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MESSAGE FROM THE IPPS PRESIDENT

Dear IPPS Members,

Best wishes for a happy new year of 2014. I hope this year brings you all health and happiness.

I am pleased to announce that our next major conference, the 13th World Congress on Parasitic Plants, will take place in Kunming, China, for the first time in Asia. Dr. Airon Li at Kunming Institute of Botany, Chinese Academy of Sciences and her colleagues with other Chinese scientists will organize the congress. We are looking forward to welcoming participants in particular from Asian countries which are rich sources of parasitic plants/weeds. The proposed date will be in June or July 2015, exact timing yet to be decided. Details will soon be available on the conference website.

As you will find in this issue, the first COST-STREAM meeting organized by Cristina Prandi and Hinanit Koltai was held in Jerusalem, Israel, in November. This meeting dealt with strigolactone-related topics and therefore strigolactones were discussed as host recognition signals for root parasitic plants and microorganisms including AM fungi and rhizobia in the rhizosphere, and as hormones regulating growth and developments of plants. Furthermore, their potential application in cancer prevention was also discussed. It was indeed a good mix of sciences on strigolactones and provided an excellent platform on which parasitic plant scientists can work together with colleagues from other research areas. Since many IPPS members are involved in this COST project, they were able to catch up on important progress in strigolactone research.

I hope this year brings further new insights into parasitic plants.

Sincerely,
Koichi Yoneyama, IPPS President
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MEETING REPORTS

The Third Symposium on the Biology of Non-Weedy Parasitic Plants, Namur, Belgium, 12-15 September 2013.

This meeting took place in the beautiful town of Namur, Belgium, in the Youth Hostel along the river Meuse. After the first two symposia on the biology of non-weedy hemiparasitic Orobanchaceae (at Wageningen in 2004, and České Budějovice in 2008), we decided to broaden the thematic range to all haustorial parasites, due to similar methodologies used in research and many parallels in the biology across unrelated groups of parasitic plants. The first full day of lectures focused on ecology and ecophysiology, while the talks on the second day dealt with the evolutionary aspects.

The meeting had two invited speakers. Of these, David Watson (Charles Sturt University, Australia) gave an amazing talk about parasitic plants as important components of terrestrial ecosystems supported by many examples of his own work on the ecological interactions of Australian mistletoes. Vincent Merckx provided a fascinating outlook on the biology of mycoheterotrophic plants, which was followed by a discussion comparing their ecological behaviour with haustorial parasites.

Several of the 26 participants gave talks or presented posters on the ecophysiology of hemiparasites. Andras Demey (Ghent University, Belgium) summarized his PhD work on the effects of hemiparasites on nutrient cycling in grasslands. Jakub Těšitel (University of South Bohemia, Czech Republic) gave a talk on the effects of abiotic resources, namely water and mineral nutrients, on the parasitic and competitive components of the root hemiparasitic interaction. Gerhard Glatzel (Austrian Academy of Sciences) presented an ecophysiology-based hypothesis on the evolution of deciduousness in mistletoes. Petra Světlíková (University of South Bohemia, Czech Republic) presented a poster on the efficiency of sunfleck (patchy sunlight) harvesting by Melampyrum pratense, a root hemiparasite growing in forest understory. The poster by Michal Hejcmann (Czech University of Life Sciences) summarized the effects of application of various fertilizers on the population density and seed production of Rhinanthus minor in the long-term Rengen Grassland Experiment. Adrien Saulnier (Louvain University, Belgium) presented a poster on his MSc project detailing the patterns of seed formation in Rhinanthus angustifolius.

Population and community ecology of root parasites was another important topic of the conference. Jitka Kocková (University of South Bohemia, Czech Republic) gave a talk on a DNA barcoding-based approach to identification of host spectra of root hemiparasites. Petr Blažek (University of South Bohemia, Czech Republic) gave a talk on the effects of application of various fertilizers on the populations of Rhinanthus. Pavel Fíbich (University of South Bohemia, Czech Republic) introduced a project on modelling of ecological niches of Central European hemiparasites based on the data from Czech National Phytosociological Database and a functional trait approach. Vojtèch Adamec (University of South Bohemia, Czech Republic) gave a talk on various aspects of ecology of the endangered early ecotype of Melampyrum nemorum. Vítěm Pavlík (Czech University of Life Sciences) presented results of an experiment investigating the effects of climatic
conditions on germination and growth of *Rhinanthus* and its effect on the host. Markéta Tahadlová (University of South Bohemia, Czech Republic) presented a poster on her project dealing with the interactions between root hemiparasites and herbivorous insects. Jakub Těšitel’s poster introduced a restoration ecology project aiming to suppress the aggressive grass species *Calamagrostis epigejos* by *Rhinanthus* hemiparasites.

The evolutionary contributions mostly focused on individual species or species groups. Sidonie Bellot (University of Munich, Germany) gave a talk on the retention of the plastid genome in holoparasitic plant lineages exemplified by her study on the endophytic holoparasites in the Apodanthaceae. Milan Štech (University of South Bohemia, Czech Republic) presented results of his long-term investigation on the evolution and phylogeography of the *Melampyrum nemorosum* group, and the last lecture of the conference was given by Laurent Natalis (Louvain University, Belgium) on the role of bumblebees in shaping asymmetric hybridization between *Rhinanthus minor* and *R. angustifolius*. Šárka Svobodová (University of South Bohemia, Czech Republic) presented a poster on evolution and hybridization patterns in Central European *Euphrasia* species. Daniel Pinto Carrasco (University of Salamanca, Spain) had a poster on taxonomy and phylogeography of the *Odontites recordonii* group, an endemic of the Iberian Peninsula. Olena Peregrym presented her study on seed morphology and ornamentation of East European *Pedicularis* species, and Vinciane Mossion’s poster outlined the plans for her PhD project on the taxonomy and phylogeography of the genus *Rhinanthus*.

The conference programme ended with a field excursion to calcareous grasslands in the hills surrounding the river Meuse close to Namur. We enjoyed this remarkably species-rich vegetation in its late summer shape. Although it was rather late for most annual hemiparasitic species, possibly occurring locally, we managed to find some fruiting plants of *Melampyrum pratense* at a forest edge. The social part of the conference included evening sessions filled with various discussions and supported by a supply of outstanding Belgian beer, and the last evening of the conference happily coincided with splendid fireworks at the Namur Festival.


**Papers presented:**

David Watson - Parasitic plants as drivers of ecological communities patterns > predictions > processes.

Andreas Demey - Impacts of hemiparasitic plants on the vegetation and biogeochemical cycling in two contrasting semi-natural grassland types.

Jakub Těšitel - Fighting for resources–parasitism, competition and virulence in a hemiparasitic association.

Petr Blažek - Response of grassland *Rhinanthus* Orobanchaceae to different mowing dates.

Vojtěch Adamec - Ecology of early ecotype of *Melampyrum nemorosum*.

Jitka Kockova - Using DNA-barcoding and anatomical methods to reveal host spectra of hemiparasitic plants under natural conditions.

Pavel Fibich - Modelling of niches of Central European root-hemiparasitic species.

Vincent Merckx - Mycoheterotrophy: plants living on fungi.

Sidonie Bellot - The evolutionary retention of plastid genomes in nonphotosynthetic plants: A comparative approach centred on the endoparasitic Apodanthaceae.

Gerhard Glatzel - The evolution of deciduous mistletoes – a hypothesis.

Milan Štech - Why is the *Melampyrum nemorosum* group taxonomically difficult?

Laurent Natalis - The role of bumblebee pollinators in hybridization between two *Rhinanthus* species.

Jakub Těšitel and Renate Wesselingh

**EWRS Working Group - Novel and Sustainable Weed Management in Arid and Semi-arid Agro-ecosystems**


**Contributions presented included:**

Cohen, Y. *et al.* - Parasitic weed mapping to improve management: the case of broomrape in tomato crops.

Eizenberg, H. - Advanced technologies for tempo-spatial modeling of broomrapes (*Orobanche* and *Phelipanche* spp.) and herbicides application.

Shilo, T. *et al.* - Aspects of glyphosate mechanism in Egyptian broomrape control.

Sen, B. *et al.* - Effects of salt stress (NaCl) and broomrape (*Phelipanche aegyptiaca*) on superoxide dismutase and peroxidase activities of two tomatoes varieties.

Ben David, O. *et al.* - Variation in response of a resistant sunflower cultivar to *Phelipanche aegyptiaca* and *Orobanche cumana*.

Aly, R. *et al.* - Development of molecular markers based on ITS and *rbCL* genes to identify and distinguish between broomrape species in a soil sample.
Rabinovitz, O. et al. - Modeling imazapic movement applied by drip irrigation to maximize broomrape control.
Bab, R. et al. - Breaking dormancy at seeds of Cuscuta approximata
Boz, Ö. et al. - Determination of the frequencies and densities of broomrape and other weed species occurring in field tomato, sunflower and tobacco fields in Denizli Province of Turkey.


**Building a new research alliance to reclaim faba bean production area abandoned to Orobanche.** Rabat, Morocco, 6-9 October, 2013.

This meeting brought together workers from 12 countries to discuss the current problems from Orobanche crenata and *O. foetida* in the Mediterranean zone and NE Africa which have resulted in a serious decline in the area of faba bean and other legumes grown in the region. Objectives included a better understanding of the variation within both these species, identification of new sources of resistance within faba bean, and the exploitation of new technology in the understanding of *Orobanche* biology, and the development of resistance in the crop to the parasites and to herbicides. The meeting was funded by a range of institutions including the UK BBSRC (Biotechnology and Biological Sciences Research Council), ICARDA (still fully active on a range of sites outside Syria) and INRA, Morocco (Institut National de la Recherche Agronomique).

The first session, hosted by the Institut Agronomique et Vétérinaire Hassan II, entitled ‘Control of *Orobanche crenata* in legumes’ heard 4 review papers. John Pickett described the successful technique for control of Striga species by intercropping with *Desmodium* spp. and the possibilities of transferring the essential genes from *Desmodium* to other species including cowpea initially and conceivably faba bean in the future. Fouad Maalouf described the history of discovery and exploitation of *Orobanche* resistance in faba bean in Egypt and recent work with herbicides. Diego Rubiales covered the corresponding history of resistance breeding and other techniques for the control of *Orobanche* species in Spain, commenting incidentally on the fact that there was uncertainty whether there was any source of resistance available in faba bean other than that discovered in Giza 402. Finally Jim Westwood described the Parasitic Plant Genome Project in USA which involves 4 main species including *O. aegyptiaca* and how results from this project might be applied to *O. crenata*.

In the session on Taxonomy and Distribution, Mariem Bouhadida first described the dual problems of *O. crenata* and *O. foetida* in Tunisia, the latter attacking faba bean in Tunisia only, though other biotypes attack other legumes elsewhere. She also described her exploration of molecular markers as a means of distinguishing populations with different host ranges. Chris Parker then described the serious infestation of faba beans in Kent UK which had only been discovered a few weeks previously. Although not completely new to the UK, this is only the second significant infestation to be recorded in the country, or indeed anywhere in northern Europe. He discussed the need for better understanding of the germination behaviour of the weed in these more temperate conditions and whether this infestation was just a freak occurrence or represented a result of global warming or of a shift in the behaviour of the weed. Gianniantonio Domina reported on the distribution of *O. crenata* in Italy, mainly confined to Sicily and the extreme south of the mainland, and on some screening of faba bean varieties for resistance. Dense planting of faba bean has shown benefit. Tadessa Sefera Gela then painted an alarming picture of the dramatic spread of *O. crenata* in faba bean which has occurred in northern and western Ethiopia since it was first recognised in the 1980s. Faba bean is a major crop in Ethiopia grown on almost 500,000 ha and quantities have been exported in the past but domestic shortages have curtailed export activity. Many farmers are having to give up growing the crop and the area of production may be shrinking.

In the session on Breeding for Tolerance and Resistance, Ana Maria Torres described the search for and identification of QTLs for resistance to *O. crenata* and to *O. foetida* in faba bean, contributing to the eventual mapping of resistance genes in the crop. The following papers, presented by Mahmoud Abdelmohsen, and Sabah Attia covered various aspects of faba bean breeding and other work on *O. crenata* in Egypt where the problem of *O. crenata* has resulted in widespread replacement of the crop by wheat and clover, and a corresponding drastic fall in self-sufficiency in the crop from 99% down to below 50%. Current hopes are pinned on the variety Misr 3, released in 2012, which gives reasonably good yields in heavily infested sites. Walid El-Rodeny described the creation of an EST-SSR based linkage map of faba bean genome which should in time help map genes for resistance. Mahmoud Zeid’s paper made a critical examination of the correlation between the most widely used measure of resistance/tolerance – spikes/plant - and various detailed measures of attachment frequency and parasitic biomass obtained when root systems are carefully washed and evaluated, and this led to a stimulating discussion on what constitutes ‘resistance’. Progress was reported on the identification of relevant QTLs and molecular markers. It was also noted that infestation of faba bean is much less following irrigated crops of rice and cotton and is reduced.
Herbicide Tolerance in Faba bean, began with Rachid Picklettii inoculation of faba bean with the rhizobacterium crenata. Nadjia Zermane reported on the situation of gene construct in transgenic faba bean plants. Also in this session, Nadjia Zermane confirmed the successful integration of the sarcotoxin 1A expression of a selective sarcotoxin polypeptide and reported on studies aimed at the possible parasite-induced resistance. Khalil Khamassi described a mutagenesis programme aimed initially at selecting mutants for the creation of a dense SNP-based map of the faba bean genome and initiation in the UK of a regeneration system for studying the molecular steps in the infection process. Donal O'Sullivan described progress in the creation of a dense SNP-based map of the faba bean genome and initiation in the UK of a mutagenesis programme aimed initially at selecting mutants with resistance to herbicides. Khalil Khamassi described related genetic diversity and gene mapping work carried out in a UK-Tunisia collaboration, while Abdelwahd Rabha reported on studies aimed at the possible parasite-induced expression of a selective sarcotoxin polypeptide and confirmed the successful integration of the sarcotoxin 1A gene construct in transgenic faba bean plants. Also in this session, Nadja Zermane reported on the situation of O. crenata in Algeria and described experiments with inoculation of faba bean with the rhizobacterium Ralstonia pickettii, resulting in significant reductions in O. crenata and increases in faba bean yield. Combination with the trap crop Trifolium alexandrinum boosted the benefits further. Masood Ali estimated there are 24 million ha of legume crops in India, the most important being lentil and chickpea. Pea is apparently unaffected and may be suitable as a trap crop. Comparison with Spanish and Moroccan ecotypes had confirmed the extra virulence of the Tunisian material. Screening had revealed at least partial resistance in two varieties, ‘Chourouk’ and ‘Najeh’. Finally in this session, Nasr Eldin Abdalla confirmed that the problem was continuing to spread in Sudan and referred to work with a range of introduced lines which showed some promise of partial resistance. However, an integrated approach was still needed, involving hygienic measures, trap crops and hand-pulling.

The third session, on Molecular Understanding of Interactions between Parasitic Weeds and their Hosts and Prospects for Engineering Orobanchace Resistance and/or Herbicide Tolerance in Faba bean, began with Rachid Mentag describing the successful in vitro culture of O. crenata callus from which normal shoots could be regenerated, providing a valuable system for studying the molecular steps in the infection process. Donal O’Sullivan described progress in the creation of a dense SNP-based map of the faba bean genome and initiation in the UK of a mutagenesis programme aimed initially at selecting mutants with resistance to herbicides. Khalil Khamassi described related genetic diversity and gene mapping work carried out in a UK-Tunisia collaboration, while Abdelwahd Rabha reported on studies aimed at the possible parasite-induced expression of a selective sarcotoxin polypeptide and confirmed the successful integration of the sarcotoxin 1A gene construct in transgenic faba bean plants. Also in this session, Nadja Zermane reported on the situation of O. crenata in Algeria and described experiments with inoculation of faba bean with the rhizobacterium Ralstonia pickettii, resulting in significant reductions in O. crenata and increases in faba bean yield. Combination with the trap crop Trifolium alexandrinum boosted the benefits further. Masood Ali estimated there are 24 million ha of legume crops in India, the most important being lentil and chickpea. Faba bean was a very minor crop at present but could increase in faba bean yield. Combination with the trap crop Trifolium alexandrinum boosted the benefits further. Masood Ali estimated there are 24 million ha of legume crops in India, the most important being lentil and chickpea. Faba bean was a very minor crop at present but could become more important in some northern states. Orobanchace spp. do not currently attack legume crops, but rapeseed is seriously affected by O. aegyptiacu. Khalid Daoui described a successful system in the drier areas of Morocco of alley-cropping faba beans and/or wheat in olive.

The workshop included a number of discussion sessions where ideas were exchanged on future research and collaboration. These included ‘resolutions’ to co-operate more effectively in the areas of collecting and characterising Orobanchace populations across its entire range, genetic transformation of faba bean, large-scale mutagenesis programmes to find and deploy herbicide resistance and to highlight the ongoing need for novel solutions based on deeper understanding of the cellular and molecular biology of the interaction between Orobanchace and faba bean.

**Papers presented (names of presenters only – not full authorship):**

**Mini-symposium: Control of Orobanchace crenata in legumes**

- John Pickett (Rothamsted Research, UK) - Can the highly successful control and eradication of Striga in cereals by intercropping with Desmodium offer opportunities for reclaiming faba bean production from Orobanchace?
- Fouad Maalouf (ICARDA) - Breeding faba bean for resistance to Orobanchace crenata: past problems and future horizons.
- Diego Rubiales (CSIC, Spain) - Resistance breeding and complementary control strategies for alleviation of Orobanchace problem on legumes in the Mediterranean Basin.
- Jim Westwood (Virginia Tech, US) - Genomic insights into parasitism and opportunities for Orobanchace control.

**Taxonomy, host range and distribution of Orobanchace spp.**

- Mariem Bouhadada (INRAT, Tunisia) - Distribution and genetic diversity of Orobanchace in Tunisia.
- Chris Parker (UK) - The status of Orobanchace crenata in UK.
- Gianniantonio Domina (University of Palermo, Italy) - The status of Orobanchace crenata in Sicily and preliminary observations on Orobanchace crenata susceptibility in Vicia faba.
- Tadesse Sefera Gela (ELAR, Ethiopia) - Status and distribution of Orobanchace in faba bean production areas of Northern Ethiopia.

**Characterization and exploitation of sources of tolerance of faba bean to Orobanchace.**

- Mahmoud Ibrahim Abdel Mohsen (ARC, Giza, Egypt) - Current status of faba bean production in Egypt.
- Sabah Attia (ARC, Giza, Egypt) - Misr 3 - a new Egyptian Orobanchace-tolerant faba bean variety.
- Ana Maria Torres (IFAPA, Spain) - Molecular approaches for the identification and validation of QTLs for Orobanchace spp. resistance in faba bean.
- Walid El-Rodeny (ARC, Sakha, Egypt) - Development of EST-SSR markers and construction of a linkage map in faba bean (Vicia faba).
- Moez Amri (INRA, Tunisia) - The problem of Orobanchace in Tunisia: current state, specificity and main results of the national faba bean breeding program to improve tolerance/resistance to Orobanchace foetida and Orobanchace crenata.
Mahmoud Zeid (University of Alexandria, Egypt) - Development and evaluation of faba bean breeding materials suitable for mapping resistance/tolerance to Orobanche crenata using molecular markers.

Nasr Eldin Khairi Abdalla (Agricultural Research Corporation, Sudan) - Reaction of faba bean genotypes to Orobanche crenata in Sudan.

Molecular understanding of interactions between parasitic weeds and their hosts and prospects for engineering Orobanche resistance/or herbicide tolerance in Faba bean

Rachid Mentag (INRA-Rabat, Morocco).- In vitro culture of Orobanche crenata.

Nadja Zermane (ENSA, Algeria) - Beneficial use of plant growth promoting Rhizobacteria for faba bean growth performance and broomrape control.

Khalid Daoui (INRA-Meknès, Morocco) - Faba bean and wheat productivity in an alley cropping system basis on olive tree.

Donal O’Sullivan (University of Reading, UK) - A genomic toolkit for genetic improvement of faba bean.

Khalil Khamassi (INAT, Tunisia) - Analysis of genetic diversity and molecular mapping of SNP markers for Vicia faba L. var minor.

Papers presented included:

Opening lecture:

Koichi Yoneyama - Turning points in strigolactone research.

WG1- SLs as plant hormones:

Ottoline Leyser - Strigolactone signalling in plants - knowns, unknowns.

Catherine Rameau - Strigolactones and other long range signals regulating shoot branching in pea.

Lorenzo Borghi - The strigolactone exporter PhPDR1 is asymmetrical localized in root tips and hypodermal passage cells: first insights into strigolactone polar transport.

Sofie Goormachtig - A proteomic approach to reveal insights into strigolactone signalling.

Hidemitsu Nakamura - Molecular mechanism of strigolactone perception by DWARF14.

WG2 - SLs and parasitic plants:

Alejandro Pérez de Luque - Nanotechnology for strigolactone management in parasitic weeds.

Radoslava Matusova - Response of the Slovak wild and weedy broomrapes to GR24.

Philippe Delavault - CYP707A1, an ABA catabolic gene, is a ubiquitous component of parasitic plant seed germination in response to various germination stimulants.

Maurizio Vurro - Possible use of strigolactone-degrading microbes for managing parasitic weeds.

Diego Rubiales - Identification of broomrape resistance in faba bean based in low strigolactone exudation: applications for faba bean breeding.

Radi Aly - Cucumber mosaic virus as carotenoid inhibitor reduce Phelipanche aegyptiaca infection in tobacco plants.

WG3: SLs and soil biota:

Paola Bonfante - Plant fungal communication in arbuscular mycorrhizas: do you speak plantish or fungish?

Didier Reinhardt - The search for metabolites involved in the regulation of arbuscular mycorrhiza.

Juan A. Lopez-Raez - Strigolactones contribute to plant defence against necrotrophic fungi.

Michael Walter - Integration of SL biosynthesis in greater carotenoid metabolism of mycorrhizal roots.

Pioter Rozpadek - A novel model for phytoremediation-strigolactone research based on Arabidopsis thaliana mutants.

WG4 - SLs chemistry and biochemistry:

B. Zwanenburg - Strigolactone research, quo vadis?

François-Didier Boyer - New strigolactone analogues with specific activities.
Ernesto Occhiato - Synthesis and evaluation of fluorescent strigolactone analogues for in vivo investigation.
Tatiana E. Sesan - Strigolactone use in conservation agriculture systems.
Gunilla Carlsson - X-ray crystallography and free electron lasers in structural biology.
Francisco A. Macías - New tools mimicking nature for controlling parasitic weeds.

**Further Developments Related to Strigolactones:**
Ronit Yarden - Innovative application of strigolactones to inhibit cancer cells and cancer stem cells growth.

Each session was concluded by 4 flash presentations about relevant posters, and discussions. Posters for each session were displayed throughout the meeting and are listed on the conference website: [http://streamisrael2013.wix.com/stream-israel-2013](http://streamisrael2013.wix.com/stream-israel-2013)

Cristina Prandi

**22nd COLUMA Conference, International Meeting on Weed Control, Dijon, France, Dec 10-12, 2013.**

**Contributions included:**
Duroueix, F. *et al.* - Lutte chimique contre l’orobanche rameuse en culture de colza. (oral)
Hounbedji, T. *et al.* - Etude de l’infection de la plante parasite *Rhamphicarpa fistulosa* en riziculture au Togo. (poster)
Boulet, C. *et al.* - Étude de la sensibilité des adventices vis-à-vis de l’orobanche rameuse (*Phelipanche ramosa* (L.) Pomel) en vue d’une lutte intégrée. (poster)

**THONNINGIA SANGUINEA**

Dr Ernst Specks, a floriculturist in Germany, has recently sent us pictures of this colourful parasitic plant, found in miombo (*Brachystegia*) forest in Zambia. Lytton Musselman has identified it as *Thonningea sanguinea*.

It is reported to cause serious damage to rubber trees in West Africa, and may also attack oil-palm and cacao. A single plant can spread to attack 20 or more trees over an area of 0.5 ha. The species is dioecious with male and female flowers on separate plants. Hepper and Gasson (1986) in Haustorium 16 described and illustrated tubers growing to 6 cm in diameter.

Burkill in The useful plants of west tropical Africa (1968) ([http://plants.jstor.org/upwta/1_523](http://plants.jstor.org/upwta/1_523)) provides useful information on distribution (mainly in West Africa but across tropical Africa too) local names, and a very wide range of traditional medicinal and other uses including e.g. in Ivory Coast the flower-heads are tied to the ankles of young infants to hasten their learning to walk. The pointed scales prevent sitting down in comfort! A number of more recent papers have confirmed the activity of extracts against a range of bacteria and fungi.

Photo: Ernst Specks.

If any reader has new observations on this fascinating plant do please let us know.

Chris Parker.

**BIOCONTROL OF STRIGA – A PROGRESS REPORT**

The Integrated *Striga* Management in Africa (ISMA project) is taking a multi-pronged approach to *Striga* control and this was described in the July 2013 edition of Haustorium, issue 63. A component of this project involves developing the field application of a biological control for *Striga hermonthica*. The main remit of the project in terms of field application is - does the biological control agent, *Fusarium oxysporum* f. sp. *strigae* offer the potential as a realistic method of control? In order to demonstrate this, field trials were conducted in Nigeria and Kenya from 2011 to 2013.

In Nigeria several multi-location trials were conducted under natural and artificial *Striga* infestation across major *Striga*-infested agro-ecological zones and maize based farming systems in northern Nigeria to validate the efficacy of *Striga* bioherbicide *F. oxysporum* f. sp. *strigae* (Fos). Inocula of Fos produced by our project partner University of Hohenheim in Germany, was delivered as a film-coat on maize seeds using gum Arabic and professional seed coating technology. The application of biocontrol in combination with both *Striga* resistant and susceptible maize varieties supported significantly fewer emerged parasites than the susceptible control. In combination with the resistant maize, biocontrol caused a marked reduction in
Striga emergence compared to the resistant control. Results showed that the efficacy of the biocontrol technology in combination with the Striga susceptible maize variety (the farmers’ preferred, and therefore in practice, used variety) on Striga control and enhancement of maize grain yield was more pronounced in comparison to its combination with the resistant variety. This inconsistency in grain yield increase especially in the combination of Fos and resistant variety is due to poor Striga pressure i.e., the levels of Striga emergence were too low to reflect the real impact of Fos on grain yield. Therefore, to confirm the positive results obtained from the combination of biocontrol with the susceptible maize variety, and to verify the inconsistency in the results of its combination with the resistant maize variety, a series of extensive field validation trials were established in 2013 to comprehensively evaluate the control efficacy of isolate Foxy2 against Striga and its impact on grain yield across different environments where Striga populations are sufficiently high. The efficacy of biocontrol seed treatment technology is being evaluated in combination with Striga-resistant and susceptible maize varieties, and with farmer saved seeds included as controls. In addition, socio-economic benefit (cost-benefit) and impact of biocontrol technology is being assessed.

In Kenya, trials were proposed using the Ghanaian isolate Fox2 which was shown to be effective in West Africa. The use of a non-indigenous isolate of Fusarium oxysporum f.sp. strigae isolate Fox2 was required to be field tested under quarantine conditions under the supervision of KARI and KEPHIS. However, results using the Ghanaian isolate were disappointing in the control of Kenyan Striga. Fox2 showed poor performance and did not provide effective biocontrol of Striga under East African conditions in Kenya. The low activity of Fox2 in East Africa may be due to ecological adaptations, in spite of Fox2 being able to survive following seed treatment application and planting and proliferate in Kenyan soil in rhizosphere studies carried out by our project partner University of Hohenheim in Germany. As a consequence of this, an indigenous strain FK3 was isolated locally and tested for control of Striga across 2 seasons. This gave promising results over two seasons. Trial work is continuing for the next two growing seasons in Western Kenya.

Project partners: IITA (Dr. F. Beed and Dr. A. Elzein), The Real-IPM Company Ltd (Dr. H. Wainwright), Kenya; University of Hohenheim (Prof. G. Cadisch, Dr. F. Rasche and Prof. J. Kroschel), Germany; Institute for Agricultural Research – Ahmadu Bello University (Dr. A. Zarafi), Nigeria; University of Stellenbosch (Prof. A. Viljoen), South Africa; and McGill University (Prof. A. Watson), Canada.

Fen Beed  
Abuelgasim Elzein  
Henry Wainwright

CONGRATULATIONS

Our congratulations to Dr G. Nanjappa Dhanapal at University of Agricultural Science, Hebbal, Bangalore, on his recognition as ‘Scientist of the year-2013’ by the National Environmental Science Academy, New Delhi. He has also recently been promoted to the post of Principal Investigator and Scheme Head of the All India Coordinated Research Project on Weed Control in Bangalore.

PRESS REPORTS

Witchweed a serious threat: McVeigh

Red witchweed (Striga asiatica) could cost the grains and cane industries millions if it takes hold in Queensland, says State Agriculture Minister John McVeigh. Mr McVeigh today visited producers near Mackay whose properties have been affected by the recent detection of the exotic pest in mid-July. He said it had been a good opportunity to meet face-to-face with affected landholders to discuss their individual circumstances. ‘We know in the United States it’s a very significant problem, they spend in the order of $250 million to address the issue,’ Mr McVeigh said.

Up to 60 farming properties in the Mackay region could be affected by the serious pest. Biosecurity Queensland’s Director Invasive Plants and Animals John Robertson said...
this was the first confirmed detection of red witchweed in Australia. The weed is native to parts of Africa, the Middle East and Asia and causes around $7 billion of damage to grain crops in Africa each year. ‘While our priority is to minimise any biosecurity risks, an integral part of this response is to ensure there is some business continuity for individual producers,’ Mr McVeigh said. ‘We are working closely with both industry and local producers to find ways of allowing harvesting of crops to continue this year.’

Red witchweed has not been detected outside the five properties that originally reported the pest. Movement restrictions have been placed on four of these properties. ‘The fifth property is being surveyed and will continue to be monitored but the weed hasn’t been found on that property to date,’ he said. ‘Our surveillance teams have identified potential high risk pathways for the weed to spread, such as the movement of machinery.’

Canegrowers Queensland chair Paul Schembri said the weed is impacting on the livelihoods of affected farmers and the possibility of compensation had been discussed with the State government. ‘Those four farmers are bearing an enormous bureaucratic burden and on behalf of the greater public good here,’ Mr Schembri said.

Mr McVeigh also met with Biosecurity Queensland staff at the Local Control Centre in Mackay. ‘The team is doing a great job in conducting surveillance for red witchweed and providing support and advice to the property owners,’ he said. Landholders are urged to follow good biosecurity practices to reduce any potential spread of this weed, including appropriate clean down of machinery and equipment. If anyone suspects they have red witchweed, they must report the plant to Biosecurity Queensland immediately.

Farm Weekly, 8 August 2013.

**Hunger looms as deadly weed destroys 450,000 tonnes of maize**

Western Kenya and parts of Nyanza are at risk of losing an estimated 450,000 tonnes of maize. This is as striga — a parasitic weed continues to decimate over 300,000 hectares of the crop. More than 300,000 farmers in the counties of Bungoma, Siaya, Busia, Vihiga, Kisumu, Kakamega, Migori, and Homa Bay, are the most affected by the weed. This leaves about 1.5 million people at risk of starvation. The destructive weed is also showing traces in other food basket regions including areas in Rift Valley and Central.

Across East Africa, the weed infests up to 40 million hectares of smallholder farmland in the region — occasioning yield losses ranging from 20-80 per cent and even total crop failure in severe infestation.

In its wake more than a million farmers are counting massive losses. Marking the 10th Anniversary celebrations of the African Agricultural Technology Foundation (AATF) in Nairobi last week, scientists, agro-dealers, farmers, and local seed companies warned that unless more was done, the weed will severely dent the country’s efforts at ensuring food security. ‘Over one million growers in Kenya, Tanzania, and Uganda have been counting losses as the weed destroys their crops,’ AATF Seed System Manager Gospel Omanya said. ‘We have engaged the growers through new technology but the weed is yet to be fully contained,’ he said, adding that seeds of the dangerous weed remain in the soil for up to 20 years. ‘Due to its characteristics and longevity in the soil, it is able to infest new crops in each season, frustrating efforts to enhance food security.

Striga is a parasitic weed that seriously constrains the productivity of staples such as maize, sorghum, millet and upland rice in sub-Saharan Africa. The weed survives by siphoning off water and nutrients from the crops for its own growth. Yet, according to the forum, this is just one of the challenges of food production on the continent.

Prof Gordon Conway from the Imperial College, London, blamed low commodity prices and poor technology as central to the problems that afflict African farmers. ‘Government’s must draft policies that encourage farmers to adopt modern technology,’ Prof Conway said, noting that while farmers in developed countries produce up to 11 tonnes per hectare, local farmers hardly post a tonne. ‘The beginning point could be adoption of drought-resistant seeds and use of appropriate technology to fight pests and diseases that threaten crop production,’ he said.

The most incapacitating aspect to food production, however, is farmers’ limited market access and its inevitable twin of poor commodity prices. Dr Denis Kyetere, the AATF executive director said governments should invest in structures and policies that link farmers to appropriate markets. ‘This way, agriculture becomes a business and farmers are guaranteed where to sell their produce and at how much,’ he said. He observed that the State should also work out modalities to help finance farming especially among smallholder farmers. ‘Access to markets is also key to stemming post-harvest losses,’ he said.

Nicholas Waitathu for Standard Digital, November 11th 2013.
Weed that denies Tanzania 1.7 m tonnes of maize annually

Recently, Open Forum on Agricultural Biotechnology in Africa (OFAB), Tanzania Chapter, organised its monthly meeting at COSTECH in Dar es Salaam which was attended by agricultural researchers, and media practitioners. During the meeting, researcher from Kenya, Dr Gospel Omanya explained how striga weed, a parasitic plant, is causing loss of maize in different regions in Tanzania. He was presenting a paper titled: The Role of Seed Systems in Revitalisation of Agricultural Productivity in Africa: The Case Study of Strigaway Maize in Tanzania.

Striga has been a major problem in sub-Saharan Africa daunting farmers for over seven decades and Tanzania is said to have the highest number of farma affected by striga weed in the entire region as it causes a loss of about 1.7 million tonnes of maize every year in Tanzania valued at 356 million dollars. Striga is a major contributor to food insecurity, especially among rural people whose diet comprises mainly of cereal staples and particularly maize, estimating that the lost 1.7 million tonnes of maize per year can feed more than 10 million people.

In Tanzania many regions are affected by the weed. They are Mwanza, Shinyanga, Mara, Tabora, Singida, Dodoma, Morogoro, Coast, Tanga, Lindi, Ruwuma, Iringa, Mbeya, Mtwara and Rukwa. In these regions, the parasitic weed striga has infested over 960,000 ha of farmland, which accounts for almost 70 per cent of the striga weed infested area in East Africa. Tanzanians depend much on maize as their main food crop but also Tanzania is bigger compared to other East African countries of Kenya and Uganda. Other infected countries in terms of ha include Malawi (268,000), Kenya (246,000), Ethiopia (80,000) and Uganda (38,000).

Innovations such as Strigaway (IRMaize) technologies area available for control. It is apparent that innovative technologies be adopted by farmers if the numerous challenges to agricultural productivity are to be adequately addressed. Experiences from commercialization efforts of the Strigaway (IR) maize further stress the need for a functional formal seed system to reach the farmers. In this regard, the seed systems should play a crucial role towards revitalizing agricultural productivity.

African Agricultural Technology Foundation (AATF) is a not-for-profit organisation that facilitates and promotes public-private partnerships for the access and delivery of appropriate agricultural technologies for sustainable use by smallholder farmers in Sub-Saharan Africa (SSA) through innovative partnerships and effective stewardship along the entire value chain. The Foundation is a one-stop-shop that provides expertise and know-how that facilitates the identification, access, development, delivery and utilisation of agricultural technologies. AATF works towards food security and poverty reduction in Sub-Saharan Africa, and its structure and operations draw upon the best practices and resources of both the public and private sectors. It also contributes to capacity building in Africa by engaging African institutions in the execution of tasks that contribute to the Foundation’s mission and many other issues.

On its tenth anniversary AATF celebrates the achievements in managing 10 projects involving 10 countries in Africa. AATF accesses, develops, adapts and delivers appropriate agricultural technologies for sustainable use by smallholder farmers in Sub-Saharan Africa, through innovative partnerships. AATF is bringing appropriate technologies to help fix problems like bacterial wilt in banana, aflatoxins in peanuts and maize, striga ‘vampire weed’ control in maize, cassava mechanization, pod borer infestations in cowpea as well as drought tolerance in maize.

Gerald Kitabu for This Day, November 26, 2013.

Scientists battle striga (witchweed) in Uganda

Scientists in the region are battling Striga (witchweed) that has affected the productivity of staple foods such as maize, sorghum, millet and rice in the eastern part of the country. The most affected areas are mainly, Tororo, Moyo, Bugiri, Busia, Budaka and Iganga. Farmers bordering Uganda on Kenyan side and Tanzania have also been affected by the Striga weed. Seed systems manager of African Agricultural Technology Foundation (AATF), Dr. Gospel Omanya said that over 100,000 hectares of land has been affected by the striga weed in Uganda.

Striga weed is parasitic weed that affects the productivity of staple food like maize, sorghum and millet. It causes damage to its host crop before emerging from soil by producing phytotoxins which are harmful to the host crop. Omanya said that over one million hectares of land are affected by the weed in East Africa and over 40 million hectares of smallholder farmland in the sub-saharan Africa is affected.

‘Striga weed seeds remain dormant and viable in the soil for up to twenty years. With every planting season, some of the seeds germinate and infest the crops while reproducing and increasing the striga seed in the soil,’ he said.

Nicholas Kajoba for New Vision October 24, 2013
Hundreds expected at Tenbury Well mistletoe fair

Tenbury Wells in Worcestershire, UK, claims to be the mistletoe capital and is well known for its mistletoe auctions. Its annual festival has a procession led by druids.

In 2010, conservationists warned about future supplies over fears of a decline of its habitat. Mistletoe thrives in established apple orchards, which have seen a big decline over the past 60 years. Caroline Palethorpe, festival manager, said: ‘It’s important to Tenbury because it’s the only place in the country where we have the unique mistletoe auctions which have been going for over 100 years. The area is renowned for fruit and particularly the apple tree, and therefore it grows in abundance.’

Poet Laureate Carol Ann Duffy performed poetry later on Saturday evening.

BBC News November 30, 2013.

NEW BOOKS


We have sadly, so far, been unable to find a reviewer for this great new volume, but will hope to provide a review in the next issue. Meanwhile, the wide scope of the book may be judged from the following list of chapters.

1. Introduction: The parasitic syndrome in higher plants / H.S. Heide-Jørgensen

Part I: The Orobanchaceae and their parasitic mechanisms
2. The haustorium and the life cycles of parasitic Orobanchaceae / D.M. Joel
3. Functional structure of the mature haustorium / D.M. Joel
5. Haustorium invasion into host tissues / A. Pérez-de-Luque
6. The physiology of the established parasite-host association / J.H. Westwood
7. Host reaction to attack by root parasitic plants / M.P. Timko and J.D. Scholes
8. Seed production and dispersal in the Orobanchaceae / D.M. Joel
9. The seed and the seedling / D.M. Joel and H. Bar
10. Induction of germination / K. Yoneyama, C. Ruyter-Spira, H. Bouwmeester
12. Are karrikin signalling mechanisms relevant to strigolactone perception? / D.C. Nelson
13. Changing host specificities: mutations or epigenetic? / T.J.A. Bruce and J. Gressel
14. Phylogenetic relationships and evolutionary trends in Orobanchaceae / G.M. Schneeweiss
15. Genomic evolution in Orobanchaceae / S. Wicke

Part II: The weedy Orobanchaceae and their control
17. Weedy Orobanchaceae – The problem / J. Gressel and D.M. Joel
18. The parasitic weeds of the Orobanchaceae / C. Parker
19. Population diversity and dynamics of parasitic weeds / B. Roman
20. Molecular diagnosis of parasite seed banks / J. Prider, K. Ophel Keller and A. McKay
22. Integrated agronomic management of parasitic weed seed banks / Y. Goldwasser and J. Rodenburg
24. Biotechnologies for directly generating crops resistant to parasites / J. Gressel


These two volumes present a comprehensive coverage of anything related to the rhizosphere covering current
knowledge on the molecular basis of plant-microbe interactions in the rhizosphere, with contributions from authors around the world. Parasitic plants and the strigolactones are covered particularly in the three chapters 33, 34 and 35 by Yoneyama and co-workers, Lopez-Raez and co-workers and Bouwmeester and co-workers listed in the Literature section below, providing an extensive coverage of chemistry and biochemistry of the strigolactones and their biological effects in planta and in the rhizosphere, particularly in the germination of root parasitic plants and the induction of hyphal branching in arbuscular mycorrhizal fungi.


THESIS


Abstract: Determination of 23 populations of field dodder was conducted using light and scanning electron microscopy and subsequent molecular (PCR) methods in order to fully examine the biology and ecology of Cuscuta campestris and options for its control. The effects of different temperatures and rhizobacteria (PGPR) on germination of C. campestris seeds, as well as effects of different light treatments (red, far-red and blue light) on germination, growth, and height of attachment points of field dodder shoots on alfalfa stems were also investigated. We examined the effects of C. campestris on morphological (visualisation and fresh weight), anatomical (anatomy of leaf and stem of alfalfa; leaf and petiole of sugar beet) and physiological parameters (relative chlorophyll content, total carotenoids, nitrogen, phosphorus, potassium, organic and mineral matter and chlorophyll fluorescence) in alfalfa and sugar beet plants exposed and unexposed to herbicides (imazethapyr, glyphosate, propyzamide and diquat) and untreated with herbicides.

After examining 23 populations of field dodder, two species of the genus Cuscuta were identified: Cuscuta campestris Yunk. and Cuscuta epithymum (L.) Nath. An optimal temperature for germination of C. campestris seeds was found to be 30°C and treatment with red light (for 1h at daytime) produced the highest percentage of germinated seeds, while the highest percentage of seedlings attached to alfalfa stems at 4.65 cm height was found after treatment with far-red light (for 45 min at daytime). Also, the highest percentage of germinated field dodder seeds was recorded after treatment with the rhizobacterium Azotobacter chroococcum isolated from wheat rhizosphere. An analysis of our data showed that the highest values of most parameters (visualization and fresh weight; relative content of chlorophyll and total carotenoids, effective yield and intensity of fluorescence, variable fluorescence, variable/maximal fluorescence ratio; thickness of stem epidermis, thickness of cortex, thickness of central cylinder and stem diameter of alfalfa; thickness of upper and lower leaf epidermis, thickness of palisade and spongy mesophylls, thickness of mesophyll in alfalfa and sugar beet leaves; diameter of tracheids, petiole hydraulic conductance, xylem area, diameter of phloem cells and petiole phloem area of sugar beet) were found in non-infested alfalfa and sugar beet plants, then in infested plants treated with herbicides, and the lowest in plants infested by C. campestris but untreated with herbicides. C. campestris was found to affect and reduce nearly all parameters of stem, leaf and petiole anatomy of the host plants, in contrast to some physiological parameters. The infested alfalfa and sugar beet plants were found to have higher contents of nitrogen, phosphorus, potassium and organic matter, compared to non-infested plants. The highest efficacy in controlling field dodder in alfalfa field was demonstrated by diquat (product Reglon forte 3 l/ha), then by glyphosate (product Glifol 0.8 and 1 l/ha), while the other two tested herbicides (propyzamide – product Kerb WP-50 and imazethapyr – product Pivot 100 M) showed lower efficacy.

FUTURE MEETINGS:

The XVI Congress on Molecular Plant-Microbe Interactions will be held July 6–10, 2014 in Rhodes Island, Greece at the Rodos Palace Hotel. No detailed programme as yet, but parasitic plants likely to be covered. To keep track, see: http://www.mpmi2014rhodes-hellas.gr/index.php

13th World Congress on Parasitic Plants, Kunming, China, June/July, 2015. Dates to be confirmed, and other details will be available on the IPPS web-site in due course.

GENERAL WEB SITES

For individual web-site papers and reports see LITERATURE

For information on the International Parasitic Plant Society, current issue of Haustorium, etc. see: http://www.parasiticplants.org/ (N.B. currently a little out of date)
For past and current issues of Haustorium see also:
http://www.odu.edu/~imusselm/haustorium/index.shtml
For the ODU parasitic plant site see:
http://www.odu.edu/~imusselm/plant/parasitic/index.php
For Dan Nickrent’s ‘The Parasitic Plant Connection’ see:
http://www.parasiticplants.siu.edu/
For the Parasitic Plant Genome Project (PPGP) see:
http://pppg.huck.psu.edu/
For information on the EU COST 849 Project (now completed) and reports of its meetings see:
http://cost849.ba.cnr.it/
For information on the COST/STREAM conference see:
For information on the work of the African Agricultural Technology Foundation (AATF) on ‘Parasitic weeds’ see:
http://www.aatf-africa.org/
For past and current issues of the Sandalwood Research Newsletter see:
For the Parasitic Plant Genome Project (PPGP) see:
http://www.parasiticplants.siu.edu/
For Dan Nickrent’s ‘The Parasitic Plant Connection’ see:
http://www.parasiticplants.siu.edu/
For the Parasitic Plant Genome Project (PPGP) see:
http://www.parasiticplants.siu.edu/

LITERATURE

- indicates web-site reference only


Abutarbush, S.M. 2013. Alfalfa dodder (Cuscuta campestris) toxicity in horses: clinical, haematological and serum biochemical findings. Veterinary Record 173(4): 95. [Of 20 horses ‘naturally exposed’ to lucerne contaminated with C. campestris in Jordan, 11 showed diarrhoea, decreased appetite, neurological signs and/or abdominal pain. The results of complete blood cell counts revealed leukocytopenia, neutropenia and thrombocytopenia.]


Adonu, C.C., Eze, C.C., Ugwueze, M.E. and Ugwu, K.O. 2013. Comparative study of Cassytha filiformis and Cleistopholis patens for antimicrobial activity. World Journal of Pharmacy and Pharmaceutical Sciences (WJPPS) 2(3): 1434-1445. [Extracts of C. filiformis were better antimicrobial agents than the leaf extracts of Cl. patens against Candida albicans, Staph. aureus, E. coli and Ps. aeruginosa.]


Aksoy, E., Arslan, Z.F. and Öztürk, N. 2013. Phelipanche aegyptiaca (Pers.) Pomel: a new record as a parasitic weed on apricot root in Turkey. African Journal of Agricultural Research 8(29): 4001-4006. [Recording widespread occurrence of Orobanche aegyptiaca in apricot in 5 of the 14 important apricot growing areas of Turkey. In Malatya, infestation averaged 57 shoots per m² and were over 200 per m² in some orchards.]

Aly, R. 2013. Trafficking of molecules between parasitic plants and their hosts. Weed Research (Oxford) 53(4): 231-241. [Reviewing the current knowledge on translocation of siRNAs, mRNAs, viruses, sugars,
proteins and herbicides from host to parasitic plants and the potential significance of such molecules to the parasite. Also discussing how this knowledge can contribute to the development of state-of-the-art, effective approaches to parasitic weed management.

Amer, B., Juvik, O.J., Francis, G.W. and Fossen, T. 2013. Novel GHB-derived natural products from European mistletoe (Viscum album). Pharmaceutical Biology 51(8): 981-986. [A new type of natural product derived from the methyl ester of γ-hydroxybutyric acid (GHB) coupled to hydroxybenzoic acids, namely 3-((3′-carboxethoxyproyl) gallic acid and 3-((3′-carboxethoxyproyl)-7->3″-protocatechoyl galloate were characterized from Viscum album.]

Amico, G. C., Vidal-Russell, R., Aizen, M. A. and Nickrent, D. 2014. Genetic diversity and population structure of the mistletoe Tristerix corymbosus (Loranthaceae). Plant Systematics and Evolution 300: 153-162. [This mistletoe species showed higher variation among populations in the central part of its range compared to northern and southern regions suggesting genetic mixing from pollen movement (hummingbirds) and seed movement (birds).]

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ideal hybrids for further testing. But see also Akaogu et al. above.

Ballian, D. 2013. Genetic overload of silver fir (Abies alba Mill.) from five populations from central Bosnia and Herzegovina. Folia Forestalia Polonica. Series A, Forestry 55(2): 49-57. [The presence of mistletoe (presumably Viscum album) increased the percentage of rotten seed in infested silver fir.]


Bazgir, E., Zeidaliand, E. and Ahmadi, A. 2013. Using sulfonylurea for control of broomrape (Orobanch cernua) in tomato fields in Khorroramab. Technical Journal of Engineering and Applied Sciences 3(19): 2437-2444. [Sulfosulforon was superior to nicosulforon oririm sulfuron for control of O. cernua in tomato, proving selective at 50-60 g/ha.]


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Cascante-Marín, A., Estrada-Chavarríá, A., Casante Marín, A., Sánchez González, J. and Ruiz Boyer, A. 2012. (Diversity and composition of the most important fragment of montane forest in the Central Valley of Costa Rica.) (in Spanish) Brenesia, 77: 57-70. [Heisteria concinna (Olacaceae) recorded as the third most important species in this forest.]


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Chenxi, T., Ruyter-Spira, C. and Bouwmeester, H.J. 2013. The interaction between strigolactones and other plant hormones in the regulation of plant development. Frontiers in Plant Science 4, art 199. (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC368363/)[Review of the current knowledge on the crosstalk between strigolactones and other plant hormones, such as auxin, cytokinin, abscisic acid, ethylene and gibberellins, in the regulation of several different physiological processes and how this hormonal crosstalk enables plants to respond to their ever changing environments.]

Chlumský, J., Koutecký, P., Jílková, V. and Štech, M. 2013. Roles of species-preferential seed dispersal by
ants and endozoochoory in <i>Melampyrum</i> (Orobanchaceae). Journal of Plant Ecology 6(3): 232-239. [Formica polyctena ants significantly preferred the seeds of <i>M. pratense</i> over those of <i>M. subalpinum</i> perhaps contributing to the greater abundance of the former. Some seeds were moved 3.5 m in 7 hours. The harvestman spider <i>Oligolophus tridens</i> (Opiiones) was newly identified as a significant seed disperser for <i>Melampyrum</i> spp. Longer-distance dispersal may occur via ruminant animals through whose digestive tract seeds pass undamaged.]


Demey, A., Staelens, J., Verstraeten, G., Boeckx, P., Hermy, M. and Verheyen, K. 2013. Effects of two contrasting hemiparasitic plant species on biomass production and nitrogen availability. Oecologia, 173(1): 293-303. [Removal of <i>Rhinanthus angustifolius</i> from 3 sites resulted in a 24% increase in biomass (mainly grasses), while removal of <i>Pedicularis sylvatica</i> from 3 other sites had no effect. Concurrent study of litter and N status suggested that, in addition to the suppression of host biomass due to parasitism, positive litter feedbacks on host and non-host biomass - via an increase in nutrient availability - also affect plant community structure.]

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Dey, S.K. and Mukherjee, S.K. 2013. Range of host variation of <i>Cuscuta</i> (Cuscutaceae) in Nadia district (West Bengal) along with haustorial structure in some host with plants. International Journal of Pharmaceutical Research and Bio-Science, 2(4): 72-95. [Recording 25 hosts of <i>C. reflexa</i> and only 5 of 'C. chinensis' (probably <i>C. campestris</i>?) ‘Mikania cordata’ (almost certainly <i>M. micrantha</i>) noted as a major host of both species.]

Dierschke, H. 2013. (Constancy and dynamics in a species-rich calcareous beech forest. Changes within a large transect 1981-2011.) (in German). Tuexenia 33: (49-92). [Neottia nidus-avis was among only 5 species showing a pronounced increase in beech forest over a 3 decade period.]


Dor, E. and Hershenhorn, J. 2012. Allelopathic effects of <i>Imula viscosa</i> leaf extracts on weeds. Allelopathy Journal 30(2): 281-290. [<i>Cuscuta reflexa</i> among weed species highly sensitive to the extract from <i>I. viscosa</i> and to the ground dry leaves mixed with soil. Wheat, cotton and melon crops were resistant. The active compound was identified as the sesquiterpene lactone tayunin.]


loci, along with Patterson’s D-statistic test, were used to detect significant introgression in the “re-thamnophila” clade but not the “superba” clade of Pedicularis.


Encheva, J., Valkova, D. and Shindrova, P. 2013. Sunflower mutations, produced by ultrasonic treatment of immature embryos of cultivated genotype 147 R. Bulgarian Journal of Agricultural Science 19(3): 578-583. [Mutation for resistance to the local population of Orobanche cumana Wallr. (race A-E) was obtained from the susceptible line 147 R. Two mutant restorer lines possessed 100% resistance to Orobanche and stable inheritance in the next generations.]

Fahmy, G.M. 2013. Ecophysiology of the holoparasitic angiosperm Cistanche phyllea (Orobanchaceae) in a coastal salt marsh. Turkish Journal of Botany 37(5): 908-919. [The study involved C. phyllea parasitising Arthrocnemum macrostachyum in a coastal salt marsh in Qatar. K was the major cation in the parasite, while Na was dominant in the host.. The N, soluble sugars, total amino acids, and starch contents of the parasite were higher than those of the host. The high ratio of K+ to Ca2+ in the parasite indicates that it is phloem-feeding.]

Fernández-Aparicio, M., Cimmino, A., Evidente, A. and Rubiales, D. 2103. Inhibition of Orobanche crenata seed germination and radicle growth by allelochemicals identified in cereals. Journal of Agricultural and Food Chemistry 61(41): 9797-9803. [Cereal intercrops have been shown to suppress O. crenata in faba bean. In this study it was confirmed that the cereal-derived 2-benzoxazolinone, its derivative 6-chloroacetyl-2-benzoxazolinone, and scopoletin, significantly inhibited O. crenata germination. Benzoxazolinones, L-tryptophan, and coumalic acid caused strong inhibition of radicle growth.]

Fozia Anjun, Bukhari, S.A., Muhammad Shahid, Shakeel Anwar, Muhammad Afzal and Naheed Akhter. 2013. Comparative evaluation of antioxidant potential of parasitic plant collected from different hosts. Journal of Food Processing and Technology 4(5): 228. [A study involving an unspecified Cuscuta sp. showed a strong correlation between total phenolics or reducing power and antioxidant activity whereas flavonoids exhibited weak correlation with antioxidant activity.]


Gajišek, D., Jarni, K. and Brus, R. 2103. Infection patterns and hosts of Arceuthobium oxycedri (DC.) M. Bieb. in Slovenia. Forest Pathology 43(3): 185-192. [In 6 of 11 populations of mixed Juniperus spp. studied, J. oxycedrus was more heavily and frequently (77%) parasitized by A. oxycedri than was J. communis (54%). Some A. oxycedri individuals were large – 25-40 cm in diameter.]

Gao JianMei, Li Ran, Zhang Lei, Jia LiLong, Ying XiXiang, Dou DeQiang, Li JianChun and Li HaiBo. 2013. Cuscuta chinensis seeds water extraction protecting murine osteoblastic MC3T3-E1 cells against tertiary butyl hydroperoxide induced injury. Journal of Ethnopharmacology 148(2): 587-595. [C. chinensis has been used traditionally in China to treat heart disease, diabetes, liver injury, cancer, and aging. In this study C. chinensis modulated the oxidative stress-induced apoptosis in MC3T3-E1 cells, probably due to its antioxidant activity.]


Gibot-Leclerc, S., Abdennabi-Abdemessed, N., Reibel, C. and Colbach, N. 2013. Non-host facilitators, a new category that unexpectedly favours parasitic weeds. Agronomy for Sustainable Development 33(4): 787-793. [Results show a nearly threefold increase in the infection of oilseed rape by Phelipanche ramosa in the presence of the non-host Convolvulus arvensis. It is suggested that a new category of ‘non-host facilitator’ is needed. The underlying mechanism is unknown but it was observed that C. arvensis supported secondary attachments from O. ramosa on nearby crop hosts.]

Gibot-Leclerc, S., Dessaint, F., Reibel, C. and le Corre, V. 2013. Phelipanche ramosa (L.) pomel populations differ in life-history and infection response to hosts. Flora (Jena) 208(4): 247-252. [Confirming a degree of host specialisation in two populations of P. ramosa, that on tomato/tobacco normally maturing in 14 weeks while that on oilseed rape matures only after 40 weeks. In reciprocal infections each population showed a higher aggressiveness on their natural hosts than on the other. The tomato/tobacco population completed its life cycle on both hosts within the 16 weeks of the experiment.]

Glavaš, M. 2012. (Harmful effects on silver fir caused by white mistletoe.) (in Croatian) Glasilo Biljne Zaštite 12(3): 239-244. [Viscum album occurs extensively in silver fir with up to 147 infections recorded per tree and 60% reduction in growth. The trees with diameter larger then 60 cm do not increase in volume and their yield is reduced. They may also become predisposed to attacks of pathogenic fungi a bark-beetles.]


Guaraldo, A.de C., Boeni, B.de O. and Pizo, M.A. 2013. Specialized seed dispersal in epiphytic cacti and convergence with mistletoes. Biotropica 45(4): 465-473. [Noting similar dispersal systems of epiphytic cacti in the genus Rhipsalis, and Viscaceae mistletoes, which involve the same Euphonia spp. dispersal agents. Similar fruit morphologies and fruit chemistry are apparently convergent adaptive strategies that enable seeds of both groups to reach adequate micsites for establishment in host branches.]


Gonmadje, C.F., Doumenge, C., Sunderland, T.C.H., Balinga, M.P.B., Sonke, B., Beau, N., Dessein, S. and Robbrecht, E. 2013. (Specialized seed dispersal in epiphytic cacti and convergence with mistletoes. Biotropica 45(4): 465-473. Noting similar dispersal systems of epiphytic cacti in the genus Rhipsalis, and Viscaceae mistletoes, which involve the same Euphonia spp. dispersal agents. Similar fruit morphologies and fruit chemistry are apparently convergent adaptive strategies that enable seeds of both groups to reach adequate micsites for establishment in host branches.)
Huang ShuangQuan and Shi XiaoQing. 2013. Floral isolation in *Pedicularis*: how do congeners with shared pollinators minimize reproductive interference? New Phytologist 199(3): 858-865. [Confirming that pollen placement and pickup on the bumblebee *Bombus richardsi* differed between *P. densispica*, *P. dichotoma* and *P. tricolor* helping to reduce reproductive interference, but the positions of pollen placement and stigma contact on the bee’s body were not as precise as previously thought.]

Hülsmann, L., Evers, J. and Eichhorn, J. 2013. (Mistletoe – risk of pine forests.) (in German) AFZ/Der Wald, Allgemeine Forst Zeitschrift für Waldwirtschaft und Umweltvorsorge 68(6): 27-29. [Discussing the damage to 57-year old pines from *Viscum album* and factors contributing to its spread.]


Ibegbulem, C.O. and Chikezie, P.C. 2013. Hypoglycemic properties of ethanolic extracts of *Gongronema latifolium*, *Aloe perryi*, *Viscum album* and *Allium sativum* administrated to alloxan-induced diabetic albino rats (*Rattus norvegicus*). Pharmacognosy Communications, 3(2): 12-16. [Four plant extracts including *V. album* showed similar capacity to act as hypoglycemic agents in treated rats and correlate with the therapeutic capacity of the standard drug, glimepiride.]


Jürgens, A., Wee SukLing, Shuttleworth, A. and Johnson, S.D. 2013. Chemical mimicry of insect oviposition sites: a global analysis of convergence in angiosperms. Ecology Letters 16(9): 1157-1167. [Concluding that the emission of oligosulphide-dominated volatile blends like those emitted by carrion has evolved independently in at least five plant families (Annonaceae, Apocynaceae, Araceae, Orchidaceae and Rafflesiaceae) and characterises plants associated with pollination by necrophagous flies and beetles.]


Koech, M. and 14 others. 2011. Economic returns of varying *Desmodium* trimming regimes in "Push-Pull" intercropping system in western Kenya. 10th African Crop Science Conference Proceedings, Maputo, Mozambique, 10-13 October 2011:13-17. [Confirming that that when P is not limiting inter-cropping with *D. uncinatum* or *D. intortum* (for control of *Striga hermonthica*) can provide adequate N to enhance crop growth and yield only after *Desmodium* becomes well established.]

how low phosphate through strigolactone upregulation, and their interaction with auxin and ethylene, changes root architecture.]


Kuijt, J. 2013. Tristerix rhodanthus, a new species of Loranthaceae from Bolivia. Brittonia, 65(3): 292-295. [T. rhodanthus is a new large-pink-flowered species, described from a single specimen parasitizing a Brachyotum sp. at 3,600 m.]

Kuijt, J. 2011. Isophasic parasitism in Phoradendron perredactum (Viscaceae). Acta Botanica Mexicana, 96: 11-13. [Pointing out that the newly described P. perredactum (see Rzedowski, 2011) exhibits isophasic parasitism, an advanced type of growth behaviour that also occurs in some Arceuthobium spp. (e.g. A. minutissimum), Mitrastema yamamotoi and Pilostyles haussknechtii. It entails longitudinal growth of the endophyte keeping pace with the longitudinal extension of the parasitized host branch and developing its first external shoots in completely predictable locations.]


Kwanda, N., Noikotr, K., Sudmono, R., Tanee, T. and Chaveerach, A. 2013. Medicinal parasitic plants on diverse hosts with their usages and barcodes. Journal of Natural Medicines 67(3): 438-445. [In northeastern Thailand traditional usages include: Scarrula atrpuparuea for nourishing blood, Dendrolothoe pentandra for high blood pressure, and Helixanthera parasitica for liver disease. Other species included in this study were D. lanosa, Macrosolen brandisianus, M. cochinchinensis, Viscum articatum and V. ovalifolium.

Tag sequences from each have been submitted to GenBank databases under accession numbers JN687563-JN687578.]


Li AiRong, Guan KaiYun, Stonor, R., Smith, S.E. and Smith, F.A. 2013. Direct and indirect influences of arbuscular mycorrhizal fungi on phosphorus uptake by two root hemiparasitic Pedicularis species: do the fungal partners matter at low colonization levels? Annals of Botany 112(6): 1089-1098. [AM colonization of Pedicularis rex and P. tricolor was low, but where it did occur AM fungi strongly interfered with P acquisition by both Pedicularis species from their host barley suggesting evidence for a novel mechanism preventing the parasites from overexploiting host resources through AM fungal-induced suppression of the absorptive structures in the parasites.]


Li DongZhe and Ma WeiMin. 2013. (Effects of cynomorium decoction upon the metabolism of free radical and liver glycogen of liver tissue of exercise rats.) (in Chinese) Modern Preventive Medicine 40(9): 1478-1480. [Concluding that extract of Cynomorium coccineum ssp. songaricum has the function of protecting liver tissue of rats from free radical damage and promoting the capacity to exercise.]

Liao YanFang, Huo Lini, Chen Rui, Li PeiYuan and Lu RuMei. 2013. Antioxidant activity of Taxillus chinensis parasitizing on Toona sinensis (A. Juss) Roem. Asian Journal of Chemistry 25(14): 7790-7792. [Confirming the presence of antioxidants which may be useful for curing diseases arising from oxidative deterioration.]

californicum in relation to its legume hosts, bird dispersers and climate.


Lu DanYi, Zhang JiaYu, Yang ZhenYa, Liu HongMing, Li Sha, Wu BaoJian and Ma ZhiGuo. 2013. Quantitative analysis of Cistanches Herba using high-performance liquid chromatography coupled with diode array detection and high-resolution mass spectrometry combined with chemometric methods. Journal of Separation Science 36 (12): 1945-1952. [Ten phenylethanoid glycosides were identified and further quantified as marker substances to distinguish between different Cistanche spp. including C. deserticola and C. sinensis.]


Malik, R.A. and Gupta, R.C. 2013 Meiotic studies in some selected members of Gamopetalae from Kashmir Himalaya. Plant Systematics and Evolution 299(8): 1549-1560. [Determining the chromosome number of Euphrasia paucifolia as n = 22. Also noting the occurrence of abnormal meiosis/microsporogenesis of one or other type, thereby leading to pollen anomalies.]


Mehl, H.K., Mori, S.R., Frankel, S.J. and Rizzo, D.M. 2013. Parasitism of Dacryodes edulis by the genus Tapinanthus (Loranthaceae) and the assessment of the associated myrmecofauna in Logbessou plateau (Douala, Cameroon). Journal of Applied Biosciences, 68: 5336-5348. [Recording that Dacryodes edulis (Burseraceae) is seriously parasitized by Tapinanthus ogovensis and by T. preussii, while other trees are attacked by Phragmanthera capitata. Also identifying a number of associated ant species one of which may be damaging the parasite, but most are protective?]


Mehl, H.K., Mori, S.R., Frankel, S.J. and Rizzo, D.M. 2013. Mortality and growth of dwarf mistletoe-infected red and white fir and the efficacy of thinning for reducing associated losses. Forest Pathology 43(3): 193-203. [Thinning helped to reduce Arceuthobium abietinum f.sp. magnifica and A. abietinum f.sp. concoloris in red (Abies magnifica) and white (A. concolor) fir respectively but actual losses during this study were minor and thinning may not be justified simply for mistletoe control.]


Meng HaoCong, Wang Shuo, Li Ying, Kuang YuanYuan and Ma ChaoMei. 2013. Chemical constituents and pharmacologic actions of Cynomorium concolor in red (Abies magnifica) and white (A. concolor) fir respectively but actual losses during this study were minor and thinning may not be justified simply for mistletoe control.]


Motonami, N., Ueno, K., Nakashima, H., Nomura, S., Mizutani, M., Takikawa, H. and Sugimoto, Y. 2013. The bioconversion of 5-deoxystrigol to sorgomol by the sorghum, Sorghum bicolor (L.) Moench. Phytochemistry 93: 41-48. [Establishing that 5-deoxystrigol (5-DS) and ent-2′-epi-5-deoxystrigol were absorbed by sorghum roots, converted to sorgomol and ent-2′-epi-sorgomol, respectively, and exuded out of the roots. Inhibition by uniconazol-P, suggests the involvement of cytochrome P450 in the hydroxylation.]


Murali, R., Janawad, S.C., Manu, T.G. and Rangaswamy, K.T. 2013.Occurrence of spike disease in sandal plantations in southern Karnataka. Mysore Journal of Agricultural Sciences 47(2): 444-446. [The occurrence of phytoplasmic spike disease was generally low but reached 18% in one of the 24 plantations of Santalum album surveyed.]


Nan Zé Dong, Zeng Ke Wu, Shi She Po, Zhao Ming Bo, Jiang Yong; Tu Peng Fei. 2013. Phenylethanoid glycosides with anti-inflammatory activities from the stems of Cistanche deserticola cultured in Tarim desert. Fitoterapia 89: 167-174. [Identifying one new phenylethanoid glycoside with potent inhibition of lipopolysaccharide - induced nitric oxide production in mouse microglial cells.]


Natalis, L.C. and Wesselingh, R.A. 2013. Parental frequencies and spatial configuration shape bumblebee behavior and floral isolation in hybridizing Rhinanthus. International Journal of Organic Evolution 67(6): 1692-1705. [When both R. minor and R. angustifolius were present in equal proportions, bees generally preferred the more rewarding and conspicuous species. However, when the frequencies were unbalanced, the more abundant species was preferred.]


Nikolov L.A., Endress P.K., Sugumaran M., Sasirat W., Vessabutr W., Kramer E.M., Davis C.C. 2013. Developmental origins of the world’s largest flowers, Rafflesiaeae. Proceedings of the National Academy of Science USA 110(46):18578–18583. [Structure, development, and gene-expression patterns revealed that the otherwise similar floral chambers in Rafflesia and Sapria were different.]

Niranjan Mahadevan and Jayasuriya, K.M.G.G. 2013. Water-impermeable fruits of the parasitic angiosperm Cassytha filiformis (Lauraceae): confirmation of physical dormancy in Magnoliidae and evolutionary considerations. Australian Journal of Botany 61(4): 322-329. [Confirming that fruits of C. filiformis are impermeable to water and require scarification for germination, a characteristic unusual in Magnoliidae.]

Nordeng, H., Al-Zayadi, W., Diallo, D., Ballo, N. and Paulsen, B.S. 2013. Traditional medicine practitioners’ knowledge and views on treatment of pregnant women in three regions of Mali. Journal of Ethnobiology and Ethnomedicine 9: 67. [Including reference to Opilia amentacea (= O. celidifolia) as being unsafe taken orally but safe dermally. Ximenia americana also mentioned but whether safe or toxic not clear from abstract.]


Oluwole, O., Osungunna, M.O. and Abimbola, Y. 2103. Phytochemical and antimicrobial screening of Globimetula oreophila (Oliv) van Tiegh and Phragmanthera capitata (Spreng) Balle. International Journal of Green Pharmacy, 7(2): 127-130. [P. capitata and G. oreophila proved highly effective against Escherichia coli, Klebsiella spp., Shigella spp., Salmonella typhi, Staphylococcus aureus and Pseudomonas aeruginosa. The former was the more active.]

Oyinbo, O., Saleh, M.K. and Rekwot, G.Z. 2013. Determinants of herbicide utilization in Striga hermonthica control among maize farming households in Giwa local government area of Kaduna State, Nigeria. Russian Journal of Agricultural and Socio-Economic Sciences, 3(15): 63-67. [Showing that household size, household income and educational level were significant in influencing herbicide utilization by maize farmers while membership of farmers'associations and extension contact were significant institutional variables. Frustratingly no mention of the herbicide(s) involved.]

technology 48(11): 2228-2238. [Mistletoe extract (presumably *Viscum album*) had no influence on the shelf life of fish.]

Padmanaba, M., Sheil, D., Basuki, I. and Liswanti, N. 2013. Accessing local knowledge to identify where species of conservation concern occur in a tropical forest landscape. Environmental Management 52(2): 348-359. [Local informants in villages in Indonesia provided useful, reliable information on the distribution of a range of plant and animal species including *Rafflesia* spp.]


Patykowski, J. and Kołodziejek, J. 2013. Comparative analysis of antioxidant activity in leaves of different hosts infected by mistletoe (*Viscum album* subsp. *album*). Archives of Biological Sciences 65(3): 851-861. [Finding that levels of superoxide dismutase differed somewhat according to the host on which *V.* album was growing. Also suggesting that *V.* album may be extremely tolerant to air pollution.]


Pelser P.B., Nickrent, D. L., Callado, J. R. C. and Barcelona, J. F. 2013. Mt. Banahaw reveals: The resurrection and neotypification of the name *Rafflesia lagascae* (Rafflesiaceae) and clues to the dispersal of *Rafflesia* seeds. Phytotaxa 131: 35–40. [Examination of the *Rafflesia* population from Samar Island indicates that this corresponds to the type for *R. manillana*, and that the name *R. lagascae* Blanco should be applied to the different taxon previously referred to as *R. manillana* from Luzon. Ants were observed dispersing seeds of *R. philippensis*.]


Piednoël, M., Carrete-Vega, G. and Renner, S.S. 2013. Characterization of the LTR retrotranspon repertoire of a plant clade of six diploid and one tetraploid species. Plant Journal 75(4): 699-709. [Reporting the characterization of long terminal repeat transposons in Orobanchaceae including the non-parasitic *Lindenbergia* as well as several closely related *Orobanche* and *Phelipanche* species. This is apparently the first report of these elements in the family.]

Pineda-Martos, R., Velasco, L., Fernández-Escobar, J., Fernández-Martinez, J.M. and Pérez-Vich, B. 2103. Genetic diversity of *Orobanche cumana* populations from Spain assessed using SSR markers. Weed Research (Oxford) 53(4): 279-289. [Results reveal the existence of two distant gene pools, one in Cuenca province and another in the Guadalquivir Valley suggesting two distinct introduction events. Most populations from new areas corresponded to that from the Guadalquivir Valley. Different races (mainly E and F) occurred within the same gene pool, suggesting that current races might have evolved through mutation from a common genetic background.]

Piwowarczyk, R. 2013. Seed productivity in relation to other shoot features for endangered parasitic plant *Orobanche picridis* F.W. Schultz (Orobanchaceae). Polish Journal of Ecology 61(1): 55-64. [Seeds per capsule in *O. picridis*, an endangered species in Poland and Ukraine, varied from 457 to 3,246. The mean number of seeds per shoot was 55,172 (range 8,911 to 151,050). Seed productivity depends significantly on shoot height.]

Pleines, T., Esfeld, K., Blattner, F.R. and Thiv, M. 2013. Ecotypes and genetic structure of *Rhinanthus alceolarothus* (Orobanchaceae) in southwestern Germany. Plant Systematics and Evolution 299(8): 1523-1535. [Results of studies on 39 populations of 3 sub-species of *R. alceolarothus* indicate that the subspecies of *R. alceolarothus* do not form discrete entities and that the character combinations distinguishing them are homoplastic.]


34(4): 164-168. [A general review on use of lectins from Viscum album in cancer therapy.]

Pouvreau, J.B., Gaudin, Z., Auger, B., Lechat, M.M., Gauthier, M., Delavault, P. and Simier, P. 2013. A high-throughput seed germination assay for root parasitic plants. Plant Methods 9: 32. [The method adapts the Mosmann's protocol for cell cultures to germinating seeds involving a standardized 96-well plate test coupled with spectrophotometric reading of tetrazolium salt reduction. It allows high-throughput screenings of allelochemicals (stimulants, inhibitors) or biological extracts on parasitic plant seed germination.]


Queijeiro-Bolaños, M.E., Cano-Santana, Z. and Castellanos-Vargas, I. 2013. Does disturbance determines the prevalence of dwarf mistletoe (Arceuthobium, Santalales: Viscaceae) in Central Mexico? Revista Chilena de Historia Natural 86(2): 181-190. [Arceuthobium globosum and A. vaginatum both infest Pinus hartwegii, to the extent of 47% and 37% of the trees respectively and tend to compete with each other. Both are affected by various types of disturbance.]


Raupp, F.M. and Spring, O. 2013. New sesquiterpene lactones from sunflower root exudate as germination stimulants for Orobanche cumana. Journal of Agricultural and Food Chemistry 61: 44. [Besides dehydrocostus lactone, costunolide, tomentosin, and 8-epixanthin were purified and identified. All four induced germination of O. cumana at nano- to micromolar concentrations. Costunolide did not stimulate germination of P. ramosa.]
mainly female flowers, less frequent were 3 cm long, with mainly male flowers. Plus new information on P. olae concerning male plants and hosts. Both species occur in NW Oaxaca, Mexico.] Sadeghi-Nejad, B. and Azish, M. 2013. In vitro antibacterial and antifungal effect of some medicinal plants. African Journal of Microbiology Research 7(29): 3802-3806. [In Iran, ‘Loranthus capitellatus’ (= Macrosolen capitellatus) among 5 species showing activity against certain bacteria and fungi but no detail in abstract.]


Saritha Kodithala, Yoganandam, G.P. and Kiranmai, M. 2013. Pharmacognostological, phytochemical and anticancer studies of Dendrophthoe falcata (L.f.) Ettingsh. (Loranthaceae) growing on the host plant Azadirachta indica (Meliaceae). International Journal of Pharma and Bio Sciences 4(2):1010-1018. [The methanolic extract of D. e falcata shows significant anticancer activity, associated with phenolic and flavonoid constituents which may originate from the host A. indica.]


She GaiMei, Zhang YingJun and Yang ChongRen. 2013. A new phomonic constituent and a cyanogenic glycoside from Balanophora involucrata (Balanophoraceae). Chemistry & Biodiversity 10(6): 1081-1087. [Noting that B. involucrata is used medicinally for the treatment of irregular menstruation, cough, hemoptysis, traumatic injury and bleeding, dizziness and gastralgia in Yunnan Province, China.]

Shikha Sharma, Amrinder Kaur and Arjun Anania. 2013. Antimicrobial study of Cuscuta reflexa collected in different seasons. International Journal of Pharma and Bio Sciences 4(3): B-1393-B-1397. [C. reflexa showed highest activity against Pseudomonas aeruginosa and E. coli when collected in the rainy season while maximum activity against Staphylococcus aureus was from material collected during the spring.]

Singh, L.J. 2013. Macrosolen andamanensis (Loranthaceae): a new species of mistletoes from Bay Islands, India. Indian Journal of Forestry 36(1): 55-59. Smith, J.D., Mescher, M.C., de Moraes, C.M., Glover, B. and Kachroo, P. 2013. Implications of bioactive solute transfer from hosts to parasitic plants. Current Opinion in Plant Biology 16(4): 464-472. [Reviewing the potential effects of the translocation of bioactive non-nutrient solutes - such as phytohormones, secondary metabolites, RNAs, and proteins - on the development and physiology of parasitic plants such as Cuscuta, Orobanche and Siriga spp., and on their subsequent interactions with other organisms such as insect herbivores.]

Southwell, I. 2012. Sandalwood in Australia. LINK Natural Products Digest, 8(2): 2-6. [Describing the 4 Santalum species which been developed commercially in Australia - S. accuminatum, S. lanceolatum, S. album and S. spicatum. Information is given on commercial and medicinal value of their essential oil, timber and fruits.]

relating to S. hermonthica, S. asiatica and S. gesnerioides are briefly reviewed.

Stan, R.L., Hangan, A.C., Dicarli, H., Sevastre, B., Hangany, D., Catoi, C., Sarpakti, O. and Ionescu, C.M. 2013. Comparative study concerning mistletoe viscosotoxins antitumor activity. Acta Biologica Hungarica 64(3): 279-288. [Classic doxorubicin therapy not only prevents the accumulation of ascitic fluid, but also significantly reduces the activity of plasma antioxidant enzymes in Ehrlich ascites carcinoma of mice. This effect was enhanced by combination with viscosotoxins from V. album.]

Stanga, J.P., Smith, S.M., Briggs, W.R. and Nelson, D.C. 2013. SUPPRESSOR OF MORE AXILLARY GROWTH2 1 controls seed germination and seedling development in Arabidopsis. Plant Physiology, 163(1): 318-330. [Concluding that SMAX1 is an important component of KAR/SL signalling during seed germination and seedling growth but is not necessary for all MAX2-dependent responses and Hypothesising that one or more SMXL proteins may also act downstream of MAX2 to control the diverse developmental responses to KARs and SLs.]

Start, A.N. 2013. Mistletoe flora (Loranthaceae and Santalaceae) of the Kimberley, a tropical region in Western Australia, with particular reference to fire. Australian Journal of Botany 61(4): 309-321. [The flora consisted of one genus with three species in the Santalaceae and five genera with 22 species in the Loranthaceae. Amyema was the largest genus in both regions. Host records included 165 species from 33 families. No further detail in abstract.]


Švubová, R. and Blehová, A. 2013. Stable transformation and actin visualization in callus cultures of dodder (Cuscuta europaea). Biologia (Braňská) 68(4): 633-640. [Confirming that C. europaea callus cells are competent for transformation, but under given conditions, these cells failed to realize their morphogenic and regeneration potentials.]


Świerczyn’ska, J., Kozieradzka-Kiszkurno, M. and Bohdanowicz, J. 2013. Developmental and cytochemical studies of the endosperm chalazal haustorium of Rhinanthis serotina (Scrophulariaceae). Acta Biologica Cracoviensia. Series Botanica 55(1): 99-106. [The chalazal haustorium is a huge single cell containing two enlarged nuclei. Results suggest it is a site of intense metabolic activity.]


*Teodoro, G.S., van den Berg, E. and Arruda, R. 2013. Metapopulation dynamics of the mistletoe and its host in savanna areas with different fire occurrence. PLoS ONE 8(6): e65836. (http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0065836) [In Brazil savanna, Psittacanthus robustus is a fire sensitive species and its host Vochysia thyrsoida is fire tolerant. Confirming that P. robustus increases host mortality, but its effect is lessened by periodic burning that reduces the parasite.]


Těšíteř, J., Hejíčman, M., Lepš, J. and Cameron, D.D. 2013. How does elevated grassland productivity influence populations of root hemiparasites? Commentary on Borowicz and Armstrong (Oecologia 2012). Oecologia 172(4): 933-936. [See Haustorium 63 and excuse my garbled extract. Noting that competition for light may be detrimental to hemiparasites such as Pedicularis canadensis in the seedling stage but where it arises from increased nutrient, the parasite may yet benefit.]

Tibe, O., Sutherland, I.A., Lesperance, L. and Harding, D.R.K. 2013. The effect of purified condensed tannins of forage plants from Botswana on the free-living stages of gastrointestinal nematode parasites of livestock. Veterinary Parasitology 197(1/2): 160-167. [Extracts of Viscum verrucosum and Tapinanthus oleifolius were more active against some species of gastrointestinal nematode parasites from sheep than were those from V. rotundifolium.]


Tivadar, B., Ildikó, V., Balázs, G. and Ferenc, D. 2013. (Influence of European mistletoe (Viscum album) to the structural change of apple (Malus domestica) woody tissue.) (in Hungarian) Növényvédelem 49(6): 245-252. [Acoustic measurement was more useful than impedance tomography.]


Venditti, A., Serrilli, A.M. and Bianco, A. 2013. Iridoids from Bellardia trisago (L.) All. Natural Product Research, 27(15): 1413-1416. [Identifying 8 iridoid glucosides from B. trisago, 3 of them for the first time; also D-mannitol.]

Venette, R.C., Kriticos, D.J. and Venette, R.C. 2013. Incorporating climate change into pest risk models for forest pathogens: a role for cold stress in an era of global warming? NeoBiota 18: 131-150. [Concluding that, for Arceuthobium tsugense subsp. tsugense, decreased cold stress and increased heat stress will result in distribution being moved significantly northward.]


Wang ChangBao, Xu ZengQi and Yue RenJie. 2013. Population characteristics of mistletoe (Viscum coloratum) in Wandashan mountain. Plant Science Journal 31(4): 345-352. [The frequency of V. coloratum was highest on Populus davidiana, with decreasing frequency on Betula platyphylla, Alnus sibirica, B. dahurica, Tilia amurensis, Acer tegmentosum and A. mono. Fruits were 50% red and white and dispersal was associated with Bohemian waxwing, Bombycilla garrulus.]

Wang ChaoBo; and Gong Xun. 2013. Comparative analyses of indels based on the whole chloroplast genome of Cuscuta reflexa between European and Asian populations. Plant Diversity and Resources 35(2): 158-164. [The chloroplast genome of C. reflexa from both areas encoded identical functional genes in the same order. Analyses revealed 251 insertions and 210 deletions. A majority of the indels observed were single-base but four large length mutations longer than 200 bp were also detected, including two deletions in ycf2 region, one insertion in trnF-psbE and another insertion in marK-trnQ.]


Watson, D.M. and Rawsthorne, J. 2013. Mistletoe specialist frugivores: latterday 'Johnny Appleseeds' or self-serving market gardeners? Oecologia 172(4): 925-932. [Suggesting that birds known as mistletoe specialist frugivores are better considered exploitative than mutualistic, tending to intensify local populations rather than spreading further afield, which may depend more on dietary generalists.]

Wei Qing, Yang GuoWei, Wang XiaoJie, Hu XueXia and Chen Liang. 2013. (The study on optimization of Soxhlet extraction process for ursolic acid from


Widhalm, S. 2013. (Mistletoe in cancer therapy: an update.)

Wong, V.L. and Bruns, T.D. 2013. Gibberellic acid induces haustorium 64 December 2013 29

Xia Jing, Sun ShiGuo and Liu GuiHua. 2013. Evidence of a fungus in stimulating germination of Pterospora andromedea (in German) Zeitschrift für Phytotherapie 34(3): 112-115. [Preparations from Viscum album rich in lectins appear to inhibit angiogenesis. They may allow reductions in dose or frequency of conventional drugs and several studies have demonstrated improvement in quality of life through mistletoe therapy.]

Wong, V.L. and Bruns, T.D. 2013. Gibberelllic acid induces asymbiotic germination of the obligate mycoheterotroph Pterospora andromedea (Ericaceae), Madroño 60(3): 186-192. [GA was more effective than the usual host fungus in stimulating germination of Pterospora andromedea but not of Sarcodea sanguinea.]


Xia Jing, Sun ShiGuo and Liu GuiHua. 2013. Evidence of a component Allee effect driven by pre-dispersal seed predation in a plant (Pedicularis rex, Orobanchaceae). Biology Letters 9(5): 20130387. [Dense patches of P. rex experienced significantly fewer attacks by pre-dispersal seed predators, providing strong evidence of a component Allee effect driven by predation in a plant species.]


Yoneyama, K., Xie XiaoNan, Kisugi, T., Nomura, T. and Yoneyama, K. 2103. Nitrogen and phosphorus fertilization negatively affects strigolactone production and exudation in sorghum. Planta 238(5): 885-894. [In general, after withdrawal of nutrient, root contents and exudation of SLs from sorghum stayed at similar levels for 6 to 12 h and then significantly increased at 24 h. The production of SLs responded more quickly to P fertilization than their secretion, while up-regulation of SL secretion started earlier after N amount was reduced.]

Yu WenBin, Cai Jie, Li DeZhu and Mill, R.R. 2013. Floral ontogeny of Pedicularis (Orobanchaceae), with an emphasis on the corolla upper lip. Journal of Systematics and Evolution 51(4): 435-450. [Studies of the floral ontogeny of P. gruina and P. siphanantha confirm that floral monosymmetry of Pedicularis is established at the beginning of sepal initiation and is maintained until flowering. The development of the upper lip provides some clues to the evolution of beaked and/or toothed galeas in the genus.]*

Yu WenBin, Huang PanHui, Li DeZhu and Wang Hong. 2013. Incongruence between nuclear and chloroplast DNA phylogenies in Pedicularis section Cyathophora (Orobanchaceae). PLoS ONE 8(9): e74828. (http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0074828) [The nrITS phylogeny reveals that the long corolla tube with beaked galeas in Striga, the chloroplast phylogeny indicates the beakless (toothed and toothless) and beaked galeas may have evolved independently within section Cyathophora, and the chloroplast phylogeny confirms that the long corolla tube with beaked galea is derived from the short one.]

Yusuf, O., Sani, I., Usman, S. and Dawang, C.N. 2013. Factors determining farmers' participation in Striga resistant maize variety (SAMMAZ 11) production in Ushongo Local Government area of Benue State, Nigeria. Journal of Agricultural Biotechnology and Sustainable Development 5(3): 48-53. [Results confirmed that education, access to credit, access to improved planting material and number of extension contacts had significant positive effects on farmers'
adoption of the *S. hermonthica*-resistant maize. Recommending provision of more extension agents.


Zare, G. and Dönmez, A.A. 2013. Two new records of the genus *Orobanche* (Orobanchaceae) from Turkey. Turkish Journal of Botany 37(3): 597-603. [Adding *O. owerini* and *O. reticulata* to the 37 *Orobanche* species already recorded for Turkey, and providing information on habitat, ecology.]


Zheng Lei, Cui XuSheng, Wu Yan, Zhai ZhiXi and Guo YuHai. 2013. (Study on seed yield and quality of *Cistanche deserticola* by tip pruning.) (in Chinese) Seed 32(1) 9-11. [Concluding that tip pruning at the early flowering stage could improve the seed yield and the quality of *C. deserticola*.]

Zwanenburg, B., Nayak, S.K., Charnikhova, T.V. and Bouwmeester, H.J. 2013. New strigolactone mimics: structure-activity relationship and mode of action as germinating stimulants for parasitic weeds. Bioorganic & Medicinal Chemistry Letters, 23(18): 5182-5186. [SL analogues all contain the D-ring connected with an enone moiety through an enol ether unit. SL mimics only have the D-ring with an appropriate leaving group at C-5. Here, SL mimics were used to investigate their mode of action in stimulating parasitic plant seed germination.]

Zhang WenNa, Luo JianGuang and Kong LingYi. 2013. (Effect of *Orobanche cumana* parasitization on growth and antioxidant enzymes activity of different *Helianthus annuus* varieties in seedling stage.) (in Chinese) Acta Botanica Boreali-Occidentalia Sinica 33(7): 1403-1408. [The activities of protective enzymes, SOD, POD and CAT were generally higher in sunflower varieties showing resistance to *O. cumana*. The levels of these enzymes could be increased in susceptible varieties by exposing them to environmental stress.]

Zhang MoJing; Li MeiJia, Jun RuiHong, Niu Lin, Cao XueMin, Wu Yan and Chen GuiLin. 2013. (Effect of *Orobanche cumana* on the growth and antioxidant enzymes activity of different *Helianthus annuus* varieties in seedling stage.) (in Chinese) Seed 32(1) 9-11. [Concluding that tip pruning at the early flowering stage could improve the seed yield and the quality of *C. deserticola*.]

Zhang MoJing; Li MeiJia, Jun RuiHong, Niu Lin, Cao XueMin, Wu Yan and Chen GuiLin. 2013. (Effect of *Orobanche cumana* parasitization on growth and antioxidant enzymes activity of different *Helianthus annuus* varieties in seedling stage.) (in Chinese) Acta Botanica Boreali-Occidentalia Sinica 33(7): 1403-1408. [The activities of protective enzymes, SOD, POD and CAT were generally higher in sunflower varieties showing resistance to *O. cumana*. The levels of these enzymes could be increased in susceptible varieties by exposing them to environmental stress.]