HAUSTORIUM

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HAUSTORIUM BY EMAIL

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Production and distribution of this issue has been made possible by private donations from Donald Drennan, Nick Reid and the School of Rural Science and Natural Resources, University of New England , Armidale, Australia. Our warmest thanks to those benefactors. Further contributions will be gratefully received.

Thanks to arrangements with the Institute of Arable Crops Research, Long Ashton Research Station, Bristol, Haustorium 34 will also be available on the web site: www.lars.bbsrc.ac.uk/cropenv/haust.htm

SEVENTH INTERNATIONAL PARASITIC WEED SYMPOSIUM

Arrangements are continuing for the Seventh International Parasitic Weed Symposium to be held in Nantes, France, 3-8 June, 2001. A first circular will be sent to all 'subscribers' to Haustorium in April. If you know of others who would be interested, or if there are any comments or suggestions on the format of this event please contact Haustorium editors, or Patrick Thalouarn, Laboratoire de Cytopathologie Vegetale, University de Nantes, 2, Rue de la Houssinière, BP 92208, F44322 Nantes Cedex 3 France. Email patrick.thalouarn@svt.univ-nantes.fr

4TH INTERNATIONAL WORKSHOP ON OROBANCHE RESEARCH

About 90 delegates from 19 countries gathered in the Black Sea resort of Albena, Bulgaria, from 23rd to 26th September. The programme included 30 oral presentations and 27 posters. After an introductory review by Klaus Wegmann which included news of serious new occurrences of Orobanche problems in Germany, there were sessions covering Germination, Physiology and Biochemistry, Molecular studies, Growth and Development, Resistance breeding, and Progress in Orobanche control.

An early paper by Binnie Zwanenberg provided a lucid account of the chemistry and development of strigolactones, including Nijmegen -1. Unfortunately, the prospects for commercial development of the latter remain doubtful. A paper and poster reported parts of Ermias Kebreab's detailed PhD work on the germination and secondary dormancy of Orobanche spp. We look forward to more. Barakat Abu-Irmaileh showed evidence that some of the influence of nitrogen fertilizers in inhibiting Orobanche could be due to a salinity effect. Interesting posters by H. Bozukov and by H Chalakov presented intriguing evidence for the stimulation of germination of Orobanche seeds by surprisingly low doses of metham-sodium and dazomet.

Gea Boelhouwer and Jos Verkleij showed that the damaging effects of O. aegyptiaca in the rapeseed host were proportional to the biomass of the parasite, though there was proportionally greater reduction of host roots than of host shoots. A very interesting development, reported by Jim Westwood and Larry Foy, is the successful infection of Arabidopsis thaliana by O. aegyptiacca and O. ramosa. A total of 303 lines from 22 countries have so far all proved susceptible, but we look forward to further results from work on this important test plant.

Several papers reported the use of molecular techniques, that by A. Ljubenova and I. Minkov using RFLP and RAPD methods to distinguish between different populations of O. aegyptiaca and O. ramosa, while that by Danny Joel and others explored the narrow differences between O. cernua and O. cumana.

A review paper by Edouard Teryokhin explored some evolutionary aspects of the Orobanche genus, in particular the gradation from purely annual to tuber-bearing perennials and the ability to develop new plants from the perennial system in e.g. O. cernua.

A masterly review by Luis Carlos Alonso covered the history of sunflower resistance breeding and the development of virulence in O. cernua/O. cumana in superb detail. The present situation is the occurrence of up to 5 levels of virulence in many countries with an additional 1 or 2 in Spain. Resistance in sunflower to forms A-E is still thought to be mainly due to single dominant genes, though there is some conflicting evidence, suggesting at least some cytoplasmic influence. The mechanisms of resistance differ at each level, perhaps explaining some of the conflicting claims on this topic. The only resistance to the new forms F and G may be recessive, and not confer resistance to 'lower' virulence levels. Resistance in faba bean was also well summarised.

Among other papers on resistance, there was evidence for useful degrees of resistance in some wild Lycopersicon spp. (by O.A.Al-Menoufi), and in tobacco (by C.A. Raju). Y. Goldwasser and others suggested that the mechanism of resistance to O. aegyptiaca in Vicia atropurpurea may be due to a phytoalexin type of response.

On control, several papers from Israel, by Y. Kleifeld, R. Jacobsohn and others summarised promising developments in the use of imidazolinone and sulphonylurea herbicides which allow good selective control in an increasing range of crops, including tomato, sunflower, peas, potato and parsley. In Jordan, B. Abu-Irmaileh reported extensive use of solarization.

Two contributions described the serious problems from Orobanche spp. in Nepal, in both tobacco and in brassica crops. G.B. Kattril reported promising results from use of glyphosate in Brassica campestris reducing the parasite by 95% and increasing yields by up to 50%.

Further work on biocontrol by Fusarium oxysporum, originally isolated in Bulgaria, was presented by J.S. Bedi, showing that chlamydospores have advantages of greater longevity in storage than other propagules. And V. Valkov and others, working in Bulgaria, have confirmed the potential usefulness of genetically modified varieties of tobacco, resistant to glufosinate, chlorsulfuron and asulam, though the prospects for their commercial development and clearance for use remain some way off.

There were two purely discussion sessions, the first explored the specific problems of increasing Orobanche problems in tobacco, while a final review session attempted to identify gaps in Orobanche research and control activities and some possible ways of addressing these gaps.

Apart from the formal sessions there was a brief visit to the local laboratory complex of the Institute for Wheat and Sunflower 'Dobroudja' and a range of lively social events. Warm thanks are due to our local hosts from that Institute for their generous hospitality, along with Klaus Wegmann for his catalytic role in organisation. The Proceedings are being prepared and should be available early in 1999.

Chris Parker.

THE CUSCUTA PROBLEM IN URUGUAY

In Uruguay, four species of Cuscuta occur: C. pentagona (= C. campestris), C. suaveolens, C. cristata and C. epithymum. Cuscuta spp. mainly affects the cultivation of alfalfa (lucerne) and red clover and their seed production. On Feb. 15, l985, a decree No. 76/985 with the force of law, was issued declaring Cuscuta an agricultural pest. It establishes that:

a) seedbeds and seeds where Cuscuta is detected are to be discarded, they are not to be used commercially.

b) it is compulsory to control this weed by destroying it.

At the moment there are three ways in which this problem is managed:

a. by preventive action using only Cuscuta-free seed.

b) when the plant is established but seed is not yet formed, by applying the desiccating agent paraquat. This agent does not seriously damage the leguminous plants, though a careful check is essential to ensure the Cuscuta has been completely eliminated.

c) when the Cuscuta has developed seeds, by applying paraquat in the same way, but when the foliage dries up two or three days later, it should be burned with the help of dry hay and gasoline.

A project is now in progress in the Bioengineering Department to study the possibility of using a biological control agent, such as the spores of a fungus, instead of using chemical desiccants. Colletotrichum gloeosporioides has been collected from banana and is being used in the study of fermentation in solid state systems and the development of biotechnology methods for production of inoculum as a biocontrol agent.

Further work is planned, to determine the specificity and pathogenicity of the fungal strain against various Cuscuta species and to conduct screening of the fungus in the field.

Alejandro Bossio, Adriana Giachero, Ana Laura Ortega and Juana González, University of Uruguay, Montevideo, Uruguay.

LISTSERVE FOR PARASITIC PLANTS

The global computer network provides us with a very simple tool for easy communication between those who are interested in parasitic weeds. Further to my announcement in Albena, I would like to introduce you to the "Parasitic Plant (PP) mailing list", which is administered by an automatic listserve programme that enables each of us to send questions, comments, notes etc. for immediate distribution by Email to all subscribers (it is not a website). With this system, one can easily initiate a discussion, get helpful tips, find colleagues who may collaborate on specific matters, or just keep reading the discussions of others that may be interesting, helpful, or challenging. This gives an easy access to many others who are interested in parasitic plants.

If you wish to subscribe, send the command: SUBSCRIBE PP <your name>

(e.g. SUBSCRIBE PP John Smith) to the address: listserv@opus.hpl.hp.com (NB not listserve@). If you later wish to discontinue, you can de-subscribe by sending the command UNSUB PP to the same address.) The command should be in the message space (not the subject line) and should not be followed by any further text or signature. Soon after, you will get an acknowledgement message and your Email address will be added to the mailing list. You will then receive copies of all messages that are sent to the listserve, including group discussions.

You may contribute your own messages by sending them by Email to the distribution address: pp@opus.hpl.hp.com (note this is different from that above). All information regarding future workshops, conferences and other meetings on parasitic plants (including weeds) will be distributed via this channel, which saves postage and is much more efficient than ordinary mail. We therefore encourage all subscribers of Haustorium to subscribe to the PP List. Please distribute this information also to those who do not get Haustorium.

For those with internet access, you may be interested in checking out the PP WEB page at: http://www.hpl.hp.com/bot/pp_home. Another site is "The Parasitic Plant Connection" (see next item). Good luck!

Daniel M. Joel, Newe Ya'ar Research Centre, P.O.Box 1021, Ramat-Yishay 30095, Israel.

WEBSITE - THE PARASITIC PLANT CONNECTION

During the spring and summer of 1997, I created a web site called "The Parasitic Plant Connection" and placed it on the College of Science web server at: http://www.science.siu.edu/parasitic-plants/index.html

Since that time the site has continued to grow and evolve. As explained on the "Why the Parasitic Plant Connection?" page, the motivation to assemble this series of pages was both self-serving and altruistic. For myself, I would like to use these pages as a repository of information on parasitic plants as an aid to my research program. Parasitic plants are found in approximately 18-22 families representing 230 genera and 3100 species. A group of this size requires real effort to keep the information organized (something systematists are compelled to do). I began organizing information about parasitic plants over three years ago using a program called HyperCard. From this came a series of "stacks" (files) containing graphical images (B & W), species lists, distribution maps, etc. for all groups in Santalales, Balanophorales s. lat. and Rafflesiales s. lat. that I named "HyperParasite." This series of stacks is still available from me (send five formatted disks) or via the FTP server h ere at SIUC. HyperParasite is still extremely useful for me, but it requires a MacIntosh platform to run, hence its use was limited to that crowd. By posting these pages on the web, the number of "users" will hopefully increase. In addition, the black and white images do not do justice to the beauty of many of the parasitic plants. The spectacular flower of Rafflesia must be seen in color to be fully appreciated! Such is also the case for many other plants such as the flamboyant flowers of Loranthaceae or the subtle beauty of a mistletoe seed. During the course of traveling to the far corners of the earth to collect parasitic plants, I have assembled a rather sizable collection of photographs of these unusual plants. With these, and hopefully with others made available by colleagues, I hope to share with others the joy of viewing these fantastic plants. In addition to aesthetic appreciation, I hope these pages will also be of use to those interested in learning some science about these plants. As a systematis t, links to current nomenclature and bibliographic sources are very important. As a molecular systematist, I also require ready access to DNA sequence data on these plants. For this reason, I have made available links to sequence information, ribosomal RNA secondary structure diagrams, and multiple sequence alignments to all parasitic flowering plants.

The success of the PPC can be judged from the fact that there have been 3500 visits to the site since December 1997. The web site has also generated many questions from users ranging from research scientists to the general public. Finally, the visibility of the site has been increased by links to it from other major web sites and databases, including the following:

The Plant Pathology Internet Guide Book:

http://www.ifgb.uni-hannover.de/extern/ppigb/ppigb.htm Scott's Botanical Links: http://www.floridaplants.com/Scott/

The Botany Site (the Mining Company, Bryan Ness: http://botany.miningco.com/ BioMedLink database: http://biomedlink.com/

Dan Nickrent, Dept. of Plant Biology, Southern Illinois University, Carbondale, Illinois, USA.

STRIGA-RESISTANT COWPEAS

In the paper by Touré et al., 1998, listed in the Literature section (see below), there is a comment that 'the low quality of the seeds (of B 301) seems to be transmitted to the progenies, and farmers in West Africa still lack well-adapted high-yielding, good quality cowpea cultivars with resistance to S. gesnerioides'. We asked Dr B.B. Singh of IITA for his reaction to this comment and he writes as follows:

'Dr Touré's observations about B 301 seed quality being poor is true but there is no linkage between seed quality and Striga resistance. Therefore, we have transferred the gene for Striga resistance from B 301 into a diverse set of new cowpea varieties with white as well as brown seeds which are quite acceptable in West Africa. Most of these varieties have combined resistance to all the 5 known strains of Striga including the one at Zakpota (Benin Republic). The most promising lines are:

1. IT93K-513-2 (white)

2. IT93K-693-2 (brown)

3. IT94K-437-1 (white

4. IT94K-440-3 (white)

5. IT95K-1090-12 (brown)

6. IT95-627-34 (white)
7. IT96K-748 (white)
8. IT96D-757 (white)
9. IT96D-759 (white)

All these varieties have combined resistance to Striga, aphid, bruchid and major diseases. In addition, a large number of advanced breeding lines with Striga resistance are in preliminary trials. You may also be aware that from the earlier Striga resistant lines derived from crosses with B 301, IT90K-76 (brown), has been released in Nigeria and IT90K-59 (brown) in South Africa.

B.B. Singh, IITA, Kano, Nigeria Email .'

POLLEN MORPHOLOGY OF VISCUM SPP. IN SPAIN:

ITS APPLICATIONS TO HOLOCENE PALAEOECOLOGY

The thermal-limit curve for mistletoe (Viscum album) indicates it is not restricted by temperature in oceanic western Europe. It appears to tolerate more cold than the ivy (Hedera helix) or holly (Ilex aquifolium); the two other species that are normally mentioned in the palaeopalynological papers along with the mistletoe. In Denmark and Great Britain, pollen grains of Viscum have been found in Boreal, Atlantic and Sub-boreal times in deposits beyond its present range, suggesting that it preferred warmer conditions. This applies only to V. album, not to V. cruciatum which is restricted in Europe to the Iberian Peninsula. The ecology of each species in the Iberian Peninsula is quite different: V. album parasitises at least 24 species in Spain including Abies alba, Pinus spp., Malus communis, Pyrus communis, Robinia pseudoacacia, Sorbus aucuparia, Sorbus aria, Salix spp., Acer spp., Tilia spp., Quercus robur, Corylus av ellana, etc. It is recorded in 15 regions and 35 provinces in the north and centre of the country, but in the south (Andalusia) it is known only in mountainous zones. V. cruciatum, on the other hand has a different ecology. V. cruciatum grows at lower altitudes with a mean warm mountain climate (subtropical) in 8 provinces of Andalusia on different hosts such as Retama spp., Olea europaea, Hedera helix or Rhamnus lycioides. The chorological maps of both species clearly show that they are vicarians. There are two different pollen types. Both are 3-colporates, spheroidals, rounded triangulars, with a sexine about 1.5-2 m m thick, that in V. album is finely bacculate with distantly spaced blunt spinules. The V. cruciatum type has a sexine with a different ornamentation, with big spines about 3-5 m m.

J.A. López-Sá ez, Laboratorio de Arqueobot« nico, 28014 Madrid, Spain.

CHANGES OF HOST IN GERMANY

Jurgen Kroschel left Hohenheim at the end of 1998 and is now with the Institute for Crop Science, University of Kassel, Steinstr. 11, 37213 Witzenhausen, Germany. His new Email address is: kroschel@wiz.uni-kassel.de

Meanwhile, Jachim Sauerborn has returned to Hohenheim, joining the Institute of Plant Production and Agroecology in the Tropics and Subtropics (380), University of Hohenheim, 70593 Stuttgart, Germany. His new Email addres is: sauerbn@uni-hohenheim.de

OBITUARY - LARRY BUTLER

14 December 1933-19 February 1997.

Professor Larry Butler died suddenly after surgery and will be greatly missed by Striga researchers and others who knew this generous, kindhearted, self-deprecating biochemist. Born on a farm, he received his BS in chemistry from Oklahoma State University in 1960 and his Ph.D. in 1964 at the University of California Los Angeles. For a year he was chairman of a science department at a church school reflecting his long interest in the Bible and church related activities. In the 1980s he began his research on polyphenol metabolism in sorghum. It was not surprising that this led to studies of germination stimulants produced by cereals that signal the Striga seeds to germinate. In 1986, he was the first to identify the host-produced germination signal, sorgholeone with a complex molecular structure.

His love of people and science endeared him to people around the world. Not only his colleagues at Purdue University but those of us who had only occasional interaction with him mourn his loss.

Lytton Musselman

TWO NEW BOOKS ON OROBANCHE FROM GERMANY

Increased interest in the holoparasitic root parasites of the Orobanchaceae is evidenced by a series of books published during the past several years. Like that by Kreutz, reviewed in Haustorium 31, the following two volumes centre on European species.

Die Sommerwurzarten Europas. Gattung Orobanche. Holger Uhlich, Jürgen Pusch, Klaus-Jörg Barthel. (1995). Westart Wissenschaften, Wolf Graf von Westarp, Uhlichstrasse 6, 39108, Magdeburg, Germany. 235 pp. (paperback). DM45, SF44. ISBN 3-89432-444-9.

Die Sommerwurzarten Europas appears to be an updating of the mammoth monograph of Beck von Mannagetta. Published in 1930 as part of Pflanzenreich, this detailed and taxonomically byzantine work culminated four decades of research. Subspecific taxa, including forms, were named with little restraint, obscuring the inherent variation in a group usually considered as rapidly evolving. Sommerwurzarten, then, must be read through the lenses of this earlier work and the resultant fog of names. Ideally this classical work should be examined in the light of contemporary work. Significant systematic research on Orobanche using cladistics and molecular methods have been published in the last five years. Virtually none of these are cited.

The book is divided into nine parts beginning with an overview of the family followed by a detailed discussion of the names, ecology, and anatomy and morphology. This latter section is of particular value for its detailed discussion of floral parts used in taxonomy. Figure 2 (page 27) is one of the best descriptions of the terminology of the floral parts I have seen. Typewritten and difficult to read labels detract.

The bulk of the book is in section four, The European Species of the Genus, which takes almost half the book. Again, the irritating splitting is bothersome. But a great deal of information is available for each species with especially detailed host lists (although I am suspect of the reliability of some of these reports). Helpful color photographs, well reproduced, as well as black and white pictures and figures (from Beck von Mannagetta?) enhance this part.

There is a section on chromosome numbers, hybridization and culture that grossly omits published reviews and other papers. This is followed by a section on the nutrition of the parasite. Section eight deals with East German species and includes a helpful illustrated key. The last section treats of conservation. An extensive host list, glossary, references and maps of species distribution conclude the book.

The cost is reasonable for a well produced book. Despite its shortcomings and already being out of date, I am glad to add this volume to my collection of Orobanche literature. Anyone dealing with the flora of Europe or parasitic plants will be interested in this book.

Weed Broomrapes. Systematics, ontogenesis, biology, evolution. Edward S. Teryokhin. (1997). Aufsteig CmbH, Isarweg 37, D-84028 Landshut, Germany. x+182 pp. (paperback). DM 39. ISBN 3-7612-0254-7.

Teryokhin's volume is a helpful compilation of the author's research spanning several decades. It is, in many ways, representative of an earlier era, with much classical typology of the German school. I am glad that so much of this work first published in Russian is now in English--of a sort. If I were not familiar with the author and his work I would have difficulty comprehending some of the writing. Further, there is a plethora of spelling errors as well which reflect more a lack of editing than a language problem.

The main corpus of the book is based on Teryokhin's many and diverse publications on the Orobanchaceae. He presents a new taxonomy of the subfamily Orobanchoideae. This includes several new taxa. Weed scientists will chaff (as they often do when dealing with botanical nomenclature) at his splitting of the widespread and important parasitic weed Orobanche ramosa and its relatives into the genus Phelipanche and the new names that result. While I will probably continue to use the old name, Teryokhin gives reasonable evidence for recognizing these plants as a separate genus.

Botanists will gain much from the first English presentation of his detailed studies on inflorescence morphology, seed development, embryology, dissemination, germination, seedling development, and vegetative propagation. The final chapter deals with broomrape evolution and selection and could have been combined with a truncated earlier chapter on evolution. One of the very informative aspects of the evolution chapter is a discussion of race development summarizing the well known work of Pustovoit who first pointed out this phenomenon while working with sunflower (Helianthus anuus). Pustovoit showed that the broomrape Orobanche cernua developed races in response to sunflowers bred for resistance.

Weed Broomrapes is a worthwhile contribution to our understanding of the genus Orobanche. Despite its defects, it should be in the library of any scientist or organization working with parasitic weeds. At less than $20 it is a bargain. Figures and drawings are well reproduced but the binding in my copy is already disintegrating in the arid Middle East.

(These reviews are adapted from those published in Economic Botany)

Lytton Musselman

OTHER NEW BOOKS AND PROCEEDINGS

Mistletoes of Africa. Roger Polhill and Delbert Wiens. (1998). Royal Botanic Gardens, Kew, Richmond, TW9 3AB, UK. 370 pp. (hardback) £70.00. ISBN 1 900347 56 3.

This magnificent new volume has three main sections. The introductory section has a series of excellent in-depth chapters on The Parasitic Habit etc (see below). The second section is the Systematic part, while the third includes References and a comprehensive List of Specimens studied.

The main section amounts to a masterly, almost monumental, monograph of the African mistletoes in Loranthaceae (21 genera) and Viscaceae (3 genera). There is happily no re-arrangement or re-naming of genera, but an immensely erudite and thorough re-appraisal of the taxa in each genus and a substantial number of new species described, perhaps 40 in all. Of 45 Viscum species, no less than 10 are newly described; of 59 Aelanthus spp., 7 are new; of 30 Tapinanthus and 25 Englerina spp., 4 are new in each; of 34 Phragmanthera spp. just 1 is new. One may ask, do we have splitters at work here? But the answer seems to be no. The new species sound to be quite distinct, and are mostly very restricted in distribution.

There is a lengthy introduction to each genus (and section, where necessary), followed by clear keys which appear to use generally accessible characters. The treatment of individual species provides detailed synonymy and description, often supported by excellent line drawings by Marguerite Scott and Christine Grey-Wilson, showing comparison of key features in groups of species. There are colourful photographs of about 50% of the species. There is no systematic attempt to illustrate all species, and some have neither drawing nor photograph. Distribution of all species is shown on beautifully clear, coloured relief maps of Africa, usually 2 or 3 species per map. Information on host range is somewhat sporadic - presumably reflecting the information, or lack of it, recorded on herbarium sheets.

The introductory chapters provide valuable, up-to-date reviews of a range of background topics. The first, on the Parasitic Habit, covers the haustorium, host relations, physiological aspects, and mimicry. Under host range it is shown that 70% of species have a wide host range, 12% are limited in host range and 18% very limited. The chapter on Origins and Evolution includes reference to some of the latest evidence from DNA studies (e.g. Nickrent, 1996). That on Comparative Morphology (by Clyde Calvin and Carol Wilson) describes the different types of haustorial connection with the host, showing the gradation from a single point of contact ('wood rose') through the 'clasping union' to the presence of 'epicortical roots' and 'bark strands' (endophyte) from each of which additional adventitious shoots may or may not occur. It is illustrated with many photographs of haustoria from the substantial haustorium collection at Portland State University. That on Pollination Mechanisms (by Donald Kirkup) discuss es the many different explosive and non-explosive pollination mechanisms involved, and the relationship with birds. This is illustrated with many excellent photomicrographs of the critical tissues involved in explosive opening. Chapters on Generic Classification and Biogeography are both detailed, and again refer to the most recent molecular data, quoting websites for the latest unpublished information. That on Economic Importance is relatively brief but provides a useful overview of the genera and species causing economic damage, including Tapinanthus bangwensis damaging cocoa in West Africa not only directly, but also by encouraging certain ant species and hence the mealy bugs responsible for transmission of swollen shoot disease. Also Phragmanthera capitata, prevalent on rubber and teak in Cameroon, and Tapinanthus spp. on rubber in Nigeria, on shea butter nut in Burkina Faso and on citrus and guava in Sudan.

It is noted that this book 'serves as a precursor for the Flora of Tropical East Africa and Flora Zambesiaca'. It seems possible that this may account for the price being kept to £70, a relatively modest price for such an important volume so beautifully produced and illustrated. A must for all mistletoe workers and a potential inspiration to many others working on parasitic plants.

Chris Parker.

Striga Research Methods--A Manual. D. K. Berner, M. D. Winslow, A. E. Awad, K. F. Cardwell, D. R. Mohan Raj, and S. K. Kim (1997) International Institute of Tropical Agriculture, Oyo Road, PMB 5320, Ibadan, Nigeria. 81 pages (paperback). No price given.

Farmers in sub-Saharan Africa often suffer the devastating effects of Striga species (known as witchweed in English) on their cereal and legume crop yields. Despite the well documented losses inflicted by these parasitic weeds, research in Africa during the past three decades has lacked a clear focus that would use a diversity of approaches rather than just breeding for resistance. This changed when the International Institute of Tropical Agriculture (IITA) established a Striga Research Group and, later, a parasitic weed research initiative that would co-ordinate research on parasitic weeds for all of the centres associated with the Consultative Group on International Agricultural Research. This manual is a benchmark of the success of this very productive and innovative group. The value of the manual lies in the detailed, hands on approach to setting up experiments and giving information on how to interpret and analyse the results. Its audience is African researchers. Topics include the colle ction and preservation of seed for research purposes; ways to infest pots and fields; techniques to extract seeds from the soil, essential in measuring the efficacy of methods to reduce the seed bank; maize breeding for Striga resistance; and a systems approach to Striga research. Looked at another way, the manual guides the worker from the collection of the seed, through the laboratory and field to systems modelling. All of this in clear, simple language with helpful pictures, drawings, glossary, and even computer programs for analysing data. Ten years ago, I edited a volume that attempted to provide a single source for the researcher who needed both to understand Striga as well as the methods needed for research. I am pleased to say that this compact volume is more than a suitable successor because it incorporates so much up-to-date data. Weed researchers, plant pathologists, and agronomists outside Africa will also want a copy of this work!

(This review is adapted from that published in Economic Botany)

Lytton Musselman

New Zealand's Loranthaceous Mistletoes. 1997. Proceedings of a workshop hosted by Threatened Species Unit, Department of Conservation, Cass, 17-20 July, 1995. Edited by de Lange, P.J. and Norton, D.A. Published by Department of Conservation, P.O. Box 10-420 Wellington, New Zealand.

Contents (with some abbreviation):

Historical distribution of New Zealand loranthaceous mistletoes.

Status of loranthaceous mistletoes in (13 Conservancy districts)

An annotated checklist of New Zealand mistletoe (Loranthaceae) hosts.

Host specificity and spatial distribution patterns of mistletoes.

Reproductive ecology of the loranthaceous mistletoes of New Zealand.

Some aspects of reproduction and possum control of five loranthaceous mistletoes…

Mistletoe moths.

Population biology of Australian mistletoes. (see Bibliography below - Reid, 1997)

Evidence of the impacts of possums on mistletoes.

An assessment of possum (Trichosurus vulpecula) impacts on loranthaceous….

Decline of New Zealand loranthaceous mistletoes - a review of non-possum threats

Discussion of threats to mistletoes.

Conservation status of New Zealand loranthaceous mistletoes: a comment on the application of IUCN Threatened Plant Committee Red Data Book Categories.

Discussion on status of mistletoes

Mistletoe management, Tongariro-Taupo Conservancy.

Mistletoe protection and monitoring strategies on the West Coast.

Propagation of mistletoes in the central North Island.

Discussion of management techniques.

Discussion on the development of a mistletoe strategy.

Annotated bibliography for New Zealand viscaceous and loranthaceous mistletoes.

Chris Parker

LITERATURE

Abayo, G.O., English, T., Eplee, R.E., Kanampiu, F.K., Ransom, J.K. and Gressel, J. 1998. Control of parasitic witchweeds (Striga spp.) on corn (Zea mays) resistant to acetolactate synthase inhibitors. Weed Science 46: 459-466. (Imazapyr applied to Pioneer 3245 IR (resistant to ALS-inhibiting herbicides) at about 30 g/ha, either post-emergence, directed, or in a 1 ml drench per planting hole greatly delayed emergence of Striga asiatica and S. hermonthica in USA and Kenya respectively and improved crop growth. Other imidazolinone or sulfphonylurea herbicides were less effective, or damaging.)

Abdel-Hameed, M. T. 1996. Effects of watering regimes on the relationship between faba bean and Orobanche crenata. MSc Thesis, Cairo University. (In pot experiments, reducing water availability by 60% did not consistently increase the damaging effect of O. crenata. In the field, reduced irrigation reduced the numbers of O. crenata attacking the crop, but resulted in significantly more damaging effect. There were varying responses among the 4 varieties tested - Giza 3, Giza 402, Asssiut 104 and Cairo 241.)

Aflakpui, G.K.S., Gregory, P.J. and Froud-Williams, R.J. 1998. Effect of temperature on seed germination rate of Striga hermonthica (Del.) Benth. Crop Protection 17: 129-133. (Base, optimum and ceiling temperatures were 23, 40 and 43oC after conditioning at 20 oC, and 19, 32-35 and 43 oC after conditioning at 30 oC.)

Al-Khatib, K., Baumgartner, J.R., Peterson, D.E., Currie and R.S. 1998. Imazethapyr resistance in common sunflower (Helianthus annuus). Weed Science 46: 403-407. (Repeated - 7 year - use of imazethapyr to control wild H. annuus in USA led to development of a biotype with x170 resistance. Could be useful for Orobanche?)

Anderson, R. 1997. Orobanche minor Smith on sea holly (Eryngium maritimum) at Inishmaan, Aran Islands. Irish Naturalists' Journal 25: 456.

Appiah, A.A. and Owusu, G.K. 1997. Cocoa mistletoes - a review. Proceedings, First International Cocoa Pests and Diseases Seminar, Accra, 1995: 272-279.

Avdeev, Y.I. 1998. (The variety 'Astrakhan' is resistant to broomrape.) (in Russian) Kartofel' I Ovoshchi, 1998 No 2: 40. (Field observations in the Astrakhan region suggest that tomato varieties 'Astrakhan' and 'Bakhtemir' may be resistant to Orobanche aegyptiaca.)

Aydin, A. and Korkut, K.Z. 1998. Broomrape resistance of some backcross derivatives of HA-89 and their hybrids. Helia 21(28): 29-34. (Male-sterile sunflower HA-89 backcrossed with different Orobanche resistant lines, yielded 7 resistant combinations, 6 of which retained resistance after crossing with Orobanche-susceptible restorers.)

Bayaa, B., Kumari, S.G., Akkaya, A., Erskine, W., Makkouk, K.M., Turk, Z. and š Özberk, I. 1998. Survey of major biotic stresses of lentil in South-East Anatolia, Turkey. Phytopathalogia Mediterranea 37: 88-95. (Orobanche aegyptiaca was prevalent in some production regions, and in Sanliurfa some fields were totally devastated.)

Barney, C.W., Hawksworth, F.G. and Geils, B.W. 1998. Hosts of Viscum album. European Journal of Forest Pathology 28: 187-208. (V. album has more recorded hosts than any other mistletoe species - 452 taxa in 96 genera of 44 families.)

Berner, D.K. and Williams, O.A. 1998. Germination stimulation of Striga gesnerioides seeds by hosts and nonhosts. Plant Disease 82: 1242-1247. (Species other than cowpea, capable of germinating S. gesenerioides, and of potential value as trap crops include other Vigna spp. and some selections of sorghum, pigeon pea, Lablab purpureus and Sphenostylis stenocarpa.)

Berner, D.K., Winslow, M.D., Awad, A.E., Cardwell, K.F., Mohan Raj, D.R. and Kim, S.K. 1997. Striga research methods - a manual. IITA, Nigeria. 81 pp. (See review above.)

Briggs, J. 1997. Mistletoe survey. Spring 1997 update. Botanical Society of the British Isles News 75: 31-33.

Calder, M. (ed.) 1997. (Sixteen papers on mistletoe ecology and management) The Victorian Naturalist 114(3). (see e.g. Reid, 1997 below)

Caldwell, J.S., Touré , G.K., Erbaugh, M., Dembélé , B., Edwards, C.R. and Diarra, A. 1998. Merging farmer knowledge and priorities with scientific knowledge and research methods for participatory development of IPM technology for control of blister beetles and Striga parasitic weed in Mali, West Africa. Proceedings 15th International Symposium, Association for Farming Systems Research and Extension, Pretoria, 1998. 1030-1037. (Blister beetles and Striga were predominant problems identified by farmers: inter-cropping (cowpea) plus fertilizer more acceptable than late weeding for Striga management.)

Carsky, R.J., Nokoe, S., Lagoke, S.J.O. and Kim, S.K. 1998. Maize yield determinants in farmer managed trials in the Nigerian Northern Guinea Savanna. Experimental Agriculture 34: 407-422. (Complex statistical analysis of 52 variables from 37 farmer trials: the tolerant maize hybrid 8321-18, known as Oba Super 1, yielded siginficantly better than the local variety: the Striga-resistant synthetic STR Syn-W was no better than the local.)

Crackles, E. 1998. Thistle broomrape apparently behaving as a saprophyte. Botanical Society of the British Isles News 79: 53. (Orobanche reticulata apparently thriving after death of hosts Cirsium eriophorum and C. arvense.)

Dale, H. and Press, M.C. 1998. Elevated atmospheric CO2 influences the interaction between the parasitic angiosperm Orobanche minor and its host Trifolium repens. New Phytologist 140: 65-73. (Higher CO2 alleviated the damaging effect of O. minor on its host, but did not increase parasite growth.)

Davies, D.M. and Graves, J.D. 1998. Interactions between arbuscular mycorrhizal fungi and the hemiparasitic angiosperm Rhinanthus minor during co-infection of a host. New Phytologist 139: 555-563. (Infection of Lolium perenne by R. minor reduced host growth by c. 50% and reduced AM colonization apparently via reduced C availability. Colonization of the host by AM increasaed numbers of secondary haustoria and weight of R. minor by c. 50%.)

Davies, D.M., Graves, J.D., Elias, C.O. and Williams, P.J. 1997. The impact of Rhinanthus spp. on sward productivity and composition: implications for the restoration of species-rich grassland. Biological Conservation 82: 87-93. (On 5 sites in Britain and N. Italy, productivity reduced by Rhinanthus: grasses reduced, dicots increased.)

Debrah, S.K., Defoer, T. and Bengaly, M. 1998. Integrating farmers' knowledge, attitude and practice in the development of sustainable Striga control intervention in southern Mali. Netherlands Journal of Agricultural Science 46: 65-75. (Soil fertility and farming practices identified as the main factors influencing Striga abundance; and emphasising improvement of soil fertility as the most important route towards control.)

De Lange, P.J. and Norton, D.A. (eds.) 1997. New Zealand's Loranthaceous Mistletoes. Proceedings of a Workshop Hosted by the Threatened Species Unit, Department of Conservation, Cass. Wellington, 1995. (see Contents list above)

Determann, R., Kirkman, L. and Nourse, H. 1997. Plant conservation by propagation. The case for Macranthera and Schwalbea. Tipularia a Botanical Magazine 12: 2-12. (Presenting protocols for the growth and maintenance of Macranthera flammea and Schwalbea americana, both parasitic Scrophulariaceae and rare in SE USA. S. americana is a federally endangered species: M. flammea is one of the most spectacular members of the family with large orange flowers pollinated by humming birds.)

Dimitrova, T.S. 1998. (Study of the herbicide Pivot 100 EK for Cuscuta spp. control in an alfalfa stand establishment.) (in Bulgarian) Plant Science, Sofia 35: 651-655. (Imazethapyr 100-150 g/ha applied at the 2-4 trifoliate leaf stage controlled Cuscuta and other weeds and increased yield X 2.6.)

Duff, R.J. and Nickrent, D.L. 1997. Characterization of mitochondrial small-subunit ribosomal RNAs from holoparasitic plants. Journal of Molecular Evolution 45: 631-639.

Ebel, J. and Mithöfer, A. 1998. Early event in the elucidation of plant defence. Planta 206: 335-348. (No mention of parasitic plants, but potentially relevant discussion of the role of elicitor-binding proteins and their role in defence signalling.)

Gagne, G., Roeckel-Drevet, P., Grezes-Besset, B., Shindova, P., Ivanov, P., Vear, F., Tourevielle de Labrouche, D., Charmet, G. and Nicolas, P. 1988. Study of the variability and evolution of Orobanche cumana populations infesting sunflower in different European countries. Theoretical and Applied Genetics 96: 1216-1222. (Populations from Bulgaria, Romania, Turkey and Spain studied using RAPD markers. Apparently self-pollinating, little intra-population variability. E. European populations distinct from the Spanish.)

Gardner, S.N., Gressel, J. and mangel, M. 1998. A revolving dose strategy to delay the evolution of both quantitative vs major monogene resistance to pesticides and drugs. International Journal of Pest Management 44: 161-180. (A highly mathematical treatise proposing that a cycle of low and high doses of pesticide will tend to delay development of pesticide resistant species (including weeds) compared with constant doses. No mention of parasitic weeds but presumably relevant to potential herbicide resistance in Orobanche.)

Gbèhounou, G. 1998. Seed ecology of Striga hermonthica in the Republic of Bénin: host specificity and control potentials. Doctoral thesis. Vrije University, Amsterdam. 126 pp. (Seeds of S. hermonthica from different sites had a variable primary dormancy lasting 0-7 months; stored in moist soil, seeds apparently lost viability in 2 years; delayed sowing greatly reduced Striga infestation, but failed to increase sorghum yields; cowpea IT 90k-56 was shown to have a beneficial trap-crop effect when sown early.)

Ghosh, R.B. and Das, D. 1998. Cassytha filiformis - a census on its host range in the district of Midnapore, West Bengal. Environment and Ecology 16: 485-486. (24 host species noted, in 22 genera.)

Hagenah, W., Dörges, I., Gafumbegete, E. and Wagner, T. 1998. (Subcutaneous appearance of a centrocytic non-Hodgkin lymphoma at the site of a misteltoe preparation.) (in German) Medizinische Wochenschrift 123: 1001-1004. (High concentrations of mistletoe preparation promoted growth of lymphoma cells, perhaps due to liberation of interleukin -6 from the skin.)

Hall, P.J., Bowers, W.W. and Hirvonen, H. 1998. Forest insect and disease conditions in Canada 1995. Canadian Forest Service, 72 pp. (Arceuthobium americanum, discussed.)

Hartmann, T. 1997. (Pine mistletoe contrary to ecological silviculture?) (in German) AFZ/Der Wald, Allgemene Forst Zeitschrift fur Waldwirtschaft und Umweltvorsorge 52(1): 52-53. (Arguing for V. laxum in Pinus sylvestris in Germany to be treated as a natural component, not as a weed.)

Hassan, R.M. and Ransom, J.K. 1998. Determinants of the incidence and severity of Striga infestation in maize in Kenya. In: Hassan, R.M. (ed.) Maize Technology Development and Transfer: a GIS Application for Research Planning in Kenya. CABI, Wallingford, UK: 163-174.

Hebbar, K.P., Lumsden, R.D., Lewis, J.A., Poch, S,M, and Bailey, B.A. 1998. Formulation of mycoherbicidal strains of Fusarium oxysporum. Weed Science 46: 501-507. (No mention of parasites, but technology of relevance to work on Striga, Orobanche.)

Herrman, I. 1998. Seed population dynamics of Striga hermonthica (Del.) Benth. on maize (Zea mays L.) in Southern Benin, with special emphasis on maize root induced S. hermonthica seed losses in the soil. PLITS 16(1): 181 pp. + appendices. (Tolerant maize 8322-13 averaged 1 t/ha higher yield than susceptible 8338-1: 2-12% of seeds in soil stimulated by crop roots per season: many other detailed observations.)

Hershenhorn, J., Goldwasser, Y., Plakhine, D., Ali, R., Blumenfeld, T., Bucsbaum, H., Herzlinger, G., Golan, S., Chilf, T., Eizenberg, H., Dor, E. and Kleifeld, Y. 1998. Orobanche aegyptiaca control in tomato fields with sulfonylurea herbicides. Weed Research 38: 343-349. (Repeated application of chorsulfuron and triasulfuron by sprinkler irrigation, followed by clean water, gave up to 90% control and substantial yield increases.)

Hershenhorn, J., Goldwasser, Y., Plakhine, D., Lavan, Y., Herzlinger, G., Golan, S., Chilf, T. and Kleifeld, Y. 1998. Effect of sulfonylurea herbicides on Egyyptian broomrape (Orobanche aegyptiaca) in tomato (Lycopersicon esculentum) under greenhouse conditions. Weed Technology 12: 115-120. (Rimsulfuron at 25 g a.i./ha sprayed 10 days after planting gave good selective suppression; chlorsulfuron and triasulfuron also gave excellent selective control when applied to the soil at 3.75-15 g a.i./ha in irrigation water.)

Hershenhorn, J., Plakhine, D., Goldwasser, Y., Westwood, J.H., Foy, C.L. and Kleifeld, Y. 1998. Effect of sulfonylurea herbicides on early development of Egyyptian broomrape (Orobanche aegyptiaca) in tomato (Lycopersicon esculentum). Weed Technology 12: 108-114. (Bensulfuron, chlorsulfuron, nicosulfuron, primisulfuron, rimsulfuron, thifensulfuron and triasulfuron all reduced O. aegyptiaca seedlings in vitro; only rimsulfuron caused selective suppression of the parasite after attachment.)

Hibberd, J.M., Bungard, R.A., Press, M.C., Jeschke, W.D., Scholes, J.D. and Quick, W.P. 1998. Localization of photosynthetic metabolism in the parasitic angiosperm Cuscuta reflexa. Planta 205: 506-513. (Photosynthesis shown to be restricted to cells adjacent to vascular bundles, but otherwise normal in character, presumably using internally respired CO_2, and making a positive contribution to the carbon budget.)

IITA 1998. Researchers take the risk out of growing food crops. International Agricultural Development Sept/Oct 1998: 14-15. (A brief summary of current activities on Striga in maize.)

Joel, D.M., Portnoy, V.H. and Katzir, N. 1998. In: Champion, G.T., Grundy, A.C., Jones, N.E., Marshall, E.J.P. and Froud-Wiulliams, R.J. (eds.) Weed Seedbanks: Determination, Dynamics and Manipulation. Aspects of Biology 51: 23-27. (Identification of seeds of 5 species of Orobanche by DNA analysis, using PCR-based markers.)

Karadavut, U., Can, E., Divanli, A. and Gemalmaz, N. 1998. Weed survey of faba bean (Vicia faba L.) fields in Hatay province. Turkish Journal of Field Crops 3(1): 33-35. (Orobanche crenata one of the 3 commonest weeds of faba bean on the Amik Plain.)

Kelly, P., Reid, N and Davies, I. 1997. Effects of experimental burning, defoliation, and pruning on survival and vegetative resprouting in mistletoes (Amyema miquelii and Amyema pendula). International Journal of Plant Sciences 158: 856-861. (Experiments with pruning and flaming suggest that browsing and periodic fires are natural control agents.)

Kharrat, M., Halila, M.H. and Ait-Abdallah, F. 1998. (Distribution, biology and control of Orobanche in food legumes in Mediterranean countries.) (in French) In: Tivoli, B. and Caubel, G. (eds.) Les légumineuses alimentaires méditerranéennes. Contraintes biotiques et potentialités de développment, Rennes, 1997. Colloques de l'INRA. No. 88: 65-80. (A review covering distribution, importance, temperature effects and control measures, especially by herbicide.)

Kim, S.K., Fajemisin, J.M., Thé, C., Adepoju, A., Kling, J., Badu-Apraku, B., Versteeg, M., Carsky, R. and Lagoke, S.T.O. 1998. Development of synthetic maize populations for resistance to Striga hermonthica. Plant Breeding 117: 203-209. (Claiming the development of populations of both white and yellow maize with combined resistance to S. hermonthica, maize streak and other constraints.)

King, V. 1997. Mistletoe on the move. Plant Life, Summer 1997: 17. (Reviewing distribution of Viscum album in the British Isles in 1970 and now.)

Kipfmueller, K.F. and Baker, W.L. 1998. Fires and dwarf mistletoe in a Rocky Mountain lodgepole pine ecosystem. Forest Ecology and Management 108(1/2): 77-84.

Kroschel, J. 1998. Striga - how will it affect African agriculture in the future? - an ecological perspective. PLITS 16(2): 137-158. (Considering five hypotheses concerning the apparently beneficial effects of organic matter and concluding that no one is clearly responsible. Effects may include the encouragement of microbial degradation of Striga seeds, suicidal germination, and maintenance of higher nitrogen levels.)

Lazarides, M., Cowley, K. and Hohnen, P. 1997. CSIRO Handbook of Australian Weeds. Collingwood, Australia: CSIRO. (Simple maps show distribution of weeds including Cuscuta, Striga, Amyema spp. etc, with references.)

Lolas, P. 1997. Sub-group collaborative study on broomrape. Bulletin d'Information - CORESTA No. 3: 79-85. (Summarises herbicide trials for control of Orobanche in 7 countries. Good results reported in at least some countries with chlorsulfuron, imazaquin, imazapyr, pre-transplanting; glyphosate, sulfosate, imazaquin and MH post-emergence.)

Lolas, P.C. 1998. Methods and strategies for control of broomrape in tobacco. In: 1998 Tobacco Symposium, Indian Tobacco - Problems and Prospects, Rajahmundry 1998: 33-42. (General review, relating especially to Orobanche in Greece.)

López-Granados, F. and García-Torres, L. 1998. Short- and long-term economic implications of controlling crenate broomrape (Orobanche crenataForsk.) in broad bean (Vicia faba L.) under various management strategies. Crop Protection 17: 139-143. (Suggesting that annual herbicide application is a highly desirable option.)

Manners, D. 1998. More toothwort management. Botanical Society of the British Isles News 79: 63. (Lathraea squarrosa associated with abundant suckering of host Tilia x europaea - cause or effect?)

Mapongmetsem, P.M., Mompea Motalindja and Nyoma, H. 1998. Eyes on the enemy. Identifying parasitic plants of wild fruit trees in Cameroon. Agroforestry Today 10(3): 10-11. (Tapinanthus globiferus ssp. apodanthus most frequent, occurring especially on Syzigium guineense,Vitellaria paradoxa and Vitex doniana. Hymenodictyon floribundum (Rubiaceae) and Ficus spp. also treated as 'parasites'.)

Mathiasen, R.L. 1998. Infection of young western larch by larch dwarf mistletoe in northern Idaho and western Montana. Western Journal of Applied Forestry 13(2): 41-46. (Larix occidentalis mainly infected by Arceuthobium laricis after 7 years old. Appropriate management suggested.)

Matthies, D. 1998. Influence of the host on growth and biomass allocation in the two facultative root hemiparasites Odontites vulgaris and Euphrasia minima. Flora (Jena) 193: 187-193. (O. vulgaris grew better on Medicago sativa than on Lolium perenne (= without a host); conversely E. minima only grew better on L. perenne. E. minima did not reduce either host, but O. vulgaris reduced both.)

Mauch-Mani, B. and Métraux, J-P. 1998. Salicylic acid and systemic aquired resistance to pathogen attack. Annals of Botany 82: 535-540. (No mention of parasitic plants but presumably of potential relevance re resistance mechanisms. Concludes 'there is now good evidence that both salicylic acid-dependent and SA-independent pathways are involved in systemic signalling for defence responses.')

Melero Vara, J.M. 1997. (Broomrape (Orobanche cernua): evolution and development of resistance.) (in Spanish) Agricultura, Revista Agropecuaria 66: 872-874. (Reporting development of a race overcoming available resistance genes in sunflower in Spain; and reduced attack at higher temperatures.)

Mohamed, A.H., Ejeta, G., Butler, L.G. and Housley, T.L. 1998. Moisture content and dormancy in Striga asiatica seeds. Weed Research 38: 257-265. (Detailed exploration of the influence of moisture on after-ripening - primary dormancy lost as seeds dried to 11% moisture - and on induction of secondary dormancy. Importantly demonstrates that the tetrazolium test indicates germinability rather than viability - negative results after prolonged moisture had induced secondary dormancy were reversible with exposure to dry conditions.)

Molnár, F., Gyulai, B. and Czepó, M. 1998. (A new possibility of controlling dodder (Cuscuta spp.) in the field.) (in Hungarian) Növényegészsédelem 34: 379-383. (Cuscuta 'spp.' in 'various crops' controlled by Roundup and Roundup Bioforce at 0.6 l/ha.)

Mori, K., Matsui, J., Bando, M., Kido, M. and Takeuchi, Y. 1997. Synthesis and biological evaluation of the four racemic stereoisomers of the structure proposed for sorgolactone, the germination stimulant from Sorghum bicolor. Tetrahedron Letters 38: 2507-2510.

Mullen, R.J., Orr, J.P., Caprile, J., Viss, T.C. and Whiteley, R.W. 1997. Preemergence and postemergence studies with rimsulfuron for the control of Solanum and other weed species in processing tomatoes. In: Proceedings, 1st International Conference on the Processing Tomato, and Proceedings, 1st International Symposium on Tropical Tomato Diseases, Recife, 1996: 63-66. (Rimsulfuron applied to tomatoes in California, USA, as three sequential post-emergence applications, 10-12 days apart, caused some toxicity but controlled 'Cuscuta spp.' and greatly increased yields.)

Murray, J. 1997. Lathraea clandestina. Botanical Society of the British Isles Scottish Newsletter 19: 31. (Describing the spread of L. clandestina in Scotland.)

Murty, D.S., Diarra, M. and Dembele, B. 1997. New sources of resistance to Striga hermonthica in sorghum. International Sorghum and Millets Newsletter 38: 76-77. (128 lines assessed as low stimulant for S. asiatica were screened against S. hermonthica: least affected by Striga in 2 years of field trials in Mali were IS16005, IS14844 and CMDT48.)

Neumann, U., Paré, J., Raynal-Roques, A., Sallé, G and Weber, H-C. 1998. Characteristic trichomes and indumentum specialisation in African and European parasitic Scrophulariaceae. Botanica Acta 111: 150-158. (Trichomes described from Striga, Buchnera, Rhamphicarpa, Euphrasia, Melampyrum and Rhinanthus species.)

Neumann, U., Vian, B. and Sallé, G. 1998. (Haustoria of two African parasitic Scrophulariaceae: ontogeny and interface.) (in French) Comptes Rendus des Séances du Biologie et de ses Filiales 192(1): 37-51. (Reporting on the origin and structure of haustoria of Buchnera hispida and Rhamphicarpa fistulosa growing on pearl millet.)

Nickrent, D.L., Duff, R.J. and Konings, D.A.M. 1997. Structural analyses of plastid-derived 16S rRNAs of holoparasitic angiosperms. Plant Molecular Biology 34: 717-729.

Nickrent, D.L., Ouyang, Y., Duff, R.J. and dePamphilis, C.W. 1997. Do nonasterid holoparasitic flowering plants have plastid genomes? Plant Molecular Biology 34: 731-743.

Nickrent, D.L., Duff, R.J., Colwell, A.E., Wolfe, A.D., Young, N.D., Steiner, K.E. and dePamphilis, C.W. 1998. In: Molecular phylogenetic and evolutionary studies of parasitic plants. Soltis, D., Soltis, P. and Doyle, J. (eds.) Molecular Systematics of Plants II. DNA Sequencing. Kluwer Academic Publishers, Boston, MA.: 211-241

Nirenberg, H.I., O'Donnell, K., Kroschel, J., Andrianaivo, A.P., Frank, J.M. and Mubatanhema, W. 1998. Two new species of Fusarium: Fusarium brevicatenulatum from the noxious weed Striga asiatica in Madagascar and Fusarium psudoanthophilum from Zea mays in Zimbabwe. Mycologia 90: 459-463.

Nof, E, Rubin, B. and Dinoor, A. 1998. Colletotrichum sp. - a potential, specific biological control agent for dodder (Cuscuta campestris). (abstract) Phytoparasitica 26: 355. ('Colletotrichum sp.' ex China damaged C. campestris without affecting 19 crop spp. on which it was growing. Molecular study suggested it was C. acutatum rather than C. gloeosporioides as reported in Chinese literature.)

Norton, D.A., Ladley, J.J. and Owen, H.J. 1997. Distribution and population structure of the loranthaceous mistletoes Alepis flavida, Peraxilla colensoi and Peraxilla tetrapetala within two New Zealand Nothofagus forests. New Zealand Journal of Botany 35: 323-336. (A. flavida mainly on outer branches, and P. tetrapetala on inner branches and trunk of N. solandri; P. colensoi on inner branches of N. menziesii.)

Olivier, J-F., 1998. Cartographie de Viscum album L. ´ Bruxelles et dans les environs. Adoxa 20/21: 1-14. (60 sites mapped and hosts indicated. Most on Populus, Robinia and Tilia, one on Quercus rubra.)

Onu, I., Chindo, P.S., Adeoti, A.A. and Bamaiyi, L.J. 1996. Preliminary report on some arthropod enemies of Striga spp. on sorghum in Nigeria. Noma 12: 30-33. (Listing 9 species/genera, of which those of greatest interest included Alcidodes marramus (Coleoptera; fruit galler), Junonia orythia,Helicoverpa armigera and Smicronyx spp.)

Pageau, K., Simier, P., Naulet, N., Robins, R. and Fer, A. 1998. Carbon dependency of the hemi-parasite Striga hermonthica on Sorghum bicolor determined by carbon istopic and gas exchange analyses. Australian Journal of Plant Physiology 25: 695-700. (Concludes that photosynthetic capacity is 3-5 times respiration. 40-60% of parasite carbon is of autotrophic origin.)

Panossian, A., Kocharian, A., Matinian, K., Amroyan, E., Gabrielian, E., Mayr, C. and Wagner, H. 1998. Pharmacological activity of phenylpropanoids of the mistletoe, Viscum album L., host: Pyrus caucasia Fed. Phytomedicine 5(1): 11-17. (V. album in Armenia has been used for treatment of cardiovascular disease and stimulation of the immune system. It is suggested that anti-tumour effects of ethanolic extracts could be associated with inhibition of kinase C.)

Paré, J. and Pronier, I. 1998. (Embryology of Striga. Application to methods of control: action of herbicide, biological control.) (in French) . In: Les phanérogames parasites. Séance du décembere 1997. Comptes Renus des Séances de la Sociétéde Biologie et ses Filiales 192(1): 91-100. (Reporting effects of 2,4-D in preventing seed development, and possible interactions with Smicronyx spp.)

Pazy, B. 1998. Diploidization failure and apomixis in Orobanchaceae. Botanical Journal of the Linnean Society 128: 99-103. (Meiosis in Cistanche found to be irregular, as in Orobanche: as a result, polyploidy is not a likely mechanism of speciation suggesting that parthenogenesis and pseudogamy play a role in seed production.)

Petzoldt, K. 1998. Success and failure in breeding resistance to broomrape, Orobanche spp. In: Martin, K, Mò ther, J. and Auffarth, A. (eds.) Agroecology, Plant Protection and the Human Environment: Views and Concepts. PLITS 16(2): 37-55. (Resistance successful in sunflower varieties for oil, but not in open-pollinated confectionery types; in Vicia faba, some more-or-less tolerant small-seeded types, but little progress in the most important var. major.)

Polhill, R. and Wiens, D. 1998. Mistletoes of Africa. Royal Botanic Gradens, Kew, UK. 370 pp. (A magnificent new volume: see review elsewhere in this newsletter.)

Press, M.C. 1998. Dracula or Robin Hood? A functional role for hemiparasities in nutrient poor ecosystems. Oikos 82: 609-611. (It is suggested that root hemiparasites facilitate nutrient cycling and the maintenance of species richness.)

Pundir, Y.P.S. 1997. Leafy mistletoe - Taxillus vestitus loss assessment in Chakrata oak forests. World Weeds 4(1/2): 1-8. (58% of Quercus leucotricophora and Q. himalayana trees infected at 6 sites in N. India. Apparently less than 1% of host trees died, but this thought to be an underestimate.)

Pundir, Y.P.S. 1997. First report of Scurrula pulverulenta (Wall.) G. Don. (Loranthaceae) on gymnosperms. World Weeds 4(1/2): 9-10. (Occurrence recorded on Taxodium mucronatum.)

Pundir, Y.P.S. 1997. 'Banj' and 'Moru' oaks and their mistletoes in western Himalayas. World Weeds 4(1/2): 69-75. (Quercus leucotricophora and Q. himalayana parasitised by 10 spp. of mistletoe, but not by Helixanthera ligustrina.)

Reid, N. 1997. Behaviour, voice and breeding of the mistletoebird Dicaeum hirundinaceum in arid woodland. The Victorian Naturalist 114(3): 135-142. (Description of many aspects of the behaviour of D. hirundinaceum which feeds on fruits of many mistletoes including Amyema quandang, Lysiana exocarpi, although it also eat insects.)

Reid, N. 1997. Control of mistletoes by possums and fire: a review of the evidence. The Victorian Naturalist 114(3): 149-158. (Greater abundance of mistletoes, Amyema, Muellerina and Dendrophthoe spp. in agricultural areas, compared with forestry areas, is attributed to both the reduction of arboreal marsupials, and lack of prescribed or wild fires in the former.)

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