HAUSTORIUM

Parasitic Plants Newsletter

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IPPS UPDATE

The Next Meetings of the International Parasitic Plant Society (IPPS)

The Society, which started activity at the International Parasitic Weed Symposium in Nantes, is now preparing two scientific meetings: (1) a Parasitic Weeds Workshop in Durban (South Africa) which is due for late June 2004, and an International Congress on Parasitic Plants in 2006. In addition, we are negotiating the possibility of organizing a workshop on mechanisms of parasitism in *Orobanche*, in conjunction with a COST meeting.

(1) IPPS Workshop on Parasitic Weeds (IPPSW)

The Workshop will take place in Durban (South Africa) in collaboration with the International Weed Science Congress (IWSC) that is due on June 19-25, 2004. The exact dates of the Workshop are still under negotiations and will be published soon, together with a call for papers. The preliminary plan for the IPPS Workshop is:

Thursday 24 June 2004.

Plenary lecture on **The parasitic weeds problem and its fate in the 21st century**.

Workshop on ***Striga* management in various cropping systems**. This workshop is open for contributions.

Poster session on **Parasitic weeds,** including discussion of selected contributions.

A special session on **Progress in parasitic weed research**, with review lectures on:
i. Understanding key developmental processes in parasitic weeds.
ii. New methodologies for the management of parasitic weeds.
iii. Mechanisms of resistance and their application in susceptible crops.
iv. Demography of parasitic weeds and its impact on management.

Friday 25 June 2004.

Workshop on **Genetic variation in parasitic weeds.** This workshop is open for contributions.

Workshop on **Molecular and physiological aspects of parasitic plants development.** This workshop is open for contributions.

The program of the IPPSW and the IWSC are complementary, so that participants in both meetings will have the opportunity to discuss parasitic weeds within the wider scope of weed biology and control, and benefit from both.

(2) The International Parasitic Plants Congress (IPPSC)

The IPPS Congress will take place in 2006, and will cover all aspects of the biology and control of parasitic plants. Special sessions will be dedicated to the mistletoe problem, to root parasites, to mechanisms of parasitism, to novel aspects of the management parasitic weeds, and to many other aspects of parasitic plant biology and management. The exact dates and venue for the Congress and a call for papers will be published in due course.

Danny Joel, IPPS Secretary
dmjoel@volcani.agri.gov.il

SYMPOSIUM IN USA, 2004

Preliminary plans are under way for a one day symposium on parasitic plants to be held in August 2004 at Snow Bird, Utah as part of the annual Botanical Society of America meeting. The theme is 'After the book--Parasitic Plant Biology After Three Decades'. Our understanding of parasitic plants has advanced remarkably since the appearance of Job Kuijt's 'Biology of Parasitic Flowering Plants' in 1969, the starting date of modern research on the topic. The object of this symposium is to review progress, highlight major contributions, and discuss avenues for further investigations. Further information available from:

Lytton Musselman lmusselm@odu.edu

COVER CROPS AND ORGANIC RESIDUES FROM TREES FOR REDUCING *STRIGA HERMONTHICA* IN SORGHUM

An integrated approach including the use of tolerant cultivars and adequate cultural practices can help limit the damage caused by *Striga hermonthica* on cereal crops. Could cover crops be a component of such an approach?

The use of organic residues, as well as land management based on rotation and association with nitrogen-fixing legumes, are among the cultural practices that have been proposed to help control *S. hermonthica* infestation. This led us to undertake a study on the effect of organic residues from leguminous and non-leguminous trees and crops on *S. hermonthica* infestation in sorghum.

In a field experiment conducted in collaboration with the Institute of Rural Economy, in Mali, a one-year rotation with *Canavalia ensiformis*, *Cajanus cajan* or a natural fallow did not reduce *S. hermonthica* infestation, as compared to monocropping of sorghum (control). However, the rotation with *C. ensiformis* doubled sorghum yield as compared to control.

The effect of organic residues from various tree species on the sorghum-witchweed interaction has also been tested in pot experiments. Adding 2 g of ground leaves from either *Gliricidia sepium* or *Vitellaria paradoxa* (shea nut) in the top soil of 10-cm pots resulted in a significant decrease in the number of emerged *S. hermonthica* as compared to control. A better growth of infested sorghum was also observed when adding ground leaves from either *Azadirachta indica* (neem), *G. sepium* or *Cassia siamea*, although it remained significantly lower than the growth of non-infested sorghum.

These results indicate that the use of organic residues from species such as *C. ensiformis* and *G. sepium* could eventually help control the damage caused by *S. hermonthica* in sorghum. As pointed out by Rao and Gacheru (1998), increased microbial activity following the incorporation of organic residues could affect witchweed emergence. While reducing *S. hermonthica* infestation, organic residues would also help restore soil fertility, thus promoting sorghum growth.

Reference: Rao, M.R. and E. Gacheru. 1998. Agroforestry Forum 9: 22-27.

For more information, please contact:

A. Létourneau, M.-P. Dubé and A. Olivier : Département de phytologie, Université Laval, Québec, G1K 7P4, Canada. Alain.Olivier@plg.ulaval.ca
K. Coulibaly, Institut d'économie rurale, B.P. 186, Sikasso, Mali.

UPDATE ON THE *DESMODIUM* INTERCROP TECHNIQUE FOR *STRIGA* CONTROL

During a visit to Kenya in February, I was fortunate to have the opportunity to visit the ICIPE (International Centre of Insect Physiology and Ecology) headquarters in Nairobi and their substation at Mbita Point on the shores of Lake Victoria, where the 'push-pull' techniques for control of stalk borers and *Striga* have been developed over the past 5-6 years in collaboration with Rothamsted Research, UK, with funding from the Gatsby Charitable Foundation. In the case of stalk borers both push and pull are involved, the push from the repelling affect of an intercrop such as *Desmodium uncinatum* (silver-leaf desmodium) or *Melinis minutiflora* (molasses-grass) and the pull by attraction of adult moths to *Pennisetum pupureum* (napier-grass) grown around the field borders (see the web-site listed below for further background). Control of *Striga* involves just the *Desmodium*. Dr Zeyaur Khan kindly arranged my visit to Mbita Point where irrigation is used during the dry season to maintain plots for demonstration purposes. Here I was duly impressed by the performance of *Desmodium* not only in almost totally suppressing emergence of *S. hermonthica* but also in increasing soil fertility and the vigour of the maize crop through nitrogen fixation. Equally impressive were pot experiments in screen houses which vividly demonstrate how the suppressive effect on *Striga* is quite independent of the increase in nitrogen status. The direct effect on *Striga* is being described as allelopathic, as the *Striga* seedlings cease growth soon after germination, but we await more detail of the laboratory studies, such as those reported in Dr Tsanuo's thesis (see abstract below), which show that premature haustorial initiation is involved, thus involving a stimulatory as well as an inhibitory process.

I was particularly interested to learn some aspects of the technique which had not been clear to me from the available literature. Although it has been explained that *D. uncinatum* is a perennial, I had not appreciated that the technique ideally involves the maintenance of the *Desmodium* rows over many years, with maize being repeatedly planted into the inter-rows. And while a benefit in both *Striga* suppression and maize growth may be recorded in the first season after establishment, there is a cumulative effect on soil fertility which is very striking indeed after 3-5 years. This fulfils the widely endorsed thesis that for sustainable control of *Striga* there must be improvement in soil fertility as well as suppression of the *Striga* itself. It also means that the cost of seed and planting the legume is only incurred in the first year. Conversely there are the disadvantages that climatic conditions have to be such that the legume survives any dry seasons, and furthermore, the legume plantings have to be protected against grazing, especially during the dry season, by fencing if necessary. Many local farmers are none-the-less adopting the technique and a number are finding that the availability of the legume helps them to maintain a dairy cow which in turn helps cover any additional costs of fencing. Promotion of the technique in Kenya and Uganda is continuing to be supported by Gatsby Charitable Foundation and is currently receiving additional support in the form of a UK DFID (Department for International Development)-funded project involving ICIPE, Rothamsted Research and a number of other Kenya-based institutions, including a local company who will be producing *D. uncinatum* seed. Farm Africa are also hoping to initiate work in Tanzania. We congratulate ICIPE and their collaborators on this promising development and look forward to hearing news of further progress.

Chris Parker.

SIPWEMA
AFRICA-WIDE PARTNERSHIP TO COMBAT *STRIGA* AND *OROBANCHE*

An Africa-wide partnership project called "Sustainable integrated parasitic weed management in cereal-legume production systems in Africa", with the sweet African sounding acronym "SIPWEMA" is in the wings. SIPWEMA is a time-bound initiative of 12 pioneering countries in North, West, Central, East and Southern Africa, the CGIAR System-wide Program on Integrated Pest Management (SP-IPM), FAO Agriculture Departmental Group of the Regional Office for Africa (FAORAFA), Pan-African *Striga* Control Network (PASCON), Semi-Arid Food Grain Research and Development (AU/SAFGRAD) program of the African Union, and the Global IPM Facility. After planning workshops in Benin in October, 2002 and Morocco in March 2003, these key partners are dedicated to develop a 6-year programme which will break isolation barriers amongst themselves to bring benefits of prior research and outreach activities to reduce staggering cereal and legume food deficits caused by parasitic weed infestations in the production systems.

The parasitic weed problem is intimately associated with changes in intensity of land use. As population pressure has increased, subsequent demand for food production has increased, and land use has intensified. This intensification is reflected in greater use of cereal mono-cropping with little fallow to non-host crops. As a result, the extent and intensity of parasitic weed infestations have rapidly increased and become threats to food production. Over the years, research has provided sound knowledge-base on cropping systems and crop and land management practices that increase food production while repressing parasitic weeds, but has so far had limited impact at the farm level. In North Africa, for example, *Orobanche* attacks a wide range of key food legumes crops causing estimated

average annual losses of up to US $15 million in individual countries. In West and Central Africa, *Striga* attacks a wide range of stable cereals and legumes causing estimated annual cereal losses of US $5 to 7 billion, affecting over 100 million people. *Striga* epidemic is a primary biotic constraint to maize production in Southern Africa countries. Drastic changes in the production practices are therefore required to reduce losses by means friendly to human health and the environment.
To be sustainable, parasitic weed management practices must improve crop yield, improve soil fertility and be acceptable to farmers even in the absence of parasitic weed infestation. Towards this end, the SIPWEMA focus is on local capacity building to ensure rapid spread and farmer adoption of parasitic weed management practices Africa-wide. The short term aim of SIPWEMA is to reduce parasitic weed incidence and damage by at least 60% in a large number of farmers' fields; in the medium term the project aims to increase cereal and food legume crop yields by 20-40% over current farmers' practices; and in the long-term SIPWEMA aims to significantly reduce parasitic weed seed bank and remove land and soil degradation factors which aggravate the parasitic weed damage to crops. Drastic changes in the production practices are therefore required to reduce losses by means friendly to human health and the environment.

SIPWEMA is building on several prior and on-going initiatives by national governments, sub-regional networks and research organizations to address a common challenge: develop a field program that breaks isolation barriers, promotes inclusive partnerships, and focuses on action by the participating countries to increase stakeholder ownership of processes and results and produce impact at the community level. Building on prior inter-African initiatives, SIPWEMA provides a coordinated platform for the key players to harmonize approaches, exchange of information, expertise, technical resources, and extrapolate proven results and experiences to new locations. Working through regional, national and local focal points, SIPWEMA will harness complementary strengths of stakeholder groups to bring results of prior research to enhance farmers' capacity to manage the parasitic weed problems against which traditional coping strategies continue to be ineffective. SIPWEMA will search for proven parasitic weed management options, adapt, harmonize, and promote the options. The activities will be driven by technical innovation, cohesive partnerships, and change in attitude across a broad spectrum of stakeholders. SIPWEMA implementation is through a set of horizontal rows of sub-regional activities to underpin vertical columns of a complementary set of location-specific activities in participating countries. Location-specific activities will be contingent upon and incremental to underpinning regional activities; subject to modular funding, the activities will be extended to countries requesting assistance.

Over six years SIPWEMA will empower farmers in 28 countries to obtain highest return on production inputs and thereby contribute significantly to household and national food security and economies which are increasingly undermined by damaging infestations of the parasitic weeds. The primary beneficiaries are African men and women farmers with their immediate technical support groups. These partners will benefit from reduced pest load, increased capacity to manage cereal-legume production systems for higher and stable productivity and profitability, and foster healthy production environments. Community-based feedback mechanisms will allow research organizations to re-define research agenda in a bottom-up manner to respond to emerging issues from the farmers' field experiences, and strengthen international collaboration. The project's exit strategy centres on capacity-building to increase scientific literacy in farming communities, and promote participatory extension to scale out/up gains and benefits.

Braima James, SP-IPM Coordinator, IITA, Cotonou, Benin. B.James@cgiar.org

On behalf of the nucleus of SIPWEMA partners: PASCON (pascon1@yahoo.com), AU/SAFGRAD (ouattaram.safgrad@cenatrin.bf), FAORAFA (Sulayman.MBoob@fao.org), and Global IPM Facility (Peter.Kenmore@fao.org).

COST 849

Dr Diego Rubiales reports that COST 849 activities have been severely limited over the past year owing to changes in EU administration and associated budgetary restrictions. There have been no further meetings since that in

Obermarchtal in July 2002 but one is now planned for Greece in September, 2003. Abstracts of the papers presented at the meetings in Bari, Sofia and Obermarchtal may be seen on the COST web-site (see below). The titles of those presented at Sofia and Obermarchtal appear below under Proceedings of Meetings. Hard-copy proceedings will **not** be available.

OROBANCHE IPM IN NEAR EAST AND NORTH AFRICA

An expert consultation meeting was jointly organized by ICARDA, FAO and INRA, Morocco on IPM for *Orobanche* in food legume systems in Near East and North Africa in Rabat, Morocco , 7-9 April, 2003. The main objective was to develop a project proposal on *Orobanch*e control for possible funding. Participants from 10 countries (Egypt, Ethiopia, Sudan, Iran, Syria, Turkey, Algeria, Morocco, Jordan and Tunisia), and representatives from ICARDA, FAO and Germany attended the meeting. It was indicated that FAO encourages regional activities to control this parasite through participatory approaches in the form of Farmer Field Schools. The topics presented in the meeting included: Country reports on *Orobanche* control, development of technologies for *Orobanche* management, biological control, and the status of the overall scenario on *Orobanche* control. Towards the conclusion of the meeting, the participants formulated a log frame for the proposed project on *Orobanche* IPM in the food legumes systems of the Near East and North African region. Proceedings of the meeting will be published in the near future.

B E Abu Irmaileh
Facuty of Agriculture, Amman, Jordan
barakat@ju.edu.jo

RETIREMENT

Chester L. Foy retired on July 1, 2002 after more than 50 years of distinguished academic service in research, teaching, extension and administration at three major Land Grant institutions. He served the last 36 years as Professor of Plant Physiology/Weed Science at Virginia Tech, including six years as Department Head.

Dr. Foy has been extremely active in international scholarship, including parasitic plant research. He participated in five International Symposia on Parasitic Plants, and in two Workshops on *Orobanche* Research. In addition to other work on parasitic plants, Foy served as Scientific Coordinator for a 4-year, tri-national, $3 million US AID MERC Project for collaborative research on *Orobanche* research with colleagues in Israel and Egypt. He is a charter member of the International Weed Science Society (IWSS) and later served as President of IWSS. He presided over the First International Weed Congress in Australia and participated in the Second and Third Congresses.

Consistent with his international research interests, Foy has directed M. S. and Ph. D. students from 14 different countries. He has hosted a number of international postdoctoral researchers, Fulbright Scholars, and other Visiting Scientists, e.g. from Israel, India, Lebanon, Jordan, Iraq, Spain, The Philippines, Germany, and others for shorter visits. Moreover, he has traveled extensively, often by invitation, and has presented lectures in countries throughout the world.

Foy has also been very active in the Weed Science Society of America (WSSA) and other professional and honorary organizations during his career. He served as President of the WSSA and was named a WSSA Fellow in 1980. He was Editor of “Reviews of Weed Science” for 5 years, is a charter member of the Editorial Board of “Pesticide Biochemistry and Physiology”, and in 2002 completed 12 years as Editor of “Weed Technology”.

In addition to honors from WSSA, Foy has received numerous honors and awards in recognition of contributions to his scientific disciplines and professional leadership. For his work in international agriculture, Foy received the IWSS Outstanding Achievement Award – Developed Countries, and the ‘International Award for Distinguished Achievement in Agriculture’, presented by Gamma Sigma Delta, the Honor Society of Agriculture (He is the first weed scientist to receive this honor).

Dr. Foy retires leaving behind not only a legacy of outstanding and unselfish service to the university and his profession, both nationally and internationally, but a named scholarship fund as well (Please contact the Development Office, College of Agriculture and Life Sciences, Virginia Tech, 104 Hutcheson Hall, Blacksburg, VA 24061, or phone 540-231-5546 to inquire about the fund). He will remain affiliated with Virginia Tech as a Professor Emeritus. In retirement, he and his wife Betty will devote their new life to family, travelling, church and community service, and other interests. They will continue to reside at 607 Landsdowne Drive, Blacksburg, VA 24060 and may be reached by e-mail at cfoy@vt.edu.

PP LISTSERVE (OUT) – Pp DIGEST (IN)

Further to the note in Haustorium 41, there is another change to report. The PP Listserve has moved again and re-named itself the Pp Digest. It is apparently intended to function exactly as before. Do please consider using it for exchanging/requesting information on any aspect of parasitic plants. If you subscribed to the Listserve you will have already heard that you were automatically transferred to the new mailing list. For general information and instructions for new subscribers, please go to: http://omnisterra.com/mailman/listinfo/pp_omnisterra.com

SANDALWOOD RESEARCH NEWSLETTER

Newsletter No 17 includes three papers on *Santalum* species, listed below under Lethbridge, 2003, Angadi *et al*., 2003, and Jain *et al*., 2003.

N.B. Yet another change of contact address. Jon Brand is still Editor but has moved to Forest Products Commission, MidWest Sharefarms, Lot1 / 260 Kalamunda Rd., South Guildford WA 6055, Australia; email jonb@fpc.wa.gov.au

THESES

Muniru Khamis Tsanuo (PhD, Jomo Kenyatta University of Agriculture and Technology, Nairobi, 2001) Studies on *Striga*-affecting semiochemicals associated with root exudates of *Desmodium uncinatum*.

This study was carried out to establish the role of semiochemicals in striga (*Striga hermonthica* (Del.) Benth.) (Scrophulariaceae) suppression by desmodium (*Desmodium uncinatum* (JacQ.) DC.) (Fabaceae) in maize (*Zea mays* L.) (Poaceae)/desmodium intercrop and to isolate and identify some of the semiochemicals involved.

Three hypotheses with respect to the role of semiochemicals were initially investigated: (i) that desmodium produces germination inhibitors; (ii) that, like other legumes, desmodium produces germination stimulants, but attempts to attach on desmodium by striga induces production of antagonists (inhibitors); and (iii) that, in addition to germination stimulants, inhibitors are also produced by desmodium and that may inhibit haustorial growth and/or its attachment to the host (maize).

To test hypotheses (i) and (ii), the germination level of *S. hermonthica* exposed to desmodium root exudates and/or maize root exudates was compared. No significant difference in striga germination was observed. The germination activity of *D. uncinatum* exudates on *S. hermonthica* was independent of striga density in the soil and comparable to that of maize exudates. Thus hypotheses (i) and (ii) were rejected.

Further observations revealed that the aqueous exudate of desmodium inhibits haustorium growth and initiates (premature) upper haustorium formation of the germinated striga seeds. These effects account for striga suppression by desmodium. Thus unlike other legumes, which act simply as false hosts of striga, desmodium interferes with the attachment of germinated striga seeds on the hosts present in the vicinity.

Germination stimulants and haustorium growth allomones of striga seeds were recovered continuously from the aqueous root exudates of a large number of *D. uncinatum* seedlings in a hydroponic device. Water was continuously pumped through an absorbent from which the compounds were later desorbed with methanol. Of the three absorbents tested (activated charcoal and bonded reverse phase C-18 and C-8 silica) C-18 silica was found the best and was used for large scale trapping of the compounds.

The extract desorbed with methanol was analysed by High Performance Liquid Chromatography (HPLC). Fractions from the eluent were collected and bioassayed on striga seeds. The allomones eluted earlier on reverse phase C-18 silica (more polar) than the germination stimulants (less polar). A bioassay-guided fractionation of germination stimulating fractions indicated the presence of not less than five active components, of which the following two novel compounds were isolated and characterized.: (a) 4”,5”-dihydro-5,2’,4’-trihydroxy-5”-isoprenylfurano-(2”,3”;7,6)-isoflavone; and (b) 5,7,2’,4’-tetrahydroxy-6-(3-methylbut-2-enyl)-isoflavone. The first stimulated the germination of *S. hermonthica* while the second was inactive on its own. The former isoflavone represents the first compound of its class to show striga germination property.

Qualitative HPLC analysis, aided by on-line ultraviolet scan, showed that the above two compounds are absent in maize exudates.

In parallel, large-scale extraction of macerated desmodium roots was also undertaken using acetone and dichloromethane. Both extracts were found to induce germination of *S. hermonthica*. The acetone extract gave higher haustorium inhibition activity than the dichloromethane extract while the latter had higher germination activity, confirming bioassay results from hydroponic fractions that growth allomones were relatively more polar than the germination stimulants. The acetone extract was subjected to chromatographic fractionation on Florisil (magnesium silicate). Activities of the fractions were monitored using striga germination and haustorium growth assays. Again, germination activity was highest on the mid-polar fractions while haustorium growth activity was mainly found in polar fractions. The active fractions were further fractionated by semi-preparative HPLC and two very active sub-fractions that induced germination of *S. hermonthica* were obtained. No structural analyses were possible on the amounts isolated. Chromatographic fractionation of dichloromethane extract led to the isolation of a weak germination stimulant, 5,7,2’,4’-tetrahydroxy-6-(3-methylbut-2-enyl)-isoflavone and 5.7.4’-trihydroxyisoflavone (genistein). Partial structure of the germination stimulant is presented.

HPLC analysis of the allomone containing fractions, from both aqueous exudates and organic extracts showed these to be intricate mixtures of compounds. To date no pure component has been isolated in sufficient amount for structural analysis. The isolation of sufficient amount of individual components with a variety of chromatographic techniques should be a priority in follow-up activities.

The results provide evidence that semiochemicals play a role in the suppression of striga in maize/desmodium inter-crop. Desmodium root exudate contains both germination stimulants and haustorium allomones. This blend of compounds initiates the germination of striga and at the same time disrupts the normal growth of germinated seeds thus preventing (or interfering with) successful attachment on host roots.

E M Kunjo (PhD, The University of Reading, 2002) Integration of socio-economically appropriate management strategies for *Striga hermonthica* in the Gambia.

Striga hermonthica severely constrains coarse grain production in the Gambia. Integrated *Striga* control trials involving crop rotation, fertility enhancement and catch cropping were carried out in 1997 and 1998 at Mankamang Kunda and Kaiaf. These sites represent Eastern and Western Gambia, respectively. Effectiveness was assessed by reduced infestations, improved crop yields, financial returns, and in the longer term by depletion of the *Striga* soil seed bank.

Using Participatory Rural Appraisal tools, surveys of farmers at both sites revealed that infestations were partly due to cereal monocropping and lack of fertilisers and herbicides. Farmers also knew the benefits of hand pulling *Striga*. To improve fertility, farmers, especially in eastern Gambia, could tether livestock in the fields.

When root exudates of potential trap crops were screened in vitro for their ability to stimulate germination of one Gambian biotype of S. *hermonthica* , cotton stimulated most (51 to 57%), while cowpea caused only 38% germination. Trap cropping combined with tethering of livestock at night during the dry season in cereal fields and hand-pulling *Striga* before seed shedding, depleted the *Striga* soil seed bank by 92% and 86 % compared to 53% to 72% depletion with unfertilized continuous cropping over two wet seasons at Mankamang Kunda and Kaiaf, respectively. By contrast, the common practice of monocropping unfertilised maize (Kaiaf) or sorghum (Mankamang kunda) without *Striga* control by hand pulling increased the soil seed bank by 200%. Even with *Striga* control by hand-pulling at Mankamang Kunda, unfertilised sorghum monocropping only gave 53% depletion of the seed bank and financial returns were less than 25% of those with a cotton trap crop/sorghum rotation with livestock tethering. Hand pulling of *Striga* was also done and this clearly has a major impact on the depletion effects.

When financial returns, crop yields and infestations and soil seed bank depletion of *Striga hermonthica* were all taken into account, integration of organic fertility improvement, rotation with a trap crop and hand-pulling residual *Striga* may be socio-economically appropriate in the Gambia. Participatory farmer research and extension is needed to validate this proposal.

A.S. Mwakaboko (PhD, Catholic University, Nijmegen, 25 March 2003) Synthesis and biological evaluation of new strigolactone analogues as germination stimulants for the seeds of the parasitic weeds *Striga* and *Orobanche* spp.

This thesis deals with the synthesis and biological evaluation of new germinating agents for the seeds of the parasitic angiosperms *Striga* and *Orobanche* spp. So far only four naturally occurring germination stimulants, named strigolactones, have been isolated (strigol, sorgolactone, alectrol and orobanchol). These compounds have three structural rings in common, namely the C-ring, the connecting enol ether moiety, and the D-ring. This so-called bioactiphore has been shown to be responsible for the biological activity, and a molecular mechanism has been proposed that explains the triggering of germination at the receptor site. The structural features of the bio-actiphore have been used as a lead to the design of structurally simpler strigolactone analogues for possible application in the control of *Striga* and *Orobanche* in the field by suicidal germination. The bulk of the thesis involves the methodology of synthesis of numerous strigolactone analogues from a wide range of chemical starting points, and confirmation of their biological activity. In Chapter 9, a range of the more promising analogues are tested in pot experiments with *Striga* spp., confirming their high activity and stability in soil. The final chapter deals with the first successful field test using the formulated dimethyl analogue of Nijmegen-1 in controlling infestations of *Orobanche* spp. in tobacco. These studies allow the conclusion that the suicidal germination approach can be successfully applied as a control method for the reduction of seed banks of parasitic weeds in the soil. However, success is likely to be depenent on appropriate timing of application and on soil conditions. Further research on the use of synthetic germination stimulants is strongly recommended.

Mohan Devkota (PhD, Universität für Bodenkultur, Vienna, May, 2003.) Mistletoes of the Annapurna Conservation Area of the Central Nepal Himalayas diversity, distribution and biology.

In this work, the diversity, distribution and biology of the mistletoes of the Ananapurna Conservation Area, Nepal’s largest conservation area, with diverse geo-topographical features and rich floral diversity, were studied. A total of 12 mistletoe species, 8 from 5 genera in Loranthaceae and 4 from Viscaceae were documented from 95 host species in 45 angiospermic host families. Four species of mistletoe were recorded for the first time in Nepal. Mistletoes of the family Loranthaceae usually have a wide host range and are mostly generalists, whereas the Viscaceous mistletoes have a narrow host range and can be highly specific. Degraded marginal forests and sunny warm slopes below 3000m are suitable habitats for mistletoes. The irregular and patchy distribution of mistletoes is governed by three factors, forest structure, site mesoclimate and zoochore dispersal, which is in most cases the most important factor. Two bird species, *Aethopyga ignicauda* (fire-tailed sunbird) and *Dicaeum ignipectus* (fire-breasted flower-pecker) are important pollinators and dispersers, respectively. The haustorial systems within the genus *Scurrula* Linn. (Loranthaceae) were documented and classified. In the genus *Scurrula* there is only one basic type of haustorium: wood rose with epicortical roots, which remains basically unchanged regardless of host and elevation, with some deviations in the endophytic system in some of the species. Vegetative reproduction by the robust epicortical roots in the genus *Scurrula* is of common occurrence. Host branch size and the age of *S. elata* are important factors in determining the length of the epicortical roots. *S. elata* produces many secondary haustoria to overcome the haustorial resistance and produce more secondary shoots to replace its aging primary shoots. Infestation of *S. elata* does not bring any changes in the wood properties of its host *Rhododendron arboretum* Sm. despite competition for water in the host branch. The total leaf area and the total foliar dry mass in the infested branch of *R. arboretum* were reduced by the infection of *S. elata* but in similar sized uninfested and infested host branches the total foliage area and dry mass is in a similar range, following the pipe theory concept. Damage to the infested host branch occurs as a result of insufficient conductive area to supply both host and mistletoe. The theories of passive vs. active uptake of mineral nutrients were tested for the nutritional relationship between *S. elata* and its hosts. The foliage of *S. elata* consistently had higher contents of phosphorus and potassium compared to the host foliage. By comparing nutrient levels in host leaves on infested and uninfested branches no evidence of selective discrimination by the haustorial system could be detected. This supports the hypothesis of passive enrichment of phosphorus and potassium by entrapment. These elements are cycled between xylem and phloem in the host plant, but cannot escape the mistletoe back to the hosts's phloem. By source sink manipulation, i.e. the selective removal of competition within a mistletoe by pruning, the possible role of haustorial resistance was studied in *S. elata*. The data on growth and mineral nutrient content imply the haustorial resistance is not limiting in this species, which is fast growing and capable of producing abundant secondary haustoria.

PROCEEDINGS OF MEETINGS

Broomrape: biology and resistance. 2002. Edited by Rubiales, D., Verkleij, J. Batchvarova, R. and Joel, D. Joint meeting of EU COST 849 Working Groups 1 and 3, Sofia, March 14-18, 2002. One-page abstracts of the following papers are available on the COST website (see below).

Benvenuti, S. Knowledge of seedbank size, germination ecology and emergence dynamics as tools to improve *Orobanche* control strategy.

Fernández-Martínez, J.M. Inheritance of resistance to *Orobanche cumana* in sunflower.

Murdoch, A.J. and Kebreab, E. Seed ecology and crop resistance to *Orobanche*.

Aly, R. Crop protection against parasites/pathogens through expression of sarcotoxin-like peptide.

Bouwmeester, H. *et al*. Secondary metabolites in the signalling between parasitic weeds and host plants.

Jorrín *et al*. On the search of *Orobanche cernua* (sunflower broomrape) germination stimulants.

Wegmann, K. Phytoalexin biosynthesis.

Pérez de Luque, A. *et al*. Hypersensitive reaction and necrosis of *Orobanche crenata* tubercles in legumes: histological studies.

Plakhine, D. *et al.* The influence of temperature on *Orobanche* resistance.

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Haussmann, B.I.G. Strategies for the application of marker-assisted selection.

Bervillé, A. *et al.* Analysis for susceptibility/resistance to *Orobanche* using a set of sunflower recombinant inbred lines.

Koutoula-Sika, E. *Orobanche ramosa* control in tomato with herbicides or using transgenic glyphosate-resistant crop.

Integrated Control of Broomrape. 2002. Edited by Rubiales, D., Wegmann, K., Riches, C.R. and Vurro, M. Joint meeting of EU COST 849 Working Groups 2 and 4, Obermarchtal, Germany, 25-27 July, 2002. One-page abstracts of the following papers are available on the COST website (see below).

Boari, A. and Abouzeid, M. Progress in biological control of *Orobanche* in Italy.

Chrysayi-Tokousbalides, M. Fungal pathogens from naturally infected *Orobanche* found in Greece.

Klein, O. and Kroschel, J. Status quo of *Phytomyza orobanchia* research.

Tóth, P. and Cagán, L. *Phytomyza orobanchia* Kalt. on different species of *Orobanche* in Slovakia.

Dor, E. and Herschenhorn, J. *Fusarium solani* as a possible agent for broomrape control.

Joel, D.M. The *Phytomyza* status in Israel.

Gressel, J. *et al.* Enhancement of mycoherbicide effectiveness by genetics.

Cristofaro, M. Combining insects and fungi: a strategy to enhance parasitic plant biocontrol?
Vurro, M. Integration of fungal toxins with pathogens.
Amsellem, Z. *et al*. *Nep1* literally transforms a sleeping mycoherbicide into Rambos.
Müller-Stöver, D. and Sauerborn, J. Formulation and application of a potential mycoherbicide against *Orobanche cumana*.
Zermane, N. *et al*. Potential of rhizobacteria to control parasitic weeds of the genus *Orobanche*.
Murdoch, A.J. Impact of seasonal effects on parasitic weed model predictions.
Press, M.C. Implications of nitrogen relations for parasite growth models.
Boulet, C. *et al*. *Orobanche*- weeds relationships; an important aspect of broomrape control.
Manschadi, A.M. *et al*. Development of a parasite modue in APSIM – case study: the parasitic weed *Orobanche crenata* infesting fababean.
Kanampiu, F.K. *et al*. *Striga* control in maize using herbicide seed coating.
Del Grasso, C. *et al*. Potential use of systemic acquired resistance for broomrape control.
Simier, P. *et al*. Search for specific targets in *Orobanche* for chemical control.
Streibig, J.C. Assessing relative efficacy of Nijmegen 1 for *Stiga* control.
Wegmann, K. Control of broomrape by germination stimulants.
Vouzounis, N. and Ioannou, N. Management of *Orobanche* spp. in vegetable crops in Cyprus.
Pacureanu-Joita, M. Control of broomrape in Romania.
Nadler-Hassar, T. and Rubin, B. *Cuscuta* tolerates high rates of herbicides inhibiting amino acid biosynthesis.
Sla lov, S.B. and Prinsen, E. The role of plant hormones in the seed germination of plant parasite *Orobanche* spp.
Nadal, S. *et al*. Control of *Orobance crenata* in horticultural faba beans of determinate habit.
Rubiales, D. *et al*. Need to integrate several control methods to solve the broomrape (*Orobanche crenata*) problem in pea in southern Spain.
Herschenhorn, J. *et al*. Broomrape control in tomato and sunflower.
Arapis, G. Environmental impact of chemicals used for the broomrape control.
Macías, F.A. *et al*. Synthesis of sesquiterpene lactone modes as *Orobanche* cumana seed germination elicitors.
Kiesecker, H. Genetic engineering in grain legumes as a platform technology for parasitic weed control.

BOOK

The *Arabidopsis* Book. The use of *Arabidopsis* to study interactions between parasitic angiosperms and their plant hosts is described by Yaakov Goldwasser, Jim Westwood and John Yoder in a new WWW book published by the American Society of Plant Biologists (ASPB) at: http://www.aspb.org/publications/arabidopsis/toc.cfm Chapters in this virtual book will be added and updated as research progresses.

BOOK NEWS – NEW EDITION

A Technical Manual for Parasitic Weed Research and Extension. Edited by Jürgen Kroschel. (2001). Kluwer Academic Publishers, Dordrecht, The Netherlands. 292 pp. Now available in paper-back edition for Euro 70.00 (orders to orderdept@wkap.nl).

WEB SITES

For information on the International Parasitic Plant Society see: http://www.ppws.vt.edu/IPPS/

For past and current issues of Haustorium see: http://web.odu.edu/haustorium

For Lytton Musselman's Plant site see: http://web.odu.edu/plant

For Dan Nickrent's 'The Parasitic Plant Connection' see: http://www.science.siu.edu/parasitic-plants/index.html

For The Mistletoe Center (including a comprehensive Annotated Bibliography on mistletoes) see: http://www.rmrs.nau.edu/misteltoe/welcome.html

For information on activities and publications of the parasitic weed group at the University of

Hohenheim see: http://www.uni-hohenheim.de/~www380/parasite/start.htm

For on-line access to USDA Forest Service Agriculture Handbook 709 'Dwarf Mistletoes: Biology, Pathology and Systematics' see: http://www.rmrs.nau.edu/publications/ah_709/

For information on, and to subscribe to, PpDigest see: http://omnisterra.com/mailman/listinfo/pp_omnisterra.com

For information on the EU COST 849 Project and reports of its meetings see: http://cost849.ba.cnr.it/

For the Parasitic Plants Database, including '4000 entries giving an exhaustive nomenclatural synopsis of all parasitic plants' the NEW address is: http://www.omnisterra.com/bot/pp_home.cgi

For a description and other information about the 'Push-Pull' technique for *Striga* suppression, see: http://www.push-pull.net

LITERATURE

Adler, L.S. 2002. Host effects on herbivory and pollination in a hemi-parasitic plant. Ecology 83: 2700-2710. (*Castilleja miniata* parasitising *Lupinus argenteus* produced twice as many seeds as when parasitizing other host species. It was also less affected by moth, fly and mammal herbivores. Benefits could not be directly attributed to alkaloid content, but were influenced by greater nitrogen resources.)

Ahonsi, M.O., Berner, D.K., Emechebe, A.M. and Lagoke, S.T. 2002. Effects of soil pasteurisation and soil N status on severity of *Striga hermonthica* (Del.) Benth. in maize. Soil Biology & Biochemistry 34: 1675-1681. (Interesting but somewhat confusing results are reported for the effects of N and/or pasteurisation on *Striga* emergence and maize yield.)

Al-Hussien, N., Bayaa, B. and Erskine, W. 2002. Integrated management of lentil broomrape. 1. Sowing date and chemical treatments. Arab Journal of Plant Protection 20(2): 84-92. (At two field sites in Syria, delaying the sowing date and applying imazapic and imazethapyr resulted in 97-98% weed control and 221 and 40% more seed yield.)

Angadi, V.G., Jain, S.H. and Shankaranarayana, K.H. 2003. Genetic diversity between sandal populations of different provenances in India. Sandalwood Research Newsletter 17: 4-5. (Isoenzyme studies suggest distinct genetic differences between 8 populations of *Santalum album*.)

Angel Garcia, M. and Castroviejo, S. 2002. (Cytotaxonomic studies in the Iberian species of the genus *Cuscuta* (Convolvulaceae).) (in Spanish) Anales del Jardin Botanico de Madrid 60(1): 33-44. (New chromosome numbers are reported for some *Cuscuta* species. The chromosome numb ers found in some species, such as *C. epithymum*, indicate the possibility of agmatoploidy and symploidy in the genus.)

Aviv, D., Amsellem, Z. and Gressel, J. 2002. Transformation of carrot with mutant acetolactate synthase for *Orobanche* (broomrape) control. Pest Management Science 58: 1187-1193. (Using an ALS resistance gene from herbicide-selected mutant *Arabidopsis thaliana*.)

Bannister, P. Strong, G.L. and Andrew, I. 2002. Differential accumulation of nutrient elements in some New Zealand mistletoes and their hosts. Functional Plant Biology 29: 1309-1318. (Studies with *Ileostylus micranthus* and *Tupeia antarctica* on a range of hosts showed levels of Ca and Mg in the parasite similar to those in the host, levels of N lower, and of K, Na and P higher. It is suggested these differences can be attributed to the lack of a phloem connection combined with circulation of elements in the host phloem and their transfer in the host xylem.)

Bar-Nun, N. and Mayer, A.M. 2002. Composition of and changes in storage compounds in *Orobanche aegyptiaca* seeds during preconditioning. Israel Journal of Plant Sciences 50: 277- 279. (Reducing sugars are rapidly utilized during the first three days of preconditioning, followed by a small increase in sucrose. Lipids involving oleic and linoleic acids remain relatively unchanged.)

Benharrat, H., Veronesi, C., Theodet, C. and Thalouarn, P. 2002. *Orobanche* species and population discrimination using intersimple sequence repeat (ISSR). Weed Research 42: 470-475. (ISSR markers were useful in distinguishing among the species *O. hederae* and *O. amthystea*, and among *O. cernua* and *O. cumana*. Analysis also showed polymorphism among geographically separate populations of *O. hederae*.)

Bidartondo, M.I., Redecker, D., Hijri, I., Wiemken, A., Bruns, T.D., Dominguez, L., Sersic, A., Leake, J.R. and Read, D.J. 2002. Epiparasitic plants specialized on arbuscular mycorrhizal fungi. Nature (London) 419: 389-392. (Showing that non-photosynthetic plants associated with arbuscular mycorrhizal fungi (AMF) can display the characteristic specificity of epi-parasites and that AMF can mediate significant interplant carbon transfer in nature. See also Callaway *et al*.)

Borkowski, J. and Robak, J. 2002. (Presence and control of parasitic *Orobanche ramosa* on the potato.) (in Polish) Ochrona Roslin 46(7): 20-22. (Chlorsulfuron was found to have some useful effect, also saltpetre and urea.)

Botanga, C.J., Kling, J.G., Berner, D.K. and Timko, M.P. 2002. Genetic variability of *Striga asiatica* (L.) Kuntze based on AFLP analysis and host-parasite interaction. Euphytica 128: 375-388. (A range of 14 mainly yellow-flowered populations of *S. asiatica* collected from maize, *Rottboellia* and *Panicum* hosts in Benin showed wide variation in virulence and host-preference, as well as genetic difference as revealed by AFLP. None attacked a usually susceptible sorghum variety. A single red form was very close genetically to the associated yellow form in the same field.)

Brand, J.E. 2002. Review of the influence of *Acacia* species on establishment of sandalwood (*Santalum spicatum*) in Western Australia. Conservation Science Western Australia 4(3): 125-129. (A successful establishment technique involves planting *S. spicatum* seeds near 1-2 year old *Acacia acuminata* seedlings.)

Buschmann, H. and Sauerborn, J. 2002. Induced resistance in sunflower against *Orobanche cumana*. In: Schmitt, A. and Mauch-Mani, B. (eds) Proceedings of the IOBC/WPRS study group on Induced Resistance in Plants against Insects and Diseases, Wageningen, April, 2001. Bulletin OILB/SROP 25(6): 145-148. (Treatment of sunflower seeds with 60 ppm of benzo(1,2,3)thiadiazole-7-carbothioic acid S-methyl ester (BTH) prevented infection in root chambers and reduced *O. cumana* by 95% in pot studies.)

Cabin, R.J., Weller, S.G., Lorence, D.H., Cordell, S. and Hadway, L.J. 2002. Effects of microsite, water, weeding, and direct seeding on the regeneration of native and alien species within a Hawaiian dry forest preserve. Biological Conservation 104: 181-190. (Reporting complex interactions between the native *Santalum paniculatum* and and native weedy species.)

Callaway, R.M., Mahall, B.E., Wicks, C., Pankey, J. and Zabinski, C. 2003. Soil fungi and the effect of an invasive forb on grasses: neighbour identity matters. Ecology 84: 129-135. (More vigorous growth of *Centaurea melitensis* in the presence of *Nassella pulchra* and arbuscular mycorrhizal fungi could possibly have been due to 'a form of fungi-mediated parasitism'? See also Bidartondo *et al*.)

Campagna, G. and Rapparini, G. 2002. (Development of biological means of weed control.) (in Italian) Informatore Agrario 58(45): 53-58. (Including discussion of the use of *Phytomyza orobanchia* for *Orobanche* control and *Smicronyux* spp. for control of *Cuscuta*.)

Chán, V., Lepsi, M., Lepsi, P., Stech, M. and Vydrová, A. 2001. (The finds of interesting and new plants in the South Bohemian flora VII.) (in Czech) Sbornik Jihoceskeho Muzea v Ceskych Budejovicich, Prirodni Vedy 41: 87-89. (*Orobanche lutea* and *Phelipanche purpurea* subsp. *purpurea* are reported for the first time.)

Chiu, S.B., Chan Sai Mun and Aloysius Siow. 2002. Biological control of *Mikania micrantha* – a preliminary finding. The Planter 78(921): 715-718. (Reporting very effective use of 'tali puteri' (probably a *Cuscuta* sp. but possibly *Cassytha*) for suppression of *M. micrantha* in West Kalimantan.)

Covarelli, L. 2002. Studies on the control of broomrape (*Orobanche ramosa* L.) in Virginia tobacco (*Nicotiana tabacum* L.). Beitrage zur Tabakforschung International 20(2): 77-81. (Tobacco variety BC 60 FB was found to be highly resistant to the weed with 85% less infestation than other varieties. Satisfactory chemical control was achieved with maleic hydrazide applied at the early crop flowering stage, and moderate control by rimsulfuron applied 55 days after transplanting.)

Deal, R. L., Tappeiner, J.C. and Hennon, P. E. 2002. Developing silvicultural systems based on partial cutting in western hemlock-Sitka spruce stands of southeast Alaska. In: Rotach, P., Schuz, J.P. and Kenk G. (eds) Uneven-aged silviculture. Selected papers from a joint meeting of IUFRO working groups 1.14 and 4.01.03, Zurich, Switzerland, September 2001. Forestry (Oxford) 75: 425-431. (A wide range of partial cutting intensities did not result in significant changes in infection by *Arceuthobium tsugense*.)

Deeks, S.J., Shamoun, S.F. and Punja, Z.K. 2002. Histopathology of callus and germinating seeds of *Arceuthobium tsugense* subsp. *tsugens*e infected by *Cylindrocarpon cylindroides* and *Colletotrichum gloeosporioides*. International Journal of Plant Sciences 163: 765-773. (The methods developed in this study helped to elucidate host-pathogen interactions and showed that *C. cylindroides* was more virulent in colonizing dwarf mistletoe tissues than *C. gloeosporioides*.)

DeNitto, G. 2002. Montana: forest insect and disease conditions and program highlights: 2001. Forest Health Protection Report - Northern Region, USDA Forest Service, 2002, No.02-1, 41 pp. (Including survey data on losses to *Arceuthobium species*.)

Dos Santos, CV., Letousey, P., Delavault, P. and Thalouarn, P. 2003. Defence gene expression analysis of *Arabidopsis thaliana* parasitized by *Orobanche ramosa*. Phytopathology 93: 451-457. (Semi-quantitative PCR indicates that *O. ramosa* parasitism induced defence gene expression in host roots prior to attachment. Defence signaling pathways induced included jasmonate and ethylene, but not salicylic acid-mediated responses.)

Díaz-Sanchez, J., Jurado-Expósito, M., López-Granados, F., Castejón-Muñoz, M. and García-Torres, L. 2003. Pronamide applied to sunflower seeds for *Orobanche cumana* control. Weed Technology 17: 314-319. (Soaking or coating sunflower seeds with pronamide reduced *O. cumana* by 50-77% without affecting crop growth, unless the treated seeds were kept for 60 days after treatment.)

Dubrovsky, J.G. 2002. Tumorous malformations in natural populations of *Pachycereus* and its association with mistletoe. Cactaceas y Suculentas Mexicanas 47(3): 48-56. (*Phoradendron diguetianum* was associated with swellings on *Pachycereus pringlei* and *P. pecten-aboriginum* but was not apparently the cause.)

Eizenberg, H., Herschenhorn, J., Plakhine, D., Kleifeld, Y., Shtienberg, D. and Rubin, B. 2003. Effect of temperature on susceptibility of sunflower varieties to sunflower broomrape (*Orobanche cumana*) and Egyptian broomrape (*Orobanche aegyptiaca*). Weed Science 51: 279-286. (The ‘resistant’ sunflower variety Ambar is shown to be susceptible to both *Orobanche* spp. at temperatures below 20^{0}C but increasingly resistant at higher temperatures, while the susceptible variety Adi shows increasing susceptibility at higher temperatures.)

Eizenberg, H., Plakhine, D., Hershenhorn, J., Kleifeld, Y. and Rubin, B. 2003. Resistance to broomrape (*Orobanche* spp.) in sunflower (*Helianthus annuus* L.) is temperature dependent. Journal of Experimental Botany 54: 1305-1311. (The resistance demonstrated in variety Ambar (see previous entry) is shown to be due to degeneration of the parasite after attachment.)

Elias, P. 2002. Host woody species of mistletoes (Loranthaceae) in Slovakia. Bulletin Slovenskej Botanickej Spolocnosti pri Slovenskej akademiii vied, Bratislava 24: 175-180. (Lists hosts of *Viscum album* and *Loranthus europaeus* in Slovakia, with comments. Hosts of *L. europaeus* include at least 7 species of *Quercus* and occasionally *Betula pendula*.)

Emechebe, A.M. and Ahonsi, M.O. 2003. Ability of excised root and stem pieces of maize, cowpea and soybean to cause germination of *Striga hermonthica* seeds. Crop Protection 22: 347-353. (Reporting the effects of varying details of the technique.)

Escher, P., Eiblmeier, M., Hetzger, I. and Rennenberg, H. 2003. Seasonal and spatial variation of reduced sulphur compounds in mistletoes (*Viscum album*) and the xylem sap of its hosts (*Populus x euramericana* and *Abies alba*). Physiologia Plantarum 117: 72-78. (The seasonal pattern in the thiol composition and contents of *Viscum* leaves showed high levels in spring and autumn and low levels in summer. The significance of these seasonal changes is discussed.)

Fayed, M.T.B., Hamdi, A., Samia, A.M. and Shaaban, M. 2002. Performance of *Orobanche* control treatments in faba bean crop. Egyptian Journal of Agricultural Research 80: 753-769. (Beneficial effects are described for a range of treatments including late sowing, glyphosate application and the tolerant variety cv. Giza 429.)

Gbehounou, G. and Adango, E. 2003. Trap crops of *Striga hermonthica*: *in vitro* identification and effectiveness *in situ*. Crop Protection 22: 395-404. (Cowpea varieties IT 90k-56 and TVX 1850-01F significantly reduced infestation by *S. hermonthica* in the following maize crop, compared with a weed-free fallow, and maize yields were increased.)

Geils, B.W., Tovar, J.C. and Moody, B. (eds) 2002. Mistletoes of North American Conifers. USDA Forest Service General Technical Report RMRS-GTR-98. 123 pp. (The 8 chapters cover specific descriptions, host range, economic importance and management strategies for *Psittacanthus* (in Mexico), *Phoradendron* (in USA and Mexico), *Arceuthobium* (in N. America), and more general consideration of damaging effects, survey techniques and various approaches to management. A mine of information.)

Godfree, R.C., Tinnin, R.O. and Forbes, R.B. 2002. The effects of dwarf mistletoe, witches' brooms, stand structure, and site characteristics on the crown architecture of lodgepole pine in Oregon. Canadian Journal of Forest Research 32: 1360-1371. (The results suggest that *Arceuthobium americanum* can be an important factor in determining the crown dimensions of *Pinus contorta* but that these effects may be interpreted only in the context of site characteristics and stand structure.)

Godfree, R.C., Tinnin, R.O. and Forbes, R.B. 2003. Relationships between *Arceuthobium americanum* and the structure of *Pinus contorta* var. *murrayana* stands in central Oregon. Plant Ecology 165: 69-84. (Concluding that the effects of *A. americanum* on different *P. contorta* size classes depends on spatial scale.)

Goldwasser, Y., Eizenberg, H., Golan, S. and Kleifeld, Y. 2003. Control of *Orobanche crenata* and *Orobanche aegyptiaca* in parsley. Crop Protection.22: 295-305. (*O. crenata* and *O. aegyptiaca* were completely controlled by split foliar application of imazapic at 2.5-5.0g/ha or glyphosate 36-72 g/ha, applied on 5-7 leaf parsley before the first cutting and on the young new growth after each cutting. Mixtures or alternating herbicides is suggested to reduce risk of herbicide resistance.)

Goldwasser, Y and Kleifeld, Y. 2002. Tolerance of parsley varieties to *Orobanche*. Crop Protection 21: 1101-107. (Exposed to *O. crenata* ex carrot and *O. aegyptiaca* ex tomato, parsley varieties Garland and Garbo were less damaged than several others. There were no differences in parasite germination, but less attachment and/or premature death of parasite seedlings.)

Groves, R. H. and Panetta, F.D. 2002. Some general principles for weed eradication programs. In: Jacob, H.S., Dodd, J. and Moore, J.H. (eds) 13th Australian Weeds Conference: weeds "threats now and forever?" Perth, Australia, 2002. pp. 307-310. (Reviewing the progress of nine weed eradication programmes including one on *Orobanche ramosa*.)

Gutschick, V.R. and Bloom, A.J. 2003. Crossroads of animal, plant, and microbial physiological ecology. BioScience 53(3): 256-259. (This report of a symposium on physiological ecology considered chemical signalling among animals, plants, and microbes. Parasitic plants were included with an emphasis on short range and high accuracy of signalling between host and parasite.)

Gworgwor, N.A., Hudu, A.I. and Joshua, S.D. 2002. Seed treatment of sorghum varieties with brine (NaCl) solution for control of *Striga hermonthica* in sorghum. Crop Protection 21: 1015-1021. (Treatment of sorghum seeds with sodium chloride at 1.5M reduced *Striga* infestation and increased crop yields in spite of some reduction in crop stand; 2.0M damaged the crop more severely.)

Haidar, M.A., Bibi, W. and Sidahmed, M.M. 2003. Response of branched broomrape (*Orobanche ramosa*) growth and development to various soil amendments in potato. Crop Protection 22: 291-294. (Goat manure was the most effective of a range of amendments in reducing *O. ramosa* emergence, but failed to significantly increase crop yield.)

Han RongLan, Zhang DianXiang, Hao Gang and Qiu HuaXing. 2002. (Geographical distribution of Chinese species of *Viscum* (Viscaceae) and its hosts.) (in Chinese) Journal of Tropical and Subtropical Botany 10: 222-228.

Holzapfel, S., Faville, M.Z. and Gemmill, C.E.C. 2002. Genetic variation of the endangered holoparasite *Dactylanthus taylorii*

(Balanophoraceae) in New Zealand. Journal of Biogeography 29: 663-676. (Genetic variation was predominantly (63%) among, as opposed to within, populations and not correlated with geographical distance below the regional scale.)

Huguet, B., Faure, A., Durand, T. and Decoin, M. 2003. (Less water, some diseases, good yields. Rape - 2001/2002 plant health review.) (in French) Phytoma 556: 18-20. (Noting the continuing spread of '*Orobanche cernua*', but presumably referring to *O. ramosa*.)

Hunter, J.T. 2003. Factors affecting range size differences for plant species on rock outcrops in eastern Australia. Diversity and Distributions 9: 211-220. (Keywords include parasitic plants.)

Jain, S.H., Angadi, V.G., Shankaranarayana, K.H. 2003. Edaphic, environmental and genetic factors associated with growth and adaptability of sandal (*Santalum album* L.) in provenances. Sandalwood Research Newsletter 17: 6-7.

Jan, C.C., Fernandez-Martinez, J.M., Ruso, J., Munoz-Ruz, J. 2002. Registration of four sunflower germplasms with resistance to *Orobanche cumana* Race F. Crop Science 42: 2217-2218. (Four sunflower populations, BR1, BR2, BR3 and BR4, had been released on the basis of their resistance to *O. cumana* race F.)

Jurado-Expósito, M., López-Granados, F., García-Torres, L., García-Ferrer, A., Sánchez de la Orden, M. and Atenciano, S. 2003. Multi-species weed spatial variability, and site-specific management maps in cultivated sunflower. Weed Science 51: 319-328. (Including data on spatial distribution characteristics for *Orobanche cernua*.)

Kalita, R.K and Anup Chandra. 2002. Natural infestation of mistletoe in various trees in Jorhat District of Assam. Indian Forester 128(7): 815-816. (Recording 11 host tree species, but not the identity of the mistletoes involved.)

Kanampiu, F., Friesen, D. and Gressel, J. 2003. A new approach to *Striga* control. Pesticide Outlook 14(2): 51-53. (Reporting on seed-coating technology using imazapyr or pyrithiobac with new, locally adapted, herbicide-resistant, open-pollinated maize cultivars.)

Khaled Makkouk, Saadia Lhaloui and Mamdouh Omar 2001. Seeking sustainable solutions: integrated pest management pilot sites in Egypt and Morocco. ICARDA Caravan 15: 37-38. (Including reference to *Orobanche* in faba bean.)

Kim, S.K. and Adetimrin, V.O. (compilers) 2002. Maize Breeding and Related Research for the Control of *Striga* in Sub-Saharan Africa. Kyunghpook National University Press, Taegu, Korea. 191 pp. (A compilation of 21 journal papers published by Dr Kim and associates over the years 1987 to 2002.)

Kintzios, S., Barberaki, M., Drossopoulos, J., Turgelis, P. and Konstas, J. 2003. Effect of medium composition and explant source on the distribution profiles of selected micronutrients in mistletoe tissue cultures. Journal of Plant Nutrition 26: 369-397. (Micronutrient accumulation, especially Fe, Mn, Zn, and Cu, in tissue cultures of *Viscum album* substantially exceeds that of either whole plants or their hosts. Relative accumulation rates fluctuate over the course of 10 wks of culture, and addition of ascorbic acid to the medium increases micronutrient accumulation)

Krause, K., Berg, S. and Krupinska, K. 2003. Plastid transcription in the holoparasitic plant genus *Cuscuta*: parallel loss of the rrn16 PEP-promoter and of the rpoA and rpoB genes coding for the plastid-encoded RNA polymerase. Planta 216: 815-823. (A PEP promoter, present in *C. reflexa* is missing in three other species, *C. gronovii, C. odorata* and *C. subinclusa*.)

Kuchinda, N.C., Kureh, I., Tarfa, B.D., Shinggu, C. and Omolehin, R. 2003. On-farm evaluation of improved maize varieties intercropped with some legumes in the control of *Striga* in the Northern Guinea savanna of Nigeria. Crop Protection 22: 533-538. (Intercropping the improved maize varieties Acr.97 TZL Comp. 1 and Oba Super 1 with either soyabean or groundnut was more profitable than the local cultivar grown alone.)

Kureh, I. and Alabi, S.O. 2003. The parasitic angiosperm *Alectra vogelii* Benth. can influence the growth and nodulation of host soybean (*Glycine max* (L.) Merrill). Crop Protection 22: 361-367. (Reporting varied reaction among 22 soybean varieties in numbers of *A. vogelii* emerged, *Rhizobium* nodulation, and crop yield.)

Lehel, J. and Vetter, J. 2002. (Frequent phytotoxicoses in small animal practice. Review article.) (in Hungarian) Magyar Allatorvosok Lapja 124: 597-606. (*Viscum* *album* among the species causing phytotoxicosis.)

Lethbridge, M. 2003. Progress report: integrated wattle and quandong orchard. Sandalwood Research Newsletter 17: 1-4. (*Acacia victoriae* proved the best of eight wattle seed (human food) producers as host of *Santalum acuminatum*, also grown for its edible fruits.)

Liu Hui and Yuan ShiBin. 2002. A preliminary study of the toxins of *Colletotrichum gloeosporioides* (Penz) Sacc. f.sp. *cuscutae* Chang. Journal of Sichuan Agricultural University 20: 246-248. (Toxins shown to be large molecules, possibly polysaccharides, water-soluble, stable to heat but not to HCl.)

Logan, B.A., Huhn, E.R. and Tissue, D.T. 2002. Photosynthetic characteristics of eastern dwarf mistletoe (*Arceuthobium pusillum* Peck) and its effects on the needles of host white spruce (*Picea glauca* [Moench] Voss). Plant Biology 4: 740-745. (Photosynthetic oxygen evolution in *A. pusillum* was exceeded by respiratory oxygen consumption at all light intensities through full sunlight. Other results suggest that carbon exchange dynamics between the host and parasite do not fully explain the detrimental effects of infection on the host.)

Lohézic-Le-Dévéhat, F., Tomasi, S., Fontanel, D. and Boustie, J. 2002. Flavonols from *Scurrula ferruginea* Danser (Loranthaceae). Zeitschrift für Naturforschung. Section C, Biosciences 57: 1092-1095. (Three flavonols were isolated from *S. ferruginea*: quercetin, quercitrin, and a flavonol glycoside 4"-O-acetylquercitrin. Quercetin was the most active on human cancer cell lines.)

Lyu SuYun, Choi SangHo and Park WonBong. 2002. Korean mistletoe lectin-induced apoptosis in hepatocarcinoma cells is associated with inhibition of telomerase via mitochondrial controlled pathway independent of p53. Archives of Pharmacal Research 25(1): 93-101.

Lyu SuYun, Rhim JeeYoung, Moon YouSun, Jung SeungHee, Lee KyueYim and Park WonBong. 2002. Antitumor activities of extract of *Viscum album* var. *coloratum* modified with *Viscum album* var. *coloratum* agglutinin. Natural Product Sciences 8(4): 155-161.

Macklin, J. and Parnell, J. 2002. An account of the Santalaceae of Thailand. Thai Forest Bulletin (Botany) 30:75-108. (13 species in seven genera are fully described. Many belong to the tribe Amphorogyneae, aerial parasites with similarities toViscaceae. Hosts include *Quercus, Lithocarpus* and *Vaccinium* spp.)

Makarov, V.S. 2002. (Dodder in Yakutiya.) (in Russian) Zashchita i Karantin Rastenii, 2002, No.3: 39. (Three species of *Cuscuta* are spreading in Siberia, including *C. europaea* and ?*C. japonica*. Hosts affected include *Ribes* and *Rosa* spp. Some *Cuscuta* had been introduced on grapes from Central Asia.)

Marshall, K., Mamone, M. and Barclay, R. 2003. A survey of Douglas-fir dwarf mistletoe brooms used for nests by northern spotted owls on the Applegate Ranger District and Ashland Resource Area in Southwest Oregon. Western Journal of Applied Forestry 18(2): 115-117. (*Arceuthobium douglasii*.)

Mathiasen, R. 2002. First report of white fir dwarf mistletoe on mountain hemlock. Plant Disease 86: 1274. (*Arceuthobium abietinum* ssp. *concoloris* on *Tsuga mertensiana* among severely infested *Abies grandis*.)

Mathiasen, R.L. and Daugherty, C.M. 2002. Adult sex ratio of *Arceuthobium gillii* (Viscaceae). Madroño 49: 12-15. (Results show a ratio effectively 50:50.)

Matsubara, S., Gilmore, A.M., Ball, M.C., Anderson, J.M. and Osmond, C.B. 2002. Sustained downregulation of photosystem II in mistletoes during winter depression of photosynthesis. In: Gilmore, A.M., Farley, S.J. and McCutchan, J.S. (eds) Papers originating from the Light Stress satellite meeting of the 12th International Photosynthetic Congress, Heron Island, Queensland, Australia, 2001. Functional Plant Biology 29: 1157-1169. (Studies involved *Amyema miquelii* on hosts *Eucalyptus blakelyi* and *E. melliodora*.)

Matthies, D. 2003. Positive and negative interactions among individuals of a root hemiparasite. Plant Biology 5: 79-84. (Seedling survival of *Rhinanthus alectorolophus* was increased at high sowing densities and the proportion of seeds producing a young plant increased linearly with sowing density, indicating positive interactions among seedlings, perhaps resulting from haustorial connections.)

Maurer, W.D., Eder, W. and Tabel, U. 2003. (A genetic study on Scots pine (*Pinus sylvestris* L.) populations of differing health status growing in the Lennebergwald and the adjacent strict nature reserve Mainzer Sand by using isozyme gene markers.) (in German) Mitteilungen aus der Forschungsanstalt fur

Waldökologie und Forstwirtschaft Rheinland-Pfalz. 49(2): 75-88. (Decline of *P. sylvestris* partly attributed to *Viscum album*.)

Medel, R., Botto-Mahan, C., Smith-Ramirez, C., Mendez, M.A., Ossa, C.G., Caputo, L. and Gonzales, W. L. 2002. Quantitative natural history of a host-parasite relationship: the *Tristerix*-cactus system in semiarid Chile. (in Spanish) Revista Chilena de Historia Natural.75(1): 127-140. (Quantifying the autoecology of the floral biology, pollination, seed dispersal, and parasitism of *Tristerix aphyllus* on its cactus host species.)

Mekky, M.S., Yehia, Z.R. and Nassar, A.N.M. 2003. Effect of sowing dates, varieties and glyphosate application on broomrape (*Orobanche crenata* Forsk.) and yield of faba bean (*Vicia faba* L.). Bulletin of Faculty of Agriculture, Cairo University 54(1): 55-76. (Delayed sowing, glyphosate application and use of variety Giza 429 all contributed to reduced *O. crenata* and increased bean yield.)

Mullen, J.D., Taylor, D.B., Fofana, M. and Kebe, D. 2003. Integrating long-run biological and economic considerations into *Striga* management programs. Agricultural Systems 76: 787-795. (Describing a model with a biological component modeling *Striga* population dynamics, and an economic component representing the production opportunities, resource constraints, and price parameters faced by farmers.)

Musambasi, D. Chivinge, O.A. and Mariga, I. K. 2003. Effect of ridging treatments and two early maturing maize cultivars on witchweed [*Striga asiatica* (L.) Kuntze] density and maize grain yield under dry land maize-based cropping systems in Zimbabwe. Crop Research (Hisar) 25(1): 37-45. (Reporting inconsistent effects of ridging on *S. asiatica* and maize yields.)

Nagarajan, K. and Reddy, C.V.K. 2001. Resistant sources in tobacco germplasm against different diseases. Tobacco Research 27(2): 197-199. (None of at least 50 varieties of tobacco showed resistance to *Orobanche cernua*.)

Norton, D.A., Ladley, J.J. and Sparrow, A.D. 2002. Host provenance effects on germination and establishment of two New Zealand mistletoes (Loranthaceae). Functional Ecology 16: 657-663. (Studies with *Alepis flavida* and *Peraxilla tetrapetala* on different provenances of their main host *Nothofagus solandri* gave somewhat inconsistent results.)

Ouédraogo, J.T., Tignegre, J.B., Timko, M.P. and Belzile, F.J. 2002. AFLP markers linked to resistance against *Striga gesnerioides* race 1 in cowpea (*Vigna unguiculata*). Genome 45: 787-793. (Genetic mapping of *Striga* resistance in two cowpea varieties found markers that are linked to both traits. The implication is that resistance genes may be either clustered together or are alleles of a single gene.)

Ohashi, K., Winarno, H., Mukai, M., Inoue, M., Prana, M.S., Simanjuntak, P. and Shibuya, H. 2003. Indonesian medicinal plants. XXV. Cancer cell invasion inhibitory effects of chemical constituents in the parasitic plant *Scurrula atropurpurea* (Loranthaceae). Chemical & Pharmaceutical Bulletin 51: 343-345. (The most inhibitory compound isolated from *S. atropurpurea,* parasitic on tea, was an alkynic fatty acid octadeca-8,10,12-triynoic acid.)

Olupot, J.R., Osiru, D.S.O., Oryokot, J. and Gebrekidan, B. 2003. The effectiveness of *Celosia argentia* (Striga "chaser") to control *Striga* on sorghum in Uganda. Crop Protection 22: 463-468. (*C. argentea* was shown to cause suicidal germination of *S. ?hermonthica*; inter-planting in the field reduced *Striga* emergence over 50% and increased sorghum yield by 35%.)

Orhan, D.D., Calis, I. and Ergun, F. 2002. Two new flavonoid glycosides from *Viscum album* ssp. *album*. Pharmaceutical Biology 40: 380-383.

Osterbauer, N.K. and Rehms, L. 2002. Detecting single seeds of small broomrape (*Orobanche minor*) with a polymerase chain reaction. Plant Health Progress, November, 2002, 6 pp.

Pageau, K., Simier, P., Bizec, B. le, Robins, R.J. and Fer, A. 2003. Characterization of nitrogen relationships between *Sorghum bicolor* and the root-hemiparasitic angiosperm *Striga hermonthica* (Del.) Benth. using $K^{15}NO_3$ as isotopic tracer. Journal of Experimental Botany 54: 789-799. (Concluding that nitrogen nutrition in *S. hermonthica* is based on a supply of both nitrate and amino acids from the host, implying a non-specific transfer in the transpiration stream. Nitrate reduction probably occurs mainly in the leaves of the parasite. Excess nitrogen in *S. hermonthica* is stored as asparagine.)

Parnell, J. 2001. A revision of Orobanchaceae in Thailand. Thai Forest Bulletin (Botany) 29: 72-80. (Three species occur – *Aeginetia* *indica, A. pedunculata* and *Christisonia siamensis*. Including SEMs of pollen.)

Pierce, S., Mbwaga, A.M., Ley, G., Lamboll, R.I., Riches, C.R., Press, M.C., Scholes, J.D. and Watling, J. 2003. Chemical characteristics of soil and sorghum from *Striga*-infested regions of Tanzania, and the influence of fertilizer application. Working Paper, University of Sheffield, Sheffield, UK. 32 pp. (Concluding that farmyard manure is a more reliable source of N than urea, and if the latter is used it should be in split doses over the season; also that varieties Hakika, Wahi and Macia are more tolerant of *Striga* attack than Pato. In the presence of *Striga*, Hakika is recommended for less fertile soils and Wahi and Macia on the more fertile.)

Pierce, S., Mbwaga, A.M., Press, M.C. and Scholes, J.D. 2003. Xenognosin production and tolerance to *Striga asiatica* infection of high-yielding maize cultivars. Weed Research 43: 139-145. (Laboratory studies confirmed that maize var. IWD STR Co and *Zea diploperennis* line BC4C2 avoided serious attack from *S. asiatica* by exuding less germination stimulant, but were not resistant to penetration.)

Pierce, S., Press, M.C. and Scholes, J.D. 2002. Growth and photosynthetic response of *Sorghum bicolor* cultivars Pato, P9405, P9406 and Macia to nitrogen availability and infection by the hemiparasitic weed *Striga hermonthica*. Working Paper, University of Sheffield, Sheffield, UK. 29 pp. (In pot experiments under a controlled environment, Pato showed greatest susceptibility to *S. hermonthica* at all levels of N; P9406 was the least affected at high N levels, while P9405 showed greatest tolerance over a range of N levels. Photosynthesis was little affected.)

Plitmann, U. 2002. Agamospermy is much more common than conceived: a hypothesis. Israel Journal of Plant Sciences 50 (Supplement): S111-S117. (The evolutionary implications of casual or facultative agamospermy in opportunistic plants, including Cuscutaceae and Orobanchaceae, are briefly discussed.)

Procopovici, E. 2001. (Behaviour of some sunflower hybrids to *Orobanche cumana* attack under conditions of Dobrogea.) (in Romanian) Probleme de Protectia Plantelor 29: 209-214. (Varieties Favorit, Turbo, Melody, Arena, and Pixel are recommended for cultivation in areas infested with *O. cumana*.)

Rao, V.P., Tesfamichael Abraha, Obilana, A.B. and Preston, S. R. 2002. Sorghum diseases in Eritrea - a survey report. International Sorghum and Millets Newsletter 43: 57-60. (*Striga hermonthica* and other pathological problems documented for a range of ecologies.)

Reid, N. and Yan, Z. 2000. Mistletoes and other phanerogams parasitic on eucalypts. In: Keane, P.J., Kile, G.A., Podger, F.D. and Brown, B.N. Diseases and Pathogens of Eucalypts. Collingwood, Australia: CSIRO. Pp. 353-383. (A comprehensive review covering *Amyema* and other mistletoe spp., *Exocarpos* (Santalaceae) and *Cassytha* spp. on *Eucalyptus* spp. in Australia. Apologies for belated posting.)

Román, B., Alfaro, C., Torres, A.M., Moreno, M.T., Satovic, Z., Pujadas, A. and Rubiales, D. 2003. Genetic relationships among *Orobanche* species as revealed by RAPD analysis. Annals of Botany 91: 637-642. (RAPD analysis of 19 *Orobanche* species generally agrees with morphological taxonomic studies. Species grouping into sections *Orobanche* and *Trionychon* are supported with the exception of *O. clausonis*.)

Román, B., Satovic, Z., Rubiales, D., Torres, A.M., Cubero, J.I., Katzir, N. and Joel, D.M. 2002. Variation among and within populations of the parasitic weed *Orobanche crenata* from Spain and Israel revealed by inter simple sequence repeat markers. Phytopthology 92: 1262-1266. (ISSR marker analysis clusters Spanish populations apart from Israeli populations. The Spanish populations have a high degree of similarity to each other, while Israeli populations show more variation.)

Román, B., Torres, A.M., Rubiales, D., Cubero, J.I. and Satovic, Z. 2002. Mapping of quantitative trait loci controlling broomrape (*Orobanche crenata* Forsk.) resistance in faba bean (*Vicia faba* L.). Genome 45: 1057-1063. (Isozyme, RAPD, seed protein gene, and micro-satellite markers were used to identify three QTLs for broomrape resistance. One of the three explained more than 35% of the phenotypic variance, whereas the others accounted for 11.2 and 25.5%, respectively.)

Rugutt, K.J., Rugutt, J.K. and Berner, D.K. 2003. *In vitro* germination of *Striga hermonthica* and *Striga aspera* seeds by 1-aminocyclopropane-1-carboxylic acid. Natural Product Research 17: 47-62.

(Overall, the germination data suggested a hormonal mode of action by ACC, which involves indirect stimulation of biosynthesis of ethylene that then triggers seed germination.)

Sallé, G. 2002. Des Vampires chez les Plantes. En guerre contre les plantes parasites. EDP Sciences, Les Ulis, France. 237 pp. (An attractive well-illustrated book for the non-specialist, covering the biology and control of the main groups of parasites.)

Sanjai, V.N. and Balakrishnan, N.P. 2001. *Viscum acaciae* Danser (Viscaceae) - a new record for India. Journal of Economic and Taxonomic Botany 25(1) 18-20.

Schulz, S., Hussaini, M.A., Kling, J.G., Berner, D.K. and Ikie, F.O. 2003. Evaluation of integrated *Striga hermonthica* control technologies under farmer management. Experimental Agriculture 39: 99-108. ('Resistant' maize grown after a soyabean trap crop greatly outyielded local maize in trials in Northern Nigeria. A cowpea trap crop was less effective.)

Sessions, L.A., Rance, C., Grant, A. and Kelly, D. 2001. Possum (*Trichosurus vulpecula*) control benefits native beech mistletoes (Loranthaceae). New Zealand Journal of Ecology 25(2): 27-33. (*Alepis flavida, Peraxilla tetrapetala* and *P. colensoi* are all believed to be reduced by possums. Studies on *A. flavida* support this thesis.)

Sessions, L.A. and Kelly, D. 2001. Methods for monitoring herbivory and growth of New Zealand mistletoes (Loranthaceae). New Zealand Journal of Ecology 25(2): 19-26. (Describing and discussing the methods used in the above study on possum damage.)

Shabana, Y.M., Muller-Stover, D. and Sauerborn, J. 2003. Granular Pesta formulation of *Fusarium oxysporum* f. sp. *orthoceras* for biological control of sunflower broomrape: efficacy and shelf-life. Biological Control 26: 189-201. (Yeast extract, glycerol, sucrose, and sodium alginate all proved useful additives to the basic wheat-gluten matrix. Several of the formulations provided excellent control and highly significant yield increases.)

Showemimo, F.A., Kimbeng, C.A. and Alabi, S.O. 2002. Genotypic response of sorghum cultivars to nitrogen fertilization in the control of *Striga hermonthica*. Crop Protection 21: 867-870. (Showing interactions between N levels and *Striga* damage, and suggesting some level of tolerance in some varieties.)

Sirma, M., Kadioglu, I. and Yanar, Y. 2001. (Study on the distribution and density of weed species in tomato fields in the vicinity of Tokat.) (in Turkish) Turkiye Herboloji Dergisi 4(1): 39-47. (*Orobanche* spp. were among the most common weed species.)

Sooryanarayana, J.P.D.V.H., Delignat, S., Bloch, M.F., Kazatchkine, M.D. and Kaveri, S.V. 2001. Variable sensitivity of lymphoblastoid cells to apoptosis induced by *Viscum album* Qu FrF, a therapeutic preparation of mistletoe lectin. Chemotherapy (Basel) 47: 366-376.

Srivastava, S. and Dwivedi, U.N. 2003. Modulation of key nitrogen assimilating enzymes by NAA and *in vitro* culture in *Cuscuta reflexa*. Plant Physiology and Biochemistry.41: 65-71. (The data suggest ammonia assimilation through a GDH pathway in *C. reflexa*.)

Stauder, H. and Kreuser, E.D.2002. Mistletoe extracts standardised in terms of mistletoe lectins (ML I) in oncology: current state of clinical research. Onkologie 25: 374-380. (A review concluding that so far, no direct anticancer action or any improvement in time to tumour progression or overall survival in cancer patients has been seen. The first results of a randomized phase III study suggest that additive administration of a mistletoe preparation may improve the quality of life. Mistletoe therapy has not gained an established place in oncology.)

Subhash Kumar. 2002. Preliminary studies on the control of broomrape (*Orobanche aegyptiaca*) in mustard. Indian Journal of Weed Science 34: 303-304. (Glyphosate at 82 g/ha 60 days after sowing was apparently selective. A range of other herbicides and oils were less effective.)

Sutiak, V., Sutiakova, I., Korenek, M., Cellarova, E., Conkova, E. and Neuschl, J. 2002. There is a possibility to protect the environment of Kosice against the menaces of mistletoe, vermin birds, and emissions. Folia Veterinaria 46(2)Supplementum: 61-62. (Referring to the problem of *Viscum album* in city trees.)

Sweetapple, P.J., Nugent, G., Whitford, J. and Knightbridge, P.I. 2002. Mistletoe (*Tupeia antarctica*) recovery and decline following possum control in a New Zealand forest. New Zealand Journal of Ecology 26(1): 61-71. (Browsing of *Tupeia antarctica* in *Carpodetus serratus* by possums

(*Trichosurus vulpecula)* reduced mistletoe foliage cover from 50% to 16% and mean plant size by about 55% over a 4-year period.)

Swift, K., Turner, J. and Rankin, L. 2002. Cariboo Forest Region: Part 1 of 3. Forest Health Stand Establishment Decision Aids. BC Journal of Ecosystems and Management 2(1): 13-18. (An extension note including reference to *Arceuthobium americanum* in lodgepole pine.)

Tang, S. X., Heesacker, A., Kishore, V.K., Fernandez, A., El-Sayed, S., Cole and G., Knapp, S.J. 2003. Genetic mapping of the Or5 gene for resistance to *Orobanche r*ace E in sunflower. Crop Science 43:1021-1028. (The Or5 locus mapped to the end of LG3 distal to the SSR marker loci. The terminal and perhaps telomeric location of Or5 on LG3 sheds light on difficulties, past and present, of identifying flanking DNA markers tightly linked to Or5.)

Tanji, A. 2001. (Weeds in rainfed lentil fields in the Settat province.) (in French) Al Awamia 104: 49-59. (*Orobanche crenata* and *O. ramosa* were found in 40% of the fields in this district of Morocco.)

Tanji, A. 2001. (Weeds of the rainfed spring chickpea crop in the Settat province.) (in French) Al Awamia 104: 61-71. (Noting that *Orobanche crenata* was NOT found.)

Tanji, A. 2001. (Weeds in rainfed faba bean fields in the Settat province.) (in French) Al Awamia 103: 71-81. (*Orobanche crenata* was 'the most noxious' weed.)

Tenebe, V.A. and Kamara, H. M. 2002. Effect of *Striga hermonthica* on the growth characteristics of sorghum intercropped with groundnut varieties. Journal of Agronomy and Crop Science 188: 376-381. (Intercropping sorghum with groundnut variety RMP-12 significantly reduced *Striga* emergence and enhanced sorghum yield.)

Tikader, A. and Thangavelu, K. 2002. Incidence of *Elyctranthe parasitica* (L.) Dans., an epiphyte on mulberry. Indian Journal of Sericulture 41(2): 162-163.

Valentiner, U., Pfuller, U., Baum, C. and Schumacher, U. 2002. The cytotoxic effect of mistletoe lectins I, II and III on sensitive and multidrug resistant human colon cancer cell lines *in vitro*. Toxicology 171(2): 187-199.

Van Huyen, J.P.D., Bayry, J., Delignat, S., Gaston, A.T., Michel, O., Bruneval, P., Kazatchkine, M.D., Nicoletti, A. and Kaveri, S.V. 2002. Induction of apoptosis of endothelial cells by *Viscum album*: a role for anti-tumoral properties of mistletoe lectins. Molecular Medicine 8: 600-606. (Results suggest that endothelial apoptosis induced by extracts of *V. album* may explain the tumour regression associated with their therapeutic use.)

Veloz, A. and Salazar, J. 2000. Ecological aspects and distribution of *Juglans jamaicensis* C. DC. (Juglandaceae) in the Dominican Republic. In: Ruiz, B.I.,Wadsworth, F.H., Miller, J.M. and Lugo, A.E. (eds) Possibilities and approaches toward community forestry in the Caribbean: Proceedings of the tenth meeting of Caribbean foresters at Georgetown, Guyana, June, 2000. pp.63-74. (*J. jamaicensis* is associated with 2 mistletoe species, not specified in the abstract.)

Watson, D.M. 2001. Mistletoe - a keystone resource in forests and woodlands worldwide. Annual Review of Ecology and Systematics 32: 219-249. (Summarizing research on mistletoe biology and synthesizing results from studies of mistletoe-animal interactions.)

Werner, K. 2002. (Comments to the revised edition of "Exkursionsflora von Deutschland, Band 4 (Kritischer Band)". 3. To the nomenclature of some species and subspecies.) (in German) Schlechtendalia 8: 1-13. (Including deliberation on the genus *Rhinanthus*.)

Wijesundara, D.S.A., Jayasinghe, C., Marambe, B. and Tennakoon, K.U. 2001. Host-parasitic associations of *Cuscuta chinensis* Lam. in Sri Lanka. Annals of the Sri Lanka Department of Agriculture 3: 343-351. (No abstract available.)

Wood, D.L., Koeber, T.W., Scharpf, R.F. and Storer, A.J. 2003. Pests of the Native California Conifers. University of California Press: California Natural History Guides. 233 pp. (A handy, colour-illustrated field guide, including descriptions of *Arceuthobium* and *Phoradendron* spp.)

Woodall, G.S. and Robinson, C.J. 2002. Direct seeding Acacias of different form and function as hosts for Sandalwood (*Santalum spicatum*). Conservation Science Western Australia 4(3) 130-134. (Proposing the use of a mixture of host species.)

Yang HyunOk, Park ShinYoung, Hong KyungHee, Kang LinWoo, Choe KwangHoon and Kim YoungKyoon. 2002. Bleeding time prolongation effect of methanol extract of *Viscum album* var. *coloratum*. Natural Product Sciences 8(4): 152-154.

Yasuda, N., Sugimoto, Y., Kato, M., Inanaga, S. and Yoneyama, K. 2003. (+)-Strigol, a witchweed seed germination stimulant, from *Menispermum dauricum* root culture. Phytochemistry 62: 1115-1119.

Yehia, Z.R. and Mekky, M. S. 2002. A comparative study on some post-emergence herbicides for the control of broomrape in faba bean fields. Assiut Journal of Agricultural Sciences 33(5): 85-96. (Suggesting the use of imazapic as a possible alternative to glyphosate for control of *O. crenata* in faba bean.)

Zehhar, N., Ingouff, M., Bouya, D. and Fer, A. 2002. Possible involvement of gibberellins and ethylene in *Orobanche ramos* germination. Weed Research 42: 464-469. (Exogenous ethylene failed to stimulate germination of *O. ramosa* but ethephon (2-chloroethylphosphonic acid) did so, while inhibitors of ethylene synthesis or action reduced germination by GR24, suggesting that ethylene is in some way involved.)

Zehhar, N., Labrousse, P., Arnaud, M.C., Boulet, C., Bouya, D. and Fer, A. 2003. Study of resistance to *Orobanche ramosa* in host (oilseed rape and carrot) and non-host (maize) plants. European Journal of Plant Pathology 109: 75-82. (None of 15 oilseed rape varieties showed any resistance. Carrot varieties Palaiseau and Buror showed resistance after germination and attachment, preventing penetration into the vascular tissues, and resulting in necrosis of the parasite. Maize also prevented effective penetration.)

Zheng XingFeng and Ding YuLong. 2001. (Life habit of *Phacellaria rigidula* Benth.) (in Chinese) Journal of Nanjing Forestry University 25(4): 7-11. (*P. rigidula* is a hyper-parasite, mainly on *Taxillus caloreas* var. *fargesii* but also on *Scurrula parasitica* var. *graciliflora*, both growing on *Keteleeria evelyniana* (Pinaceae) in sparse forest in Yunnan, China. Many aspects of the biology and ecology of *P. rigidula* are usefully described.)

Zych, A. and Zandarski, J. 2002. Organisms harmful to plants as a biological weapon. (in Polish) Ochrona Roslin 46(9): 12-14. (Discussing the potential of parasitic plants as biological weapons!)

HAUSTORIUM 43
has been edited by Chris Parker, 5 Royal York Crescent, Bristol BS8 4JZ, UK (Email chrisparker5@compuserve.com), Lytton John Musselman, Parasitic Plant Laboratory, Department of Biological Sciences, Old Dominion University, Norfolk Virginia 23529-0266, USA (fax 757 683 5283; Email lmusselm@odu.edu) and Jim Westwood, Dept. of Plant Pathology, Physiology and Weed Science, Virginia Tech, Blacksburg, VA 24061-0331, USA (Email westwood@vt.edu). Send material for publication to any of the editors.

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