in a glass-house trial, a growth cabinet trial and a shade-house trial. Results from these three trials were all highly consistent with each other, and with the original bioassay results: formulations containing oil (emulsions and invert emulsions) enhanced the efficacy of *F. tumidum* better than water-based formulations, but were also more phytotoxic.

The four most effective of the oil-based formulations were applied (both with and without *F. tumidum* spores) to small gorse (2 months old), large gorse plants (12 months old) and *Pinus radiata* seedlings (22 months old) in the field. The results of this trial confirmed observations from two previous field trials: the younger gorse plants were more susceptible to the fungus than the older ones, and the formulations that gave the highest levels of disease on older gorse plants when combined with *F. tumidum* spores, were also those that were the most phytotoxic on their own (to both mature gorse and immature pine). The pines sprayed with the formulations alone suffered about the same growth reduction as those sprayed with formulated *F. tumidum* spores, so it seems to be the phytotoxicity of the formulations, rather than infection by the fungus, that is the problem. There was one novel, and quite promising observation. One of the new formulations tested killed 94% of the young gorse plants when applied with *F. tumidum* spores, but caused minimal damage, and no deaths, when applied alone.

Production and storage of F. tumidum: Research on production and storage of *F. tumidum* inoculum had its ups and downs. On the positive side, improvements in methodology have made it easier to produce large quantities of *F. tumidum* spores. Also, these spores can readily be stored (for up to 12 months in a refrigerator) as a wettable powder. On the negative side, a reliable method for storing the fungus long term, without any loss in virulence, has not yet been developed. In 2001 some virulent cultures of *F. tumidum* will be sent to Sylvan, Inc. (a specialist in the production of mushroom spawn) in the hope that they can more easily and consistently produce and store virulent inoculum.

Future work with Chondrostereum purpureum: Research in the Netherlands and in Canada has shown that *C. purpureum* has considerable potential as a biological control agent for a number of woody weeds, including broom. Jane and Alison are collaborating with Graeme Bourdôt and Geoff Hurrell of AgResearch on a project to determine whether *Chondrostereum purpureum* could be used to control large, woody gorse and broom plants in New Zealand. This work follows on from laboratory tests of the fungus conducted by AgResearch and Ian Harvey of Plantwise in 1999. In the next twelve months, two small scale pathogenicity tests will be conducted on mature gorse plants in the field in both Auckland (North Island) and Christchurch (South Island). Dr. Meindert DeJong visited Jane and Graeme in New Zealand in December and gave valuable advice for these trials based on his many years of experience working with *C. purpureum* in the Netherlands.

Jane Frohlich FrohlichJ@landcare.cri.nz

CLASSICAL BIOLOGICAL CONTROL OF WEEDS WITH PATHOGENS

CABI Bioscience, Ascot, UK

Puccinia melampodii – a biological control agent for *Parthenium hysterophorus*

The neotropical rust *Puccinia melampodii*, a fungal pathogen showing high potential as a biological control agent for *Parthenium hysterophorus*, was evaluated by CABI Bioscience (Ascot Centre), in collaboration with the Instituto de Ecología (Xalapa, Mexico), within two separate projects: for Australia, funded jointly by Meat and Livestock Australia and Queensland Department of Natural Resources (DNR) and for India, funded by the UK, Department of International Development (DFID).

Parthenium hysterophorus (parthenium weed) is an annual herb belonging to the Asteraceae which has become a serious invasive weed of pastures and cultivations in Australia, as well as in India (where it is known as ”Congress grass”) and parts of Africa following accidental introductions. In addition to its invasiveness, the weed is highly allergenic and poses a serious health risk both to humans and livestock.

Results of rigorous host specificity tests revealed that under greenhouse conditions selected strains of *P. melampodii* ex *P. hysterophorus* from Mexico can attack certain Australian cultivars of sunflower, cultivars of *Calendula officinalis, Zinnia elegans* and *Guzotia abyssinica* (niger seed), as well as the Australian natives *Zinnia peruviana* and *Flaveria australasica*, producing mainly abnormal and abortive sporulation. However, the rust was approved for importation into Australia by the Australian Quarantine and Inspection Service (AQIS) in 1999. The benefits of *P. melampodii* as a biocontrol agent for parthenium weed were considered to outweigh the risks posed to non-target species under field conditions. This view was based partly on experiences with the rust *Puccinia xanthii*, a biocontrol agent of *Xanthium* species belonging to the Noogoora Burr complex. Under greenhouse conditions, this rust attacks a similar range of test species as *P. melampodii*, however, there have been no reports of *P. xanthii* causing economic damage to crop species (e.g. sunflower) or ornamentals or severely attacking *F. australasica* in the field. It is now considered that *P. xanthii* exists as a range of *formae speciales* and that *P. melampodii* ex *P. hysterophorus* should be regarded as the *forma specialis* of Parthenium weed (*P.xanthii* f.sp. nov.).
First releases of *P. melampodii* using rust infected Parthenium plants were made in early 2000 covering an area of 50,000 square km in Queensland. The establishment and the spread of the pathogen are being closely monitored.

In contrast to Australia, with its long-standing experience of biological control, India, as yet, has not granted permission to introduce non-indigenous pathogens. In India concern about the specificity of exotic biocontrol agents, in general, prevails, particularly since the reports of the *Zygogramma* beetle attacking sunflower, even though this has been later shown to be an artificial extension from its Parthenium host. Thus, the release of *P. melampodii* into Australia offered the possibility to assess the susceptibility of critical Indian, as well as selected Australian test plant species under natural rather than artificial conditions. A field experiment conducted in the grounds of DNR in Brisbane, Queensland, showed *P. melampodii* to be more host specific under field than under greenhouse conditions. Out of all the test plants species assessed in the field, only cultivars of *Calendula officinalis* exhibited symptoms comparable to those observed following greenhouse inoculations. *Flaveria australasica* could not be included in the experiment due to lack of seeds, but since this species is regarded as a minor weed in crops in Australia, there are no conflicts of interest with this “host”.

The results of this field experiment are indicative for an artificial host range extension of *P. melampodii* under greenhouse conditions, a phenomenon well reported in the literature for numerous biological control agents. However, the attack of *Calendula officinalis* cultivars in a field situation shows this rust to be a controversial biological control agent, which currently cannot be considered for release into India in order not to jeopardize on-going biological control programmes. Once these programmes have been shown to be successful, as well as environmentally friendly, and public awareness and acceptance of biological control of weeds using fungal pathogens has been increased, then India is in a unique position to benefit from the Australian experience with *P. melampodii* in the open field situation.

Marion Seier m.seier@cabi.org

Landcare Research, New Zealand

Mist Flower Project:

It is now more than two years since the white smut *Entyloma ageratinae* was released in the North Island of New Zealand for the biological control of mist flower. In that time the fungus has established everywhere that it was released and has spread widely and quickly (up to 77 km within 17 months). The fungus causes considerable defoliation of the weed, especially in the Spring and Summer. While mist flower is capable of substantial regrowth, photographs taken at release sites before release, and then annually after release, show a gradual decline in mist flower cover. Better yet, there has been a corresponding increase in the cover of small native plants such as ferns, seedlings of native shrubs and trees, and orchids. Thus it would appear that the fungus can successfully reduce the competitive ability of the weed in New Zealand.

The white smut appears to be performing better around some release sites than others. Consequently, it was welcome news when permission was granted for the release of a second biological control agent for mist flower, a gall fly (*Procecidochares alani*). The insect will be released in early February 2001. Its larvae form galls in the stems of mist flower which can retard the weed's growth. The activity of the two agents is expected to be complementary both in time (the flies should remain active when the fungus is suffering from lack of moisture) and in space (the fungus destroys the leaves while the insect inhibits stem elongation) and their combined effects should further reduce the vigour of the weed.

Other biological control projects involving pathogens:

Landcare Research has recently undertaken several weed pathogen surveys to establish which pathogens already occur on particular weeds in New Zealand. Such surveys ensure that if one of these weeds is targeted by a biological control programme in the future, time and money will not be wasted on introducing an organism that has already introduced itself. These surveys could also identify fungi with potential as the active ingredient of a bioherbicide.

Pathogen surveys have been completed on bone-seed (*Chrysanthemoides monilifera* ssp. *monilifera*, Asteraceae), nassella tussock (*Nassella trichotoma*, Poaceae) and Chilean needle grass (*Nassella neesiana*, Poaceae). Surveys are currently underway on woolly nightshade (*Solanum mauritianum*, Solanaceae) and banana passionfruit (*Passiflora mollissima* and *P. mixta*, Passifloraceae).

Jane Frohlich FrohlichJ@landcare.cri.nz

RECENT PUBLICATIONS

Advanced fermentation and formulation technologies for fungal antagonists

Sebastian Kiewnick
PROPHYTA Biologischer Pflanzenschutz GmbH, Inselstrasse12, D-23999 Malchow/Poel, Germany, www.prophyta.com

Abstract: To commercialize biological control agents an advanced technology to produce sufficient numbers of effective propagules in combination with a effective and stable formulation is essential for the success of a biological plant protection product. Based on the example of Contans®WG, a biological fungicide containing viable spores of *Coniothyrium minitans* for control of Sclerotinia diseases, considerations and requirements for a cost effective mass production of fungal antagonists are discussed.

Key words**: solid state fermentation, mass production, formulation, microscreen technology, *Coniothyrium minitans***

Introduction

For many years chemical pesticides have been extensively used to control insects, weeds and fungal and bacterial diseases. However, the growing awareness of the adverse effects of pesticides on the environment has resulted in more attention for biological control. Mitosporic fungi have been investigated with increasing interest by companies for the last 10 years (Jenkins et al., 1998). They can be potentially developed as biofungicides, bioinsecticides, bioherbicides and bionematicides. Several products on the basis of conidia produced by fungi have already been developed and are produced and sold by companies. Besides other factors, commercial success of biocontrol products depends on cost-effective mass production systems. Production usually aims on high yield of effective fungal spores or conidia since these are more stable compared to mycelium (Jackson, 1997).

For a commercial company, the development of a biological control product would involve many considerations that are identical to those for conventional pesticides (Auld and Morin, 1995). The commercialization of a biocontrol agent requires several steps, beginning with initial discovery and then proceeding through testing of efficacy, commercial production, large scale field testing followed by toxicology and environmental tests, registration, and marketing (Harman, 2000). Factors important for developing a biocontrol product also include the size and stability of the potential market. Any market considered for a biocontrol agent has to be big enough to justify the enormous costs for developing the basic research into a commercial product. Currently, the estimated costs for the registration of a biocontrol product in Europe and the United States are between 250.000 and 500.000 EURO (depending on the number of countries considered for registration).

One of the major considerations in developing a biocontrol product is the mass production of viable and effective propagules. Although, both solid state and liquid fermentation technology have been developed for scale up production, liquid fermentation technology is usually more readily available to industry. However, particularly for those fungi who lack the ability to sporulate in liquid culture or may not survive the liquid fermentation process, solid state fermentation offers a variety of advantages over liquid fermentation. Solid state fermentation (SSF) refers to the growth of microorganisms on moist solid substrates, usually of agricultural origin (grain, rice or waste products) without the presence of free liquid between substrate particles. The materials act as the main source of nutrients and the organisms release enzymes for breaking down and modifying the solid materials. Generally, SSF is the preferred production method since most fungi sporulate well on solid substrates and therefore SSF produces fungal biocontrol agents of better quality than liquid fermentation (Silman et al, 1993).

PROPHYTA Biologischer Pflanzenschutz GmbH has developed a solid state fermentation technology that has overcome several of the disadvantages which used to be associated with SSF. Contamination free growth conditions for long period of time allows fermentation of even slow growing fungi. Fermentation parameters such as moisture and temperature can be controlled and monitored. Metabolic heat which is generated during fungal growth is easily removed from the system which is essential for large scale operations. Mass transfer into the solid phase is no longer limited to diffusion especially with large substrate particles. Furthermore, exchange of O_2 and CO_2 is not limited even when high biomass is attained. Additionally, SSF is advantageous to liquid fermentation due to low capital investment, energy requirements and in general a low waste output. The media used for SSF are often cheap and simple and their low water content during fermentation reduces the risk of contamination. SSF offers conditions for fungal growth which are similar to the natural habitats of the fungi and all types of propagules can be developed. In particular, aerial conidia can easily develop and proliferate on the surface of the solid matrix. However, once a high yield of fungal propagules was achieved, recovery was often difficult since the substrate had to be part of the end product. This inevitably lead to bulkier products

which are more expensive to store and transport and more difficult to apply. In contrast, propagules from submersed fermentation are relatively easily recovered through filtration or centrifugation (Auld and Morin, 1995).

To overcome the obstacle of reduction of material bulk and division into particles able to pass spray nozzles, a proprietary microscreen technology, developed by PROPHYTA Biologischer Pflanzenschutz GmbH offers an advanced production system for filamentous fungi. In a continuos system, spores or conidia are separated from the solid substrate. The system has a high through put of 20kg substrate per hour and a high precision of the particle size. The obtained suspension of spores/conidia is concentrated afterwards sprayed onto a carrier in a fluidized bed dryer. End product is a waterdispersible granule (WG) formulation which is very user friendly and can be applied using standard spraying equipment since it dissolves very rapidly in water. The combination of these advanced technologies allows a cost effective annual production of 150 to 300 tons of product with a concentration of 1 x 10^9 viable spores per gram. Formulation technology is one of the key issues in successful commercialization of biocontrol agents. It has to be considered at all stages from production to its action on the target (Jones and Burges, 1999). Advanced formulations can restore activity or even increase efficacy against pathogens.

Table one shows the calculated costs per hectare of a biological control agent using the example of the product Contans®WG based on the spores of the antagonistic fungus *Coniothyrium minitans*. The end user price depends on the yield of spores per gram substrate and the effective rate of spores per ha to achieve sufficient control of the target disease *Sclerotinia sclerotiorum*. The calculation is based on the following parameters. Production in 20 solid state fermenter units with 200 kg substrate each and a production cycle of 28 days. The antagonist yield is 3 x 10^{12} spores per kg substrate and the end product (waterdispersable granule) contains 1 x 10^{12} viable spores per kg. Based on the application rate of 2 kg per ha for control of Sclerotinia disease on oilseed rape in Germany, the end user price is DEM 73.60 per hectare.

Table 1.: Example of a calculation of the end user price in DEM per ha for the biological fungicide Contans®WG (*Coniothyrium minitans*) depending on the effective rate of spores per hectare and the yield of spores per kg fermenter substrate using an advanced solid state fermentation technology

	Yield of spores per kg substrate			
Rate/ha	1 x 10^{12}	2 x 10^{12}	**3 x 10^{12}**	4 x 10^{12}
1 x 10^{12}	110.40	55.20	36.80	27.60
2 x 10^{12}	220.80	110.40	**73.60***	56.20
4 x 10^{12}	441.60	220.80	147.20	112.40
8 x 10^{12}	883.20	441.60	294.40	224.80

*) current end user price per ha for control of *Sclerotinia sclerotiorum* in oilseed rape in Germany

References

Auld, B.A. & Morin, L., 1995: Constraints in the development of bioherbicides. Weed Technology. 9: 638-652.

Harman, G.A., 2000: Myths and dogmas of biocontrol. Plant Dis.84: 377-393

Jackson, M.A. 1997: Optimizing nutritional conditions for the liquid culture production of effective fungal biocontrol agents. J. Ind. Microbio. Biotechnol., 19: 180-187

Jenkins, N.E., Heviefo, G., Langewald, J., Cherry, A.J. & Lomer, C.J., 1998: Development of mass production technology for aerial conidia for use as mycopesticides. Biocontrol News and Information. 19: 21-31

Jones, K.A. & Burges, H.D. 1999: Technology of formulation and application. in: Formulation of microbial biopesticides: Beneficial microorganisms, nematodes and seed treatments. Edited by Burges, H.D. Kluwer Academic publishers, Dordrecht. pp. 7-30

Silman, R.W., Bothast, R.J. & Schisler, D.A., 1993: Production of *Colletotrichum truncatum* for use as a mycoherbicide: effects of culture drying and storage on recovery and efficacy. Biotech. Adv. 11: 561-575

Canadian Forest Service- Pacific Forestry Centre

Refereed Journal Publications & Patent-1999/00:

1. Shamoun, S.F. 1999. The occurrence and assessment of fungal parasites as potential biological control agents of western hemlock dwarf mistleoe. Phytopathology 89: S 71.
2. Ramsfield, T.D., Shamoun, S.F., and van der Kamp, B.J. 1999. Fungal parasites of lodgepole pine dwarf mistletoe in British Columbia. Can. J. Plant Pathol. 21: 204.

3. Shamoun, S.F. and Oleskevich, C. 1999. Fusarium avenaceum and its use as biological control agent for Rubus spp. U.S. Patent # 5,985,648.
4. Ramsfield, T.D., Shamoun, S.F., Punja, Z.K. and Hintz, W.E. 1999. Variation in mitochondrial DNA in the biological control agent Chondrostereum purpureum. Can. J. Bot. 77: 1490-1498.
5. Deeks, S.J., Shamoun, S.F. and Punja, Z.K. 1999. Tissue culture of parasitic plants- Methods and Applications in Agriculture and Forestry. In Vitro Cellular Development-Biol.-Plant Journal 35: 369-381.
6. Shamoun, S.F. and Sieber, T.N. 2000. Colonization of leaves and twigs of Rubus parviflorus and Rubus spectabilis by endophytic fungi in a reforestation site in British Columbia. Mycol. Res. 104(7): 841-845.
7. Shamoun, S.F., Countess, R. E., Vogelgsang, S. and Oleskevich, C. 2000. The mycobiota of Salal (Gaultheria shallon) collected on Vancouver Island and the exploitation of fungal pathogens for biological control. Can. J. Plant Pathol. 22: 192.
8. Kope, H.H. and Shamoun, S.F. 2000. Mycoflora associates of western hemlock dwarf mistletoe plants and host swellings collected from southern Vancouver Island, British Columbia. Can. Plant Disease Survey 80: 144-147.
9. Deeks, S.J., Shamoun, S.F. and Punja, Z.K. 2000. In vitro germination and development of western hemlock dwarf mistletoe (Arceuthobium tsugense subsp. tsugense). Plant Cell, Tissue and Organ Culture (In press).
10. Deeks, S.J., Shamoun, S.F. and Punja, Z.K. 2000. A histopathological study of infection of germinated seeds and callus of western hemlock dwarf mistletoe by Nectria neomacrospora (Anamorph:Cylindrocarpon cylindroides and Colletotrichum gloeosporioides in dual culture. Inter. J. Plant Sci. (In press).
11. Ramsfield, T.D., Shamoun, S.F., van der Kamp, B.J. 2000. Factors related to seed production by lodgepole pine dwarf mistletoe. Can. J. Plant Pathol. 22: 199.
12. Shamoun, S.F. and Oleskevich, C. 2000. Biological control of Rubus spp. in conifer regeneration sites. Can. J. Plant Pathol. 22: 192.
13. Hintz, W.E., Becker, E.M. and Shamoun, S.F. 2000. Development of genetic markers for risk assessment of biological control agents. Can. J. Plant Pathol. (In press).

If you are interested in obtaining other refereed journal publications, conference proceedings, workshops publications for Dr. Shamoun , please, visit the web site of the Pacific Forestry Centre (PFC) at http://www.pfc.cfs.nrcan.gc.ca
Click on "Book store", type the option: Author: Shamoun, then you can request any of the published manuscripts listed above for 1999/00, or other publications by Dr. Shamoun since 1989, directly from "PFC Book store".

(Shamoun, Simon sshamoun@PFC.Forestry.CA)

ANNOUNCEMENTS

TOP

NEW COST ACTION

PARASITIC PLANT MANAGEMENT IN SUSTAINABLE AGRICULTURE

A new action has been proposed and recently accepted by the European Commission. This action, named “Parasitic plant management in Sustainable agriculture” will be COST 849, and will start as soon as five European Countries will sign the proposal.
The proposal has been presented by: Dr. Diego Rubiales, with the contribution of some European Scientists.
Below is the name of the proposing scientist and his address:
Dr. Diego Rubiales
Institute of Sustainable Agriculture, Consejo Superior Investigaciones Científicas – CSIC, Apdo. 4084, E-14080 Córdoba, Spain
Telephone 34 957 499215 - Fax 34 957 499252 - e-mail: ge2ruozd@uco.es.

Maurizio Vurro ma.vurro@area.ba.cnr.it

EDITOR'S CORNER

TOP

Dear all,

thanks once more to all the “aficionados” who sent their contribution to the Newsletter. To say the truth, despite the efforts to improve the bullettin preparing the new WEB site (http://ibg.ba.cnr.it) where you can see and download previous issue of the newsletter, and with the pages enriched with images sent by you, and despite the tentative to use our mailing list as “discussion group list”, the contributes to this issue resulted to be quite few. So, what’s happening? I know that we all are always busy and often abroad, but I believe all can find half a hour every six months to send a contribute, a note on a new project or the abstract of a new paper, or a slide showing some interesting results. I still believe our bullettin and mailing list is or could be the best tool for exchanging information among scientists from all over the world, working on different aspects of weed biocontrol. If you agree, please help the IBG newsletter. If no, maybe this will be my last editor’s corner.

Thanks for the attention. I wish you all the best from a scientific and personal point of view.

Maurizio Vurro

Annual Meeting Registration

S-268 Regional Working Group
Evaluation and Development of Plant Pathogens for Biological Control of Weeds

March 18-20
U.S. Horticultural Research Laboratory
Fort Pierce, Florida

Name_____

Affiliation_____

Address _____

_____

Phone _____

Fax _____

Email _____

Meeting Attendance (Registration) **$90.00**

(Registration includes the opening reception on March 18th, Continental Breakfasts and Lunches on March 19th and 20th.)

Optional Tours

A tour of the USDA Laboratory Facility, USDA Research Farm, and Header Canal Alternative Production Systems Farm are included in the agenda of the meeting. These tours are free.

Adam's Ranch Tour of "Old Florida"
(March 20th afternoon, includes a BBQ dinner at the ranch) **$30.00**

Total _____

Please circle the $30.00 if you are interested in the optional tour. Registration can be paid for with cash or check. Checks should be made out to Erin Rosskopf with S-268 in the note line. You can mail your registration with payment (please don't send cash in the mail) or by FAX and you can pay when you arrive. If you send by FAX and find that you are unable to attend, please notify me by February 23 so that we do not pay for food or meeting facilities that are not necessary. If you are interested in having transportation from the West Palm airport, please give your flight information on the second page. We will try to arrange this where necessary.

If sending by regular mail:

Erin Rosskopf
USDA, ARS, USHRL
2001 South Rock Road
Fort Pierce, FL 34945
TEL: 561-462-5887 FAX: 561-462-5986

I am interested in transportation from the West Palm Beach Airport:

Name_____

Phone_____

Email_____

Arrival Time on Sunday, March 18th_____

Airline and Flight Number_____

Departure Time on March 20th_____

Departure Time on March 21st_____