HAUSTORIUM

Parasitic Plants Newsletter
ISSN 1944-6969
Official Organ of the International Parasitic Plant Society
(http://www.parasiticplants.org/)

December 2016 **Number 70**

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MESSAGE FROM THE IPPS PRESIDENT

Dear IPPS Members,

I wish you all a very Happy New Year and lots of exciting discoveries about parasitic plants in the coming year!

There are two very interesting meetings that involve parasitic plants on the horizon. The first is the 2nd International Congress on Strigolactones that will be held in Turin, Italy from 27th-30th March 2017 and includes two sessions on strigolactones and parasitic plants.

The next major conference is of course, the 14th World Congress on Parasitic Plants, that will take place in Asilomar, California, USA from June 25th – 30th 2017. John Yoder is the local organizer and details of Registration and Abstract submission are available on the WCPP-14 website (http://www.wcpp14.org). Please note that registration closes on June 1st and abstracts should be submitted as soon as possible and no later than 14th April 2017. The venue looks fantastic and the meeting is a great opportunity to see friends and make new contacts and collaborations.

I look forward to seeing everyone in June

Best wishes,

Julie Scholes, IPPS President
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MEETING REPORTS

Ecological implications of strigolactones, Nitra, Slovakia, 20th -22nd July 2016.

This meeting was part of the activities by COST ACTION FA1206: 'Strigolactones: biological roles and applications.' The participants to the meeting were welcomed by Peter Toth and Radoslava Matusova, Local Organizers, and by the Dean's Delegate for International Relations of the Slovak University of Agriculture.

Oral presentations at the meeting are listed below.

Also, a round-table discussion was initiated, and the costs of strigolactone applications in agriculture, the amount of strigolactone to be used in fields and the possible impacts on the soil were discussed, as well as the related regulations in different countries. Ethical aspects of strigolactone applications were raised and valuable types of crops to be used. It was concluded that there is a need to provide the Agricultural Ministries of the involved countries, both at national and European level, with scientific and reasonable recommendations on the use of strigolactones and bio-stimulators in fields and related impacts on soil and also human bodies.

An enjoyable post-conference tour took us to Demänovská Valley in the second highest Slovak mountain range 'Low Tatras' - along the creek Demäňovka. The aim of the tour was particularly to observe natural populations of *Orobanche flava*, and evaluate their impact on the host plant, a white-flowered butterbur (*Petasites kablikianus* or perhaps *P. albus*). *O. flava* is one of many wild broomrapes, interesting also because its seeds do not react to GR24. Other parasites observed included a *Melampyrum* species, either *Melampyrum pratense* or *M. sylvatica a*nd a *Euphrasia* sp.; also the mycoheterotrophs *Neottia nidus-avis* and *Monotropa uniflora.*

Orobanche flava on *Petasites ?kablikianus*. Photo Chris Parker

Oral presentations:

Danny Joel (The Volcani Center, Agricultural Research Organization, Israel) - 'Germination stimulants interaction with *Orobanche cumana* and their role in its evolution as an agricultural weed'

Rocío Pineda-Martos(Institute for Sustainable Agriculture (IAS-CSIC), Cordoba, Spain) - 'Broomrape parasitism in ground covers of organic olive orchards and its possible control via strigolactone-degrading fungi: a case study'

Chris Parker (Royal York Crescent, Bristol, UK) - 'Parasitic weeds and their control: a history'

Tony Hooper (Rothamsted Research, Harpenden, UK) - 'Suicidal germination of *Striga* in the presence of the host plant'

Cristina Prandi (Dipartimento di Chimica, Università degli Studi di Torino, Italy) - 'Strigolactones: where we are, where we go'

Peter Sabol (Charles University, Prague, Czech Republic) – 'Cell polarity regulation and strigolactones - is there a link?'

Hinanit Koltai (The Volcani Center, Agricultural Research Organization, Israel) – 'Environmental considerations of strigolactone application- from lab to practice'

Binne Zwanenburg (Institute for Molecules and Materials, Nijmegen, The Netherlands) -, 'Control of parasitic weeds, recent advances'

Francisco A. Macias (University of Cadiz, Spain) – 'Encapsulation as a strategy for application of strigolactone mimics'

Daniel Blanco Ania (Institute for Molecules and Materials - Radboud of University Nijmegen, The Netherlands) - 'Strategy for the synthesis of strigolactone analogues and mimics'

Valentina Fiorilli (University of Turin, Italy) – 'Host and non-host roots in rice: cellular and molecular approaches reveal differential responses to arbuscular mycorrhizal fungi'

Hinanit Koltai.

Mistletoes: Pathogens, Keystone Resource, and Medicinal Wonder. Southern Oregon University, Ashland, Oregon, USA July 17-22, 2016

The International Union of Forest Research Organizations Division 7 (Forest Health) Unit 7.02.11, 'Parasitic Flowering Plants in Forests', met this past July 18-21, 2016, in Ashland, Oregon, The meeting was intended to focus on the diverse perspectives of mistletoe research. For example, many researchers focus on mistletoe as pests of commercial trees in forests and orchards, while others focus on the interaction with wildlife and native ecosystems where mistletoes have been coined as, 'keystone' species. In addition, the medicinal use of mistletoes is perhaps the most active research field for mistletoes based on numbers of scientific publications.

The meeting was located in the complex geologic and botanic region of the Pacific Coast in southern Oregon, along the California border. The area is mountainous, with steep environmental gradients, as well as a unique serpentine rock, and endemic plants. Mistletoes in the Viscaceae are abundant here, but no other families of mistletoe are present in the region.

Scientific conferences are peculiar affairs. On one hand, they're expensive and inconvenient; on the other, they're informative and enjoyable. Every now and then, you're fortunate enough to participate in that rarest of conferences—one that enlightens and energises. The Ashland mistletoe conference was one such gem, among the most inspiring meetings I've attended in twenty-odd years. The breadth of expertise among the delegates spanned forestry, plant pathology, plant anatomy, molecular phylogenetics, community ecology and palaeontology, but we could all speak freely using the common language of mistletoes. We were treated to Clyde Calvin (University of California) sharing his insights on why the Viscaceae are such a successful lineage (the first public presentation he's given in 19 years). Gehard Glatzel (Austrian Academy of Sciences) reviewed deciduousness in mistletoes, suggesting protection from frosts as a selective mechanism. Cynthia Ross-Friedman (Thompson Rivers University in Canada) synthesized her transdisplinary research on 'the little bang'—the mechanistic basis of explosive seed discharge in dwarf mistletoes, revealing the critical role of thermogenesis in triggering discharge. Eva-Maria Sadowski (Georg-August-University of Göttingen, Germany) showed how little we know about the early history of mistletoes, reviewing dwarf mistletoe fossils from Baltic amber and suggesting mistletoes were already operating as ecological keystones in the Eocene. Gregorio Ceccantini (University of São Paulo, Brazil) shared exquisite images of thin sections and carefully-prepared haustorial specimens, demonstrating how mistletoes cause whole-of-tree hydraulic effects in infected hosts.

The scientific program was complemented by two day-long field trips with equal doses of spectacular scenery and abundant mistletoes. Bob Scharpf shared his extensive knowledge of dwarf mistletoes and their effects on coniferous hosts. Dave Shaw (University of Oregon) was on hand, identifying trees and birds, squirrels and wildflowers and pointing out key features of infected stands, while Shawn Kenaley (Cornell University) kept a sharp eye out for rusts and other fungi. A real highlight was being in the field with Bob Mathiasen (Northern Arizona University) who convinced us that although subtle characteristics of dried herbarium specimens may be difficult to distinguish, dwarf mistletoe species are best identified by growth habit, phenology, host identity and distributional range.

In addition, we had 18 other presentations by colleagues from Brazil, Australia, Germany, Austria, USA, and Canada, with 6 graduate students presenting. Many of the presenters have submitted manuscripts for a special section of the journal Botany, which may include 12 papers and is due to publication in 2017.

Southern Oregon University was an ideal conference venue, with seamless organization thanks to Brianna Beene (University of Oregon). For a more thorough summary of the conference with details of all speakers, presentations, field trips (and piles of mistletoe photos), you can scroll through: https://storify.com/D0CT0R_Dave/mistletoe-conference

Abstracts are available at: http://blogs.oregonstate.edu/mistletoe/files/2016/07/Mistletoe-Conference-Abstracts-1.pdf

A special issue of the journal 'Botany' will feature papers from the conference.

Presentations:

Watson, Dave - Of mistletoes and mechanisms: advances in understanding their ecological role and ecosystem function.
Hagar, Joan - Bird abundance and diversity are associated with oak mistletoe in Willamette Valley oak woodlands.
Flanders, Nicholas - The role of generalist avian frugivores in determining the distribution of the mistletoe *Phoradendron leucarpum.*
Eric Forsman - Dwarf mistletoe and the spotted owl.
Mathiasen, Robert - The classification of *Arceuthobium campylopodum*, *A. laricis*, and *A. tsugense* based on morphology and host range affinities.
Wilson, Carol - Epiparasitism in mistletoe (Santalales): An overlooked topic in forest biology.
Mathiasen, Robert, Kenaley, Shawn and Daugherty, Carolyn - Morphologic analyses of dwarf mistletoe in series *campylopoda* using multi-variate statistical and phylogenetic approaches: interspecific comparisons and contrasts with western dwarf mistletoe.
Ashworth, Vanessa - Phylogenetic relationships in *Phoradendron* (Viscaceae).
Schneider, Adam - The role of host specificity in speciation: Insights from American *Orobanche* (Orobanchaceae).
Calvin, Clyde - The Viscaceae, why so successful?
Glatzel, Gerhard - Deciduousness in mistletoes.
Cynthia Ross-Friedman - The Little Bang Theory: explosive seed discharge in dwarf mistletoe.
Isikhuemen, Ekeoba - The African mistletoe: from noxious weed to cure-all medicine.
Sadowski Eva-Maria - Macrofossil evidence of Eocene dwarf mistletoes and their implications for Baltic amber forest.
Ceccantini, Gregorio - A single mistletoe can cause a systemic hydraulic effect in the host tree.
Klutsch, Jennifer - Dwarf mistletoe- induced defense chemical accumulation in jack pine alters tree resistance to a non-native bark beetle- associated fungi.
Logan, Barry - A dispatch from the East: divergent responses white spruce and red spruce to eastern dwarf mistletoe infection along the coast of Maine.
Muir, John - Monitoring western hemlock dwarf mistletoe infection of regenerating coast western hemlock forests in British Columbia.
Ritter, Scott - The relationship between dwarf mistletoe infestation intensity and stand structure, canopy fuels, and surface woody debris in lodgepole pine forests.
Shaw, Dave - Fire and dwarf mistletoe in Western North America .
Ceccantini, Gregorio - Mistletoe with giant woody gall: Interpretation of the anatomic-hydraulic connection between *Psittacanthus robustus* and *Vochysia thyrsoidea* and the discovery of new structures in the haustorium.

Teixeira-Costa, Luiza - Multiple vs. single connections: What does it mean for the parasite?
Watson, Dave - On tropical mistletoes: noteworthy advances, recent insights, emerging opportunities.

Dave Watson, Dave Shaw (USA, Coordinator, IUFRO 7.02.11)

CUSCUTA PLANIFLORA IN WESTERN IRAN

Cuscuta planiflora Ten. (red or small-seeded dodder) is an annual parasitic plant. It has recently become invasive in west of Iran. Its major areas of infestation are in Ilam province between southern parts of the highlands of Zagros mountain and tropical areas with range into neighbouring provinces like Khuzestan and Kermanshah. It is gradually increasing in natural landscapes and parasitizing many broadleaf plant species from different families including Asteraceae (*Centaurea* sp. *Echinops* sp.), Brassicaceae (*Brassica* spp., *Diplotaxis harra*), Geraniaceae (*Erodium* sp.), Papilionaceae (e.g. *Astragalus* spp., *Ononis* sp.) Polygonaceae and (*Rumex ephedroides*). The infestation is so high that host plants are affected (Taab, personal observations).

Infestation of *C. planiflora* on *Ononis spinosa* . Photo Prof. Alireza Taab.

The seeds of *C. planiflora* remain viable in the soil for more than 20 years (Dawson *et al.* 1994). Flowering of small-seeded dodder may occur from January to May (Meeuse and Welman 2000) and even longer in June (Taab, personal observation). Seed of dodder species have a hard seed coat that is broken down over time through natural processes (Dawson et al. 1994). The optimum temperature for seed germination of *Cuscuta* spp. was found to be between 30 to 33°C (Zaki *et al*. 1998) perhaps the reason why the species has becoming invasive in warmer climates probably as a consequence of raising temperature brought about by climate change.

Close-up of flowers of *C. planiflora*. Photo. Prof. Alireza Taab.

Pastures in the infested area are used by farmers for feeding livestock. Therefore, dispersal of the species might be accelerated by grazing animals as seeds may pass through birds' and mammals' digestive tracts alive (Lee and Timmons 1980) or in mud adhering to feet of animals (Cooke 2001 cited in Pratt, 2002) and be spread through their movement. Because dodder seeds are usually dispersed near parent plants so wind has little effect on their dispersal due to the seed weight and shape (Dawson *et al.* 1994).
The small-seeded dodder is expected to have a wide range of hosts, due to the adaptability of this genus (Pratt, 2002). Reported hosts of small-seeded dodder include citrus, grapes, faba beans, *Indigofera* spp., lucerne, *Melilotus* spp., clover, eggplant, tomato, capsicum, onion, *Barleria* spp., *Merremia* spp., cucumber, chrysanthemum and sugar beet and many other related species. Non-crop hosts include *Centaurea* spp., *Plectanthrus sp*., *Solanum spp*., *Rumex spp.* and *Senecio vulgaris* (Orloff *et al.* 1989, Sher and Shad 1989, Parker and Riches 1993, Zaki *et al.* 1998, Meeuse and Welman 2000, Cooke 2001 cited in Pratt, 2002). It has also been reported on canola and lupins in Australia (Pratt, 2002) and as a serious weed in alfalfa, safflower, melons, onions, carrots, berseem (*Trifolium alexandrinum*), ber tree (*Ziziphus mauritiana*) and sugar beets etc. in Pakistan (Iqbal *et al.,*

2014). Thus, it can potentially be problematic for agricultural crops in nearby infested areas.

Dodder species like *C. planiflora* that have a wide host range and invade native vegetation may significantly impact biodiversity in infested areas. For example, wild and domesticated honey bees are likely to suffer because of reduction of appropriate flowering plants. High infestation of dodder can also be a hindrance to wildlife movement (Pratt, 2002) in natural vegetation. Parasites like dodder usually weaken the host and may cause its death before reproduction. Therefore, the number of host plants are reduced over time and they could be replaced by not-host plants. This will have consequences for balance of wild life and food chains.

In conclusion, the infestation of *C. planiflora* will probably advance into more areas due to its adaptability, high potential of seed production, long survival of seeds, presence of seed dispersal vectors, and lack of control measure. The profitability of infested pastures will be reduced due to reduction of broadleaf and favorite plants for grazing animals. The biodiversity of wild life will also be affected as a consequence of dodder invasion. Due to difficulties with control of parasitic weeds in natural landscape (i.e. accessibility, costs and restriction of using herbicides), appropriate control measures e.g. biological option, need to be evaluated and adapted.

Acknowledgment:
I acknowledge the help of Prof. Lytton John Musselman in identifying the *Cuscuta* species.

References:
Cooke, D. 2001. Personal communication with David Cooke, Senior Botanist with PIRSA. Department of Primary Industries and Resources, South Australia. In Pratt, 2002.
Dawson, J.H., Musselman, L.J., Wolswinkel, P. and Dörr, I. 1994. Biology and control of *Cuscuta*. Reviews of Weed Science 6: 265-317.
Iqbal M F, Hussain M, Abid A H, Ali M A, Nawaz R, Qadir W M, Asghar M and Iqbal Z 2014 A review: Cuscuta *(Cuscuta planifora)* major weed threat in Punjab-Pakistan. International Journal of Advanced Research in Biological Sciences.; 1(4): 42-46.
Lee, W.O. and Timmons, F.L. 1980. Dodder and its control. Farmers' Bulletin No. 2117 United States Department of Agriculture, Washington.
Meeuse, A.D.J. and Welman, W.G. 2000. Flora of South Africa Volume 28, Part 1: Convolvulaceae. National Botanical Institute, Pretoria.
Orloff, S.B., Vargas, R.N., Cudney, D.W., Canevari, W.M. and Schmierer, J. 1989. Dodder control in alfalfa. California Agriculture 43(4): 30-32.
Parker, C. and Riches, C.R. 1993. Parasitic weeds of the world biology and control. CAB International, Wallingford, UK.
Pratt R A. 2002. Small-seeded dodder (*Cuscuta planiflora* Ten.), a new weed threat to Australian agriculture. Proceeding of 13th Australian Weeds Conference. Weeds: Threats Now and Forever? Sheraton Perth Hotel, Perth, Western Australia. 8-13 September, pp. 276-279.
Sher, M.A. and Shad, R.A. 1989. Distribution, hosts and measures to control dodder. Progressive Farming (9)6:17-20.
Zaki, M.A., El-Metwaly, H.S. and Hassan, R.A. 1998. Studies on dodder (*Cuscuta* spp.) control. Proceedings of the 6th Mediterranean Symposium EWRS, pp. 147-151.

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LITERATURE HIGHLIGHTS

The haustorium, a specialized invasive organ in parasitic plants. 2016, by Yoshida, S., Cui, S. Ichihashi, Y. and Shirasu, K. . Annual Review of Plant Biology 67: 643-667.

Many years ago when there were steam engines and rational political discourse, I launched my botanical career with a study of the structure and development of haustoria. So I was particularly interested in this recent review which makes it very clear that we have made epochal progress in understanding this most fascinating and specialized organ, the very essence of parasitism in plants.

After a concise and helpful introduction to the haustorium and its distribution in families of modern angiosperm (but only eudicot) phylogeny, the authors describe the anatomy of the haustorium including helpful, clear micrographs. The emphasis here, as in the rest of the paper, is on the genus *Cuscuta* (Convolvulaceae) and the Orobanchaceae, including both holo- and hemi-parasites of the latter. There is a helpful review of development of the parasitic organ including haustorial inducing factors. This is followed by a section on functions, including host invasion, host immunity avoidance, and nutrient transfer.

One of the most helpful components of this review is the treatment of transfer of genetic material, via mRNA exchanges. Years ago, a researcher who had sequenced the DNA of a parasite expressed amazement to me that there was DNA from another plant in the parasite—inexplicable at the time. Horizontal gene transfer is more common in parasitic plants than in other angiosperms. In fact, horizontal gene transfer—in both directions, host to parasite and parasite to host—has been recorded in 10 of 12 parasite lineages. (see separate Literature Highlight on this topic below)
This leads to the final section, dealing with the evolution of the haustorium. Haustoria share many structural and functional features, a remarkable example of homoplasy. Like earlier workers, the authors note that the function of a lateral root—traversing endodermis, cortex, and epidermis—is similar to a haustorium.

In this paper, as in other reviews, the presence of a storied cambium present in all haustoria from diverse lineages is not mentioned. And why are there no known monocot parasites? Is it related to the lack of a storied cambium?

This paper provides an excellent review of haustoria. Although, as noted, it is restricted largely to two taxa, it is suitable for use in plant physiology, plant pathology, and other courses.

Lytton Musselman

***Striga* demise with toothpicks.** Nzioki, *et al.,* 2016. *Striga* biocontrol on a toothpick: a readily deployable and inexpensive method for smallholder farmers. Frontiers in Plant Science (https://doi.org/10.3389/fpls.2016.01121)

Significant advances in the use of *Fusarium oxysporum* isolates for *Striga hermonthica* biocontrol have occurred since their isolation and collection from several regions in Africa (Ciotola *et al.* 1995; Kroschel *et al.* 1996; Marley *et al.* 1999). Results from various field trials (Ciotola *et al.* 2000; Marley and Shebayan 2005; Venne *et al.* 2009; Watson 2013) were often very encouraging, but successful control of *S. hermonthica* has been difficult to achieve.

Control was tried using different formulations (seed coating and pesta granules) and different isolates of *F. oxysporum f. sp. strigae* [M12-4A (origin Mali), PSM197 (origin Nigeria) and Foxy 2 (Ghana)] on *Striga*-resistant and *Striga*-susceptible varieties of sorghum and maize in Benin and Burkina Faso (Venne *et al.* 2009). Isolates Foxy 2 and PSM197 were more effective than M12-4A and pesta granules performed better than the seed coat formulation. When combined with a *Striga*-resistant maize line, *F. oxysporum* f. sp. *strigae* reduced *Striga* emergence over 90%. However, when used in Kenya, Foxy 2 did not perform well indicating the need to collect region-specific isolates adapted to local conditions for successful *Striga* control (Avedia *et al.* 2014).

Local production of *F. oxysporum* M12-4A was investigated with subsistence farmer families in four villages in Mali to evaluate as a cottage industry model for biological control of *S. hermonthica* (Bastiani 2001). Dried chlamydospores, produced off-location (Ciotola *et al.* 2000) and stored in small gelatin pill capsules were distributed to farmers for on-farm production of inoculum using locally available tools. Farmer-prepared chopped sorghum straw suspension was cooked in village kettles and when cooled the farmer added the chlamydospore powder from the capsule. After 10 days, the colonized straw was dried and ground into a powder combined with Arabic gum and used to coat farm-saved sorghum seeds (Bastiani 2001). Results were variable and limited due to contamination in production kettles.

A recent intriguing paper by Nzioki *et al.* (2016) '*Striga* biocontrol on a toothpick: a readily deployable and inexpensive method for smallholder farmers' significantly advances the use of *Fusarium* for biocontrol of *Striga*. Potential contamination of small-holder-farm-production of biocontrol inoculum has been greatly reduced by off-farm laboratory production of the starter culture (the primary inoculum) and the provision of plastic containers with lids to produce secondary inoculum on rice for field application. Results of the 500-farmer field trials are impressive indeed and credited to the training of the smallholder farmers by an NGO network to produce the biocontrol inoculum, apply the product in their maize fields and collect agronomic data. This paper supports the feasibility of on farm cottage industry production of a biocontrol agent but will require significant resources to be sustainable.

References:

Avedia, E.K., Ochienoa, D.W., Ajangac, S., Wanyamad, C., Wainwright, D., Abuelgasim, E. and Beed, F. 2014. *Fusarium oxysporum* f. sp. *strigae* strain Foxy 2 did not achieve biological control of *Striga hermonthica* parasitizing maize in Western Kenya. Biological Control 77: 7–14.

Bastiani, C. 2001. Seed coating with *Fusarium oxysporum* M12-4A for the biocontrol of *Striga hermonthica* Del. Benth. MSc thesis, McGill University Montreal.84 pp. (http://digitool.Library.McGill.CA:80/R/-?func=dbin-jump-full&object_id=32755&silo_library=GEN01)

Ciotola, M., Ditommaso, A., and Watson, A.K. 2000. Chlamydospore production, inoculation methods and pathogenicity of *Fusarium oxysporum* M12-4A, a biocontrol for *Striga hermonthica*. Biocontrol Science and Technology 10: 129–145. (doi: 10.1080/09583150029279)

Ciotola, M., Watson, A.K., and Hallet, S.G. 1995. Discovery of an isolate of *Fusarium oxysporum* with potential to control *Striga hermonthica* in West Africa. Weed Research 35: 303–307. (doi: 10.1111/j.1365-3180.1995.tb01793.x)

Kroschel, J., Hundt, A., Abbasher, A.A. and Sauerborm, J. 1996. Pathogenicity of fungi collected in northern Ghana to *Striga hermonthica*. Weed Research 36: 515-520.

Marley, P.S., Ahmed, S.M., Shebayan, J.A.Y., and Lagoke, S.T.O. 1999. Isolation of *Fusarium oxysporum* with potential for biocontrol of the witch weed (*Striga hermonthica*).in the Nigerian savanna. Biocontrol Science and Technolology 9: 159–163. (doi: 10.1080/09583159929749)

Marley, P.S. and Shebayan, J.A.Y. 2005 Field assessment of *Fusarium oxysporum* based mycoherbicide for control of *Striga hermonthica* in Nigeria. Biocontrol 50: 389. (doi:10.1007/s10526-004-0461-9)

Nzioki, H.S., Oyosi, F., Morris, C.E., Kaya, E., Pilgeram, A.L., Baker, C.S. and Sands, D.C. 2016. *Striga* biocontrol on a toothpick: a readily deployable and inexpensive method for smallholder farmers. Frontiers in Plant Science (https://doi.org/10.3389/fpls.2016.01121)

Venne, J., Beed, F., Avocanh, A. and Watson A. 2009. Integrating *Fusarium oxysporum* f. sp. *strigae* into cereal cropping systems in Africa. Pest ManagementScience 65(5): 572-80. (doi: 10.1002/ps.1741)

Watson, A.K. 2013. 'Biocontrol,' in Parasitic Orobanchaceae, Parasitic Mechanisms and Control Strategies. Joel, D.M., Gressel, J,and Musselman, L.J. (eds); Heidelberg, Germany: Springer, 469–497. (doi: 10.1007/978-3-642-38146-1_26)

Alan Watson, McGill University.

Literature Highlight: more horizontal gene transfer associated with parasitism

Parasitic plants lead the plant kingdom in horizontal gene transfer (HGT) events, exhibiting more HGT cases than fully autotrophic plants. The reason proposed to explain this has been that the physical connection between parasites and their hosts facilitates asexual transfer of genes between species. A recent paper supports this idea and establishes a strong correlation between HGT and host dependency. Yang *et al.* studied transcriptomic and genomic sequences from Orobanchaceae parasites ranging from the facultative *Triphysaria versicolor* to the obligate holoparasite *Phelipanche aegyptiaca* and identified a total of 52 instances of HGT. Most of these cases involved *Phelipanche* and *Orobanche*, fewer were associated with *Striga*, and *Triphysaria* had the fewest (just slightly more than the single HGT event detected in the non-parasitic relative, *Lindenbergia philippensis*). These findings highlight the importance of host dependency in HGT, although it is less clear which aspects of parasite biology are important. Haustorial anatomy and phloem connections may be involved, but the proximity of germline cells to the haustoria may be crucial for integration of transferred DNA. For *Phelipanche*, *Orobanche* and *Striga*, the location of the seedling shoot apex near the haustoria may increase chances of host gene integration as compared to plants like *Triphysaria* in which the haustoria form at a greater distant from shoot meristems.

The discovery of dozens of new horizontally acquired genes presents an abundance of material to consider with respect to the potential functions of HGTs in the recipient species (e.g. Yang *et al.* found a number of HGTs with defense-related annotations). Among the intriguing finds are transposon genes, including a couple of *hAT* transposons that were described in a publication by Sun *et al.* just a few months earlier. HGT of transposons could impact parasite evolution due to their role in genome expansion as well as their ability to alter expression of neighboring genes. Taken together, these two papers present evidence that horizontally acquired genes function in parasite species. A large proportion of the HGT events show greatest expression in haustorial stages, suggesting that acquired genes contribute to plant parasitic capabilities.

The specific mechanisms enabling HGT in plants remain unresolved, but both the Yang *et al.* and Sun *et al.* papers provide strong evidence that DNA is transferred between species, rather than HGT proceeding through an RNA intermediate. Although questions still surround the evolutionary role, function, and mechanisms of HGT, these papers make it clear that parasitic plants will continue to be among the most valuable systems for elucidating answers.

Sun, T., Renner, S.S., Xu, Y.X., Qin, Y., Wu, J.Q. and Sun, G.L. 2016. Two hAT transposon genes were transferred from Brassicaceae to broomrapes and are actively expressed in some recipients. Science Reports 6: 12.

Yang, Z.Z., Zhang, Y.T., Wafula, E.K., Honaas, L.A., Ralph, P.E., Jones, S., Clarke, C.R., Liu, S.M., Su, C.H., Zhang, T., Altman, N.S., Schuster, S.C., Timko, M.P., Yoder, J.I., Westwood J.H. and dePamphilis, C.W. 2016. Horizontal gene transfer is more frequent with increased heterotrophy and contributes to parasite adaptation. PNAS 113(45): E7010-E7019.

Jim Westwood.

PRESS REPORTS

Herbicide gun gives mistletoe the kiss-off

While most of us may just associate mistletoe with Christmas parties, the fact is that it can be a nuisance in the wild. It's a parasitic plant (a group of plants, actually) that grows in trees or shrubs, penetrating their branches to absorb water and nutrients. In sufficient numbers, mistletoe plants can actually kill their host. That's why scientists are taking the offensive, with a system that shoots herbicide up into trees' high branches.

A prototype of the mistletoe-killing gun.

The setup was developed by a team from Mexico's INECOL institute led by researcher Mayra del Ángel, and working with colleagues at the Advanced Technology Center in Queretaro (CIATEQ).

It consists of a paintball-like gun, along with capsules containing a bio-herbicide that kills mistletoe while not harming the host plant. Using compressed air, the gun can shoot those capsules to a height of up to 25 m (82 ft), allowing them to hit mistletoe clusters that would otherwise be difficult to reach. Each capsule has two layers, made up of a blend of three biodegradable polymers. This formulation allows it to remain intact even upon rapid acceleration (such as when it's being shot out of the gun), yet still split open upon contact with its leafy target.

In field tests, the technology has been found to be effective at eradicating mistletoe infestations. According to Ángel, the capsules could also be adapted to deliver substances such as fertilizer or insecticide.

Ben Coxworth, August 11, 2016

Boise National Forest Seeks Public Comment on Bogus Basin Forest Health Project.

Further to this story from the last issue, a new press report at http://www.idahostatesman.com/outdoors/playing-outdoors/article98909682.html includes a dramatic video emphasising the devastating effects of the combination of dwarf mistletoe, *Arceuthobium douglasii* and bark beetles on Douglas fir in the Bogus Basin Forest. Infection rates vary from 50-98%.

Mistletoe and other plant parasites for the garden

Mistletoe isn't the only plant parasite you can grow in your garden: these vampires of the plant world come in all colours and sizes.

Mistletoe brings green life to the bare trees of winter and is a symbol of fertility and renewal in the darkest days of the year. Mistletoe gains part of the nutrition it needs through stealing nutrients and water from its host plant. In the case of the European Mistletoe (*Viscum album*), apple, hawthorn and poplar trees are the preferred hosts, but it is known to grow on many other species too. It gains the nutrients and water it needs by both photosynthesising and by sending specialised roots called haustoria deep into its host tree's vascular tissue.

Mistletoe being collected from trees near Tenbury Wells in Worcestershire. Photo: Alamy

In the garden, mistletoe is not the easiest plant to establish, but if you follow certain rules you may be able to get some going on an apple tree or hawthorn.

- The seed must be fresh, as it has a short viability period (about four weeks).
- Once rubbed onto the bark of a tree it needs to be protected from the hungry beaks of birds such as blue tits and great tits. You can do this by making a small cage of chicken wire around the area with the seeds.
- It can take anything up to four years for the seedlings appear.

It needs to be sown on the younger branches of a healthy tree as here its root can penetrate the bark more easily.

With more than 4000 known parasitic species of plants, mistletoe is certainly not the only parasite worth trying in your garden, and some are easier to grow. In particular, there is an amazing family of plants called the Orobanchaceae that contains more than 90 different genera (only three of which are not parasitic). Some of them make excellent garden plants if you can provide the right conditions and hosts to allow them to establish themselves.

A mat of purple toothwort flowering at the base of a tree is a sight to behold. Photo: Chris Thorogood

Yellow rattles (*Rhinanthus* spp.), eyebrights (*Euphrasia* spp.) and Indian paintbrushes (*Castilleja* spp.) are all hemiparasitic (like mistletoe), but they attach themselves to the roots of grasses, not trees They are important in helping to create those longed-for wildflower rich meadow landscapes that have become so popular in gardens. By weakening the grasses on which they live, they allow other flowering plants a chance among the sward, while adding their brightly coloured flowers to the overall tapestry of the meadow. Louseworts (*Pedicularis* spp.) are also worth trying to find, although only a few have ever been offered by UK nurseries. With well over 300 species to choose from, they are an incredible and rewarding genus to try to grow. I first encountered *Pedicularis sylvatica* as a child on the upland moors of Wales and it has remained one of my favourite UK native species ever since.

A seemingly much more sinister group of plants, the holoparasites, get all their nutrition from their host plant, producing no chlorophyll themselves. Sometimes they can even live out their entire life inside their host, only showing themselves when they flower.

Ivy broomrape is one of the most seductive of the plant parasites. Photo: Chris Thorogood.

Purple toothwort (*Lathraea clandestina*), also in the Orobanchaceae, prefers to attach itself to the roots of willow and alder but will grow happily on a range of hosts. It can take 10 years to flower if grown from seed but can also be introduced to a garden by being transplanted if you are quick about it. To see a mat of this plant in full flower at the base of a tree is quite a sight to behold. But true broomrapes (*Orobanche* and *Cistanche* spp.) are in my opinion the most seductive of these vampires of the plant world. Looking like tatty orchids, they come in the most unusual range of colours from bright yellow through to muted burned tones and the most crystal clear of whites. As they lack leaves, they seem to stand out in a way that few other plants do in a garden. Some, like the ivy broomrape (*Orobanche hederae*), are little trouble to grow, **but be careful with others, as some species can be problematic for agricultural crops and while not killing their host (as this would kill themselves) they can cause severe reduction in crop productivity.** It is with this warning that I leave you to mull over growing some of these most unusual of plants, whose lives are so attached to the lives of others, and to think about the mistletoe above your heads and the incredible feat of evolution that allows some plants this strange strategy for survival.

Robbie Blackhall-Miles, The Guardian, 14 December 2016.

Parasitic vine in trees threatens Gurgaon's green cover

Trees in the city of Gurgaon, Harayana State in India, are being threatened by 'amar bel' (*Cuscuta*) (**NB – or could it be *Cassytha filiformis*? – Ed.) -** a parasitic vine that is spreading to several trees, predominantly along the road from Huda Metro station to Sushant Lok. This creeper grows on the host plant and draws nutrition, causing the death of the host. Environmentalists have raised concerns over the issue and alleged that the Haryana Urban Development Authority (Huda) officials are yet to act on it. Environmentalists said that the yellow vine, which does not have roots, captures the host completely, rendering it incapable of processing sunlight for photosynthesis, leading to its death.

The creeper, 'amar bel', on a tree in Gurgaon. Photo: Parveen Kumar.

The city is already reeling under low forest cover, which is less than 1% of the urban area. Also, trees are being cut for large-scale infrastructure projects. In this scenario, it becomes imperative that the creeper, which can reduce the green cover further, be eradicated. 'Although Huda officials are aware of the destruction that is being caused by Amar Bel, no action has been taken to remove the creeper,' Devjani Roy of Sushant Lok phase 1 said. She also said that when she approached Huda officials regarding the issue, she was informed that the department did not have labour and ladder to remove the creeper from the trees. 'Officials do not have any intention of removing these creepers,' she said.

Vivek Kamboj, an environmentalist, said, 'This is a major concern as this part of the country does not have enough green cover and the growth of trees is also not very fast because of less rainfall and bad soil quality.' Meanwhile, Huda officials said that they are working on a plan to remove the parasitic vine from the trees. 'We are developing a plan to figure out the areas in which trees are being affected. We might use pesticides to remove this creeper from the entire city. At present, the creeper is threatening ageold trees in the city. We will take action within the month,' VK Nirala, executive engineer, horticulture wing, Huda, said.

Ipsita Pati. Hindustan Times, Dec 22, 2016

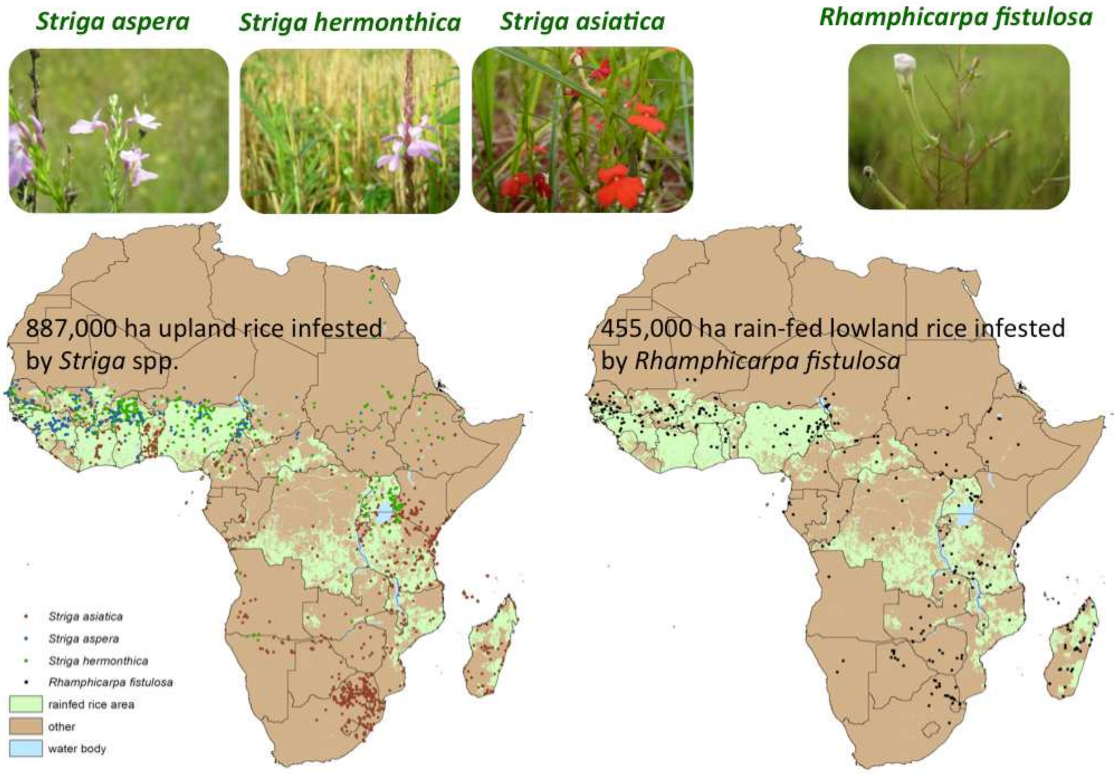
THE *PARASITE* PROJECT - INTEGRATED RESEARCH ON PARASITIC WEEDS IN RICE

PARASITE (Preparing African Rice Farmers Against Parasitic Weeds in a Changing Environment) is a research project focusing on parasitic weeds - *Rhamphicarpa fistulosa*, *Striga asiatica*, *S. aspera* and *S. hermonthica* - in rain-fed rice. It is a collaboration between Wageningen University, Africa Rice Center and National Agricultural Research and Extension Systems (NARES) from Benin, Côte d'Ivoire and Tanzania that started in December 2010. Because of interactions and interdependencies among factors, stakeholders and processes at the plant, crop, household, village and country level the leading hypothesis for this project was that only with an integrated, trans-disciplinary approach could effective and durable solutions to parasitic weed problems be explored. The project is approaching its end and can boast significant advances with respect to insights and understanding of the problem and identified leads to solutions.

Research focused on revealing the biology and ecology of the poorly studied weed *R. fistulosa*. A study revealed that *R. fistulosa* and *S. asiatica*, while appearing in nearby fields, hardly overlap and that soil moisture plays a crucial role in defining their ecological niche (Kabiri *et al*., 2015). These two parasitic weeds also differ in terms of seed biology. In contrast with the obligate parasites of the *Striga* genus, host plant root exudates do not have an influence on seed germination of the facultative parasite *R. fistulosa* (Kabiri *et al*., 2016). The facultative nature of *R. fistulosa* renders rotation with incompatible hosts, or fallow, ineffective. Furthermore, resistance to *R. fistulosa* cannot be based on low stimulant exudation. Experiments showed that low infestations cause major losses in rice grain yield. Part of the loss can be attributed to an inhibitory effect on host plant photosynthesis. The average *R. fistulosa*-inflicted relative grain yield loss in the field was 50%, but ranged from a loss of 24% to 73% for the worst performing rice variety (Rodenburg *et al*., 2016a).

A herbarium study of specimens in public herbaria in Africa and abroad was conducted to find locations of the four main species of parasitic weed in rain-fed rice systems (Rodenburg *et al*., 2016b). These locations were compared to rain-fed rice area coordinates from which overlap estimates were calculated. This information, together with data on agronomic losses, control efficacies and rice prices was input for a stochastic model used to generate estimates of economic losses caused by parasitic weeds in rice. We found that together they invade 1.34 million ha of rain-fed rice in Africa affecting an estimated 950,000 rural households. Continent-wide production losses were estimated at 497 million kg per year, comparable to 15 million rice meals a day, valued at US$200 million.

Large-scale farmer and field surveys were held in Benin, Tanzania and Côte d'Ivoire (664 farmers) to compare the impact of parasitic weeds on rice production, farmers' decisions and management abilities. The results showed that *R. fistulosa* affected 72% of the surveyed rice plots at an average infestation of 109 plants per m^2 (N'cho *et al*., 2014). The likelihood and the severity of infestation were found to be negatively correlated, suggesting that farmers who encountered the parasites more frequently, were better prepared for taking actions. Hand weeding was the most frequently used (87%) weed management practice followed by hoe weeding (62%), fertilizer use (55%), and herbicide use (53%). In Côte d'Ivoire and Benin parasitic-weed-induced productivity losses ranged from 21% to 50%. A lower weeding labour inefficiency was associated with larger farms, crops with a single, early weeding strategy and farmers with a higher education level. There was no evidence that farmers can manage the parasitic weed problem efficiently with the currently used manual weeding regimes.



Estimated annual economic losses caused by parasitic weeds in rice: US $200 million

For effective, locally accessible and socially and economically acceptable parasitic weed management strategies for rice farmers a stepwise approach was followed. In three affected rice growing areas in Tanzania surveys and workshops were organized (in total around 120 farmers). In one of these hotspots, Kyela, about 60 supplementary researcher-managed and then 40 farmer-managed participatory on-farm experiments were conducted. Farmers' current control strategy is mostly limited to hand weeding, but farmers were aware of a wider range of control options. Based on informal farmer discussions, sowing time, rice variety and soil amendment were marked as feasible control options and tested in a farmer-participatory manner in four years of experimentation in upland (*S. asiatica* infested) and lowland (*R. fistulosa*-infested) rice. Application of locally accessible rice husks was appreciated by farmers as a suitable and cheap alternative to expensive inorganic fertilizers. Farmers also noticed that the control of *R. fistulosa* in lowlands was best realized by planting earlier while for *S. asiatica*, late planting was preferred. Late planting in turn was enabled by the much-appreciated resistant and short-duration NERICA-10.

Several workshops were held with stakeholders in Tanzania and Benin to identify barriers in the crop protection system to deal with parasitic weeds and to find entry points for innovation (Schut *et al*., 2015a,b,c). These activities led to a better understanding among stakeholders that solutions to parasitic weed problems require innovations not only at the farm level but also addressing systemic problems at higher levels. It was noted that plant health services were mostly reactive rather than preventive. Also, most attention was devoted to dealing with pest outbreaks such as armyworms, quelea quelea, locusts and rodents and not with parasitic weeds that take time to spread (Schut *et al*., 2015c). This also explains the long time it usually takes between the identification of an outbreak of parasitic weeds and actions to control it. There was no direct linkage and structural collaboration between various agencies (plant health services, research, local government/extension). Another major challenge was insufficient capabilities and resources to support operations of the plant health services and extension (Schut *et al*., 2015a). The participatory workshops involving stakeholders from government agencies, the private sector (including farmers) and NGOs resulted in the identification of several entry points for innovation; (i) Increased awareness of parasitic weeds (ii) Co-developing parasitic weed management strategies (iii) Collaboration and interaction across levels (iv) Policy coherence and allocation of resources.

PARASITE publications:

Jordan, N., Schut and 22 others. 2016. Transdisciplinary weed research: new leverage on challenging weed problems? Weed Research 56, 345-358.

Kabiri S, Rodenburg J, Kayeke J, Ast A van, Makokha DW, Msangi SH, Irakiza R and Bastiaans, L., 2015. Can the parasitic weeds *Striga asiatica* and *Rhamphicarpa fistulosa* co-occur in rain-fed rice? Weed Research, 55: 145-154.

Kabiri, S., van Ast, A., Rodenburg, J. and Bastiaans, L., 2016. Host influence on germination and reproduction of the facultative hemi-parasitic weed *Rhamphicarpa fistulosa.* Annals of Applied Biology, 169: 144-154Rodenburg, J., Demont, M., Zwart, S.J. & Bastiaans, L., 2016b. Parasite weed incidence and related economic losses in rice in Africa. Agriculture, Ecosystems and Environment, 235, 306-317.

N'cho, S., Mourits, M., Rodenburg,J., Demont, M. and Oude Lansink, A. 2014. Determinants of parasitic weed infestation in rainfed lowland rice in Benin. Agricultural Systems, 105-115.

Rodenburg, J. and Bastiaans, L. 2011. Host-plant defence against *Striga* spp.: reconsidering the role of tolerance. Weed Research 51, 438-441.

Rodenburg, J., Cissoko, M., Dieng, I., Kayeke, J. and Bastiaans, L., 2016a Rice yields under *Rhamphicarpa fistulosa*-infested conditions, and variety selection criteria for resistance and tolerance. Field Crops Research, 194: 21-30.

Rodenburg, J., Meinke, H. and Johnson, D.E. 2011. Challenges for weed management in African rice systems in a changing climate. Journal of Agricultural Science 149, 427–435.

Rodenburg, J., Riches, C.R. and Kayeke, J.M. 2010. Addressing current and future problems of parasitic weeds in rice. Crop Protection 29, 210-221.

Rodenburg, J., Schut, M., Demont, M., Klerkx, L., Gbehounou, G., Lansink, A.O., Mourits, M., Rotteveel, T., Kayeke, J., van Ast, A., Akanvou, L., Cissoko, M., Kamanda, J. and Bastiaans, L., 2015. Systems approaches to innovation in pest management: reflections and lessons learned from an integrated research program on parasitic weeds in rice. International Journal of Pest Management, 61: 329-339.

Rodenburg, J., Morawetz, J.J. and Bastiaans, L. 2015 *Rhamphicarpa fistulosa* (Hochst.) Benth. – A widespread facultative hemi-parasitic weed, threatening rice production in Africa. Weed Research, 55: 118-131.

Rodenburg, J., Zossou, N., Gbehounou, G., Ahanchede, A., Touré, A., Kyalo, G. and Kiepe, P. 2011. *Rhamphicarpa fistulosa*, a parasitic weed threatening rain-fed lowland rice production in sub-Saharan Africa - A case study from Benin. Crop Protection 30, 1306-1314.

Schut, M., Klerkx, L., Rodenburg, J., Kayeke, J., Raboanarielina, C., Hinnou, L.C., Adegbola, P.Y., van Ast, A. and Bastiaans, L., 2015b. RAAIS: Rapid Appraisal of Agricultural Innovation Systems (Part I). A diagnostic tool for integrated analysis of complex problems and innovation capacity. Agricultural Systems 132: 1-11.

Schut, M., Rodenburg, J., Klerkx, L., Hinnou, L.C., Kayeke, J.M. & Bastiaans, L., 2015a. Participatory appraisal of institutional and political constraints and opportunities for innovation to address parasitic weeds in rice. Crop Protection, 74: 158-170.

Schut, M., Rodenburg, J., Klerkx, L., Kayeke, J., van Ast, A, and Bastiaans, L., 2015c. RAAIS: Rapid Appraisal of Agricultural Innovation Systems (Part II). Integrated analysis of parasitic weed problems in rice in Tanzania. Agricultural Systems 132: 12-24.

Schut, M., Rodenburg, J., Klerkx, L., van Ast, A. and Bastiaans, L. 2014. Systems approaches to innovation in crop protection. Crop Protection 56, 98-108.

Schut, M., van Paassen, A., Leeuwis, C. and Klerkx, L., 2013. Towards dynamic research configurations. A framework for reflection on the contribution of research to policy and innovation processes. Science and Public Policy 40, 207-218.

Jonne Rodenburg and Lammert Baastians.

INDEX OF OROBANCHACEAE

Our publicly accessible website on Orobanchaceae s. str. is a collection of web pages, all of them completely interrelated, continuously updated, and freely accessible to all researchers. The main body of the website is the **Index of Orobanchaceae**. On this web page, the result of many years of work by our research group, we offer a list with the correct (in the authors' opinion) nomenclatural information for all species treated. In addition, we offer an **Annotated Checklist of Host Plants of Orobanchaceae**, a web page providing a list of host plants in order to facilitate the identification of different Orobanchaceae species. All taxa on this list have been previously confirmed by our group, avoiding many of those mentioned in the literature which have not been confirmed or which seem to us wrong and may only lead to confusion. Most of the species treated are included in a **Card Index** in which we list each species according to its accepted name, basionym, synonyms, type locality, type, details of designation, host, comments, chromosomatic number, images, distribution, examined specimens, and records and references from the literature. We also include a web page, **Images of Orobanchaceae**, with numerous photographs and drawings in which site users can observe the variability of this family. Finally, we offer a list of References (Index of Orobanchaceae) used in our work, including, whenever possible, links to the original works.

The information is available in:

Sánchez Pedraja, Ó., Moreno Moral, G., Carlón, L., Piwowarczyk, R., Laínz, M. and Schneeweiss, G.M. 2016. (continuously updated). Index of Orobanchaceae. Liérganes, Cantabria, Spain. ISSN: 2386-9666.

Carlón, L., Gómez Casares, G., Laínz, M., Moreno Moral, G., Sánchez Pedraja, Ó. and Schneeweiss, G.M. 2005-2016. Index of Orobanchaceae. Liérganes, Cantabria, Spain. ISSN: 2386-9666 (authors in alphabetical order until 2016). http://www.farmaliergane s.com/Otrospdf/publica/Orobanchaceae%20Index.htm

Sánchez Pedraja, Ó., Moreno Moral, G., Carlón, L., Piwowarczyk, R., Laínz, M. and Schneeweiss, G.M. 2016. (continuously updated). Annotated Checklist of Host Plants of Orobanchaceae (Index of Orobanchaceae). Liérganes, Cantabria, Spain. ISSN: 2386-9666. http://www.farmaliergan es.com/Flora/Angiospermae/Orobanchaceae/Host_Orobanchaceae_Checklist.htm

Óscar Sánchez-Pedraja

BIODIVERSITY HERITAGE LIBRARY – AN INTERESTING RESOURCE

This site lists thousands of out-of print publications from 1450 onwards, which have been scanned and made available on line at http://biodiversitylibrary.org/browse/year#/titles , free of charge. It can be searched by date, author or subject and includes e.g. Beck-Mannagetta's monograph on *Orobanche*. There are a number of publications by Yuncker but sadly not his monograph on *Cuscuta*.

HAUSTORIUM COMPOSITE FILES

– a reminder and an apology. All past issues of Haustorium should be available in two pdf files (issues 1-48, and issues 49-70), allowing easy searching for authors, species, etc. These are available on the IPPS website. Apologies that the second file had not been updated recently, but you should find it complete now, or very shortly.

FORTHCOMING MEETINGS

2ND International Congress 'STRIGOLACTONES', Cavallerizza Reale, Turin, Italy, March 27-30, 2017. Abstract submission date now 27th January, 2017. For further information see: www.strigolactones2017.it

14th IPPS World Congress on Parasitic Plants. Asilomar Conference Grounds in Pacific Grove California, USA, June 25-30, 2017. Details available via the Congress website - www.WCPP14.org

2nd Agriculture and Climate Change Conference, Sitges, Spain, 26-28 March, 2017. https://mail.aol.com/webmail-std/en-us/PrintMessage

6e COMAPPI Conference sur les Moyens Alternatifs de Protection pour une Production Intégrée, Lille, France,21-23 March, 2017. For more information see www.afpp.net

11th International Conference on Pests in Agriculture, Montpellier, France, 25-26 October, 2017. For more information see: www.afpp.net

Chemical Ecology: new contributions to plant protection against pests. Montpellier, France, 24 October, 2017. For more information see www.afpp.net

GENERAL WEB SITES

For individual web-site papers and reports see LITERATURE

* these websites may need copy and paste.

For information on the International Parasitic Plant Society, past issues of Haustorium, etc. see: http://www.parasiticplants.org/

For past and current issues of Haustorium see also: http://www.odu.edu/~lmusselm/haustorium/index.shtmlFor the ODU parasitic plant site see: http://www.odu.edu/~lmusselm/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://ppgp.huck.psu.edu/ *

For information on the new Frontiers Journal 'Advances in Parasitic Weed Research' see: http://journal.frontiersin.org/researchtopic/3938/advances-in-parasitic-weed-research

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 2nd International Congress on Strigolactones, Turin, 2017: see http://www.strigolactones2017.it/

*For PARASITE - Preparing African Rice Farmers Against Parasitic Weeds in a Changing Environment: see http://www.parasite-project.org/

For the Annotated Checklist of Host Plants of Orobanchaceae, see: http://www.farmalierganes.com/Flora/Angiospermae/Orobanchaceae/Host_Orobanchaceae_Checklist.htm

For information on the EWRS Working Group 'Parasitic weeds' see: http://www.ewrs.org/parasitic_weeds.asp

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

For information on the work of the African Agricultural Technology Foundation (AATF) on *Striga* control in Kenya, including periodical 'Strides in *Striga* Management' and 'Partnerships' newsletters, see: http://www.aatf-africa.org/

For Access Agriculture (click on cereals for videos on *Striga*) see: http://www.accessagriculture.org/ *

For information on future Mistel in derTumortherapie Symposia see: http://www.mistelsymposium.de/deutsch/-mistelsymposien.aspx

For a compilation from the Mistletoes: Pathogens, Keystone Resource, and Medicinal Wonder Meeting in Ashland, Oregon, July, 2016, see: https://storify.com/D0CT0R_Dave/mistletoe-conference

For a compilation of literature on *Viscum album* prepared by Institute Hiscia in Arlesheim, Switzerland, see: http://www.vfk.ch/informationen/literatursuche (in German but can be searched by inserting author name).

For the work of Forest Products Commission (FPC) on sandalwood, see: http://www.fpc.wa.gov.au/sandalwood

For 6th Mistletoe Symposium, Germany, November 2015 see: http://www.sciencedirect.com/science/journal/09447113/22/supp/S1

LITERATURE

***indicates web-site reference only**

Items in bold selected for special interest

Items in blue relate to therapeutic uses of parasitic plants

Alvim, R.G., Aguiar-Menezes, E.de L. and de Lima, A.F. 2016. Dissemination of *Aleurocanthus woglumi* in citrus plants, its natural enemies and new host plants in the state of Rio de Janeiro, Brazil. Ciência Rural 46(11): 1891-1897. [Recording the whitefly *A. woglumi* on *Struthanthus flexicaulis*.]

Amelework, B.A., Shimelis, H.A., Tongoona, P., Mengistu, F., Laing, M.D. and Ayele, D.G. 2016. Sorghum production systems and constraints, and coping strategies under drought-prone agro-ecologies of Ethiopia. South African Journal of Plant and Soil 33(3): 207-217. [Twelve sorghum-growing villages in the North Welo, South Welo and Waghemra districts were surveyed. *Striga hermonthica* among the constraints described, but drought at grain-filling stage the most important.]

Amini, M., Deljou, A. and Nabiabad, H.S. 2016. Improvement of in vitro embryo maturation, plantlet regeneration and transformation efficiency from alfalfa (*Medicago sativa* L.) somatic embryos using *Cuscuta campestris* extract. Physiology and Molecular Biology of Plants 22(3): 321-330. [The *C. campestris* extract improved the efficiency of plant regeneration and transformation of somatic embryos of *M..sativa* into plantlets from 26% to 52% Transformation efficiency was 29 and 15% for medium supplemented with dodder extract and without the extract, respectively. The antibacterial assay showed that the extract was effective against some strains of *A. tumefaciens*, suggesting using *C. campestris* extract as a good natural source of antimicrobial agents and plant growth regulator.

Badu-Apraku, B., Yallou, C.G., Alidu, H., Talabi, A.O., Akaogu, I.C., Annor, B. and Adeoti, A. 2016. Genetic improvement of extra-early maize cultivars for grain yield and *Striga* resistance during three breeding eras. Crop Science 56(5): 2564-2578. [Reviewing the progress made in breeding for high yielding and *Striga* resistant or tolerant extra-early maize cultivars during the last three decades, noting an average rate of increase in grain yield of 42 kg ha^{-1} yr^{-1} under *Striga*-infestation, corresponding to 2.5% annual genetic gain.]

Baltazár, T., Varga, I. and Pejchal, M. 2016. (Feasible methods for controlling European mistletoe (*Viscum album* L.).) (in Hungarian) Növényvédelem 52(7): 360-372. [Noting the impracticality of pruning and herbicides for control of *V. album*, but suggesting that fungal biocontrol by *Sphaeropsis visci*, (= *Phaeobotryosphaeria visci*) can be effective.]

Bayram, Y. and Çıkman, E. 2016. Efficiency of *Pytomyza orobanchia* Kaltenbach (Diptera: Agromyzidae) on *Orobanche crenata* Forsk. (Orobanchaceae) in lentil fields at Diyarbakır and Mardin Provinces, Turkey. Egyptian Journal of Biological Pest Control 26(2): 365-371. [A detailed study of the effectiveness of releasing different numbers of *P. orobanchia* pupae within small cages around *O. crenata* shoots.]

Boari, C., Ciasca, B., Pineda-Martos, R., Lattanzio, V.M.T. 2016. Parasitic weed management by using strigolactone-degrading fungi. Pest Management Science 72(11): 2043-2047. [Four fungal strains, *Fusarium oxysporum*, *F. solani* (biocontrol agents of *P. ramosa*), *Tricoderma hazianum* (potential biopesticide), and *Botrytis cinera* (phytopathogenic fungus) were examined for their degrading activity of four SLs, strigol, 5-deoxystrigol (5DS), and GR24. *T. harzianum* and *F. oxysporum* more rapidly degraded (or metabolized) strigolactones than did the other two fungi. Among the SLs examined, 5DS and 4DO proved to be the most degradable ones, suggesting that major metabolic reactions were not hydrolysis but probably hydroxylations on the AB rings.]

Bolin, J., Tennakoon, K.U., Majid, M.B.A. and Cameron, D.D 2016. Isotopic evidence of partial mycoheterotrophy in *Burmannia coelestis* (Burmanniaceae). Plant Species Biology (doi:10.1111/1442-1984.12116) [Five populations of the photosynthetic species *Burmannia coelestis* were studied to determine whether it is mycoheterotrophic. Stable isotope profiles of δ 13C showed enrichment relative to surrounding C3 plants but this was not the case for δ 15N. These results are suggestive of partial mycoheterotrophy.]

Boukar, O., Fatokun, C.A., Bao Lam Huynh, Roberts, P.A. and Close, T.J. 2016. Genomic tools in cowpea breeding programs: status and perspectives. Frontiers in Plant Science 7(June): 757. (http://journal.frontiersin.org/article/10.3389/fpls.2016.00757/full) [Reviewing the latest techniques in cowpea breeding at IITA, towards improved varieties including those resistant to *Striga gesnerioides* and *Alectra vogelii*.]

Briem, F., Eben, A., Gross, J. and Vogt, H. 2016. An invader supported by a parasite: mistletoe berries as food and reproduction host for *Drosophila suzukii* in early spring in Germany. Conference paper: Ecofruit. 17th International Conference on Organic Fruit-Growing: Proceedings, 15-17 February 2016, Hohenheim, Germany 2016: 279-281. [Recording development of the alien *D. suzukii* on berries of unspecified mistletoe (presumably *Viscum album*) in Germany.]

Cala, A. Ghooray, K., Fernández-Aparicio, M., Molinillo, J.M.G., Galindo, J.C.G., Rubiales, D and Macias, F.A. 2016. Phthalimide-derived strigolactone mimics as germinating agents for seeds of parasitic weeds: Pest Management Science 72(11): 2069-2081. [19 *N*-substituted phthalimides containing a butenolide ring and different substituents in the aromatic ring were synthesised and assayed against weeds *Orobanche minor*, *O. cumana*, *Phelipanche ramosa* and *P. aegyptiaca*. The phthalimides were about 1/1000–1/100 as active as GR24 on these parasite seeds. Seeds of *P. aegyptica* and *P. ramosa* responded to phthalimides carrying various substituents while only some of them were effective in eliciting *O. cumana* germination.]

Chen ZhiDuan and more than 25 others! 2016. Tree of life for the genera of Chinese vascular plants. Journal of Systematics and Evolution 54(4): 277-306. [DNA sequences of four chloroplast genes and one mitochondrial gene were used to produce a phylogenetic tree for 6098 Chinese vascular plant species. Overall relationships were generally congruent with previous comprehensive studies with the exception of a paraphyletic Santalaceae.]

Cui QingLing, Pan YingNi, Bai XueWei, Zhang Wei, Chen LiXia and Liu XiaoQiu. 2016. Systematic characterization of the metabolites of echinacoside and acteoside from *Cistanche tubulosa* in rat plasma, bile, urine and faeces based on UPLC-ESI-Q-TOF-MS. Biomedical Chromatography 30(9): 1406-1415.[Analysis of bile samples revealed 49 metabolites of echinacoside and acteoside from *C. tubulosa*.]

Darvishzadeh, R. 2016. Genetic variability, structure analysis, and association mapping of resistance to broomrape (*Orobanche aegyptiaca* Pers.) in tobacco. Journal of Agricultural Science and Technology 18(5): 1419-1429. [89 tobacco genotypes assessed for susceptibility to *O. aegyptiaca.* 'TB 22' and 'Kramograd NHH 659' appeared to be immune. Finger-printing of these identified 5 SSR loci from linkage groups 2, 10, 11 and 18 of tobacco reference map as DNA markers to be linked to gene(s) controlling broomrape resistance in tobacco.]

Day, M.D., Clements, D.R., Gile, C., Senaratne, W.K.A.D., Shen ShiCai, Weston, L.A. and Zhang FuDou. 2016. Biology and impacts of Pacific Islands invasive species. 13. *Mikania micrantha* Kunth (Asteraceae). Pacific Science 70(3): 257-285. [Including mention of the rather dubious use of *Cuscuta campestris* as a means of biological control of *M. micrantha*.]

De Groot, A.C. and Schmidt, E. (eds) 2016. Essential oils: contact allergy and chemical composition. London, UK: CRC Press Inc. pp. 1058. [Covering 91 essential oils and 2 absolutes, this book presents an alphabetical list of all 4350 ingredients that have been identified in them, a list of chemicals known to cause contact allergy and allergic contact dermatitis, and tabular indications of the ingredients that can be found in each essential oil. Including oils based on *Santalum* spp.]

Deepa, P. and Yusuf, A. 2016. Influence of different host associations on glutamine synthetase activity and ammonium transporter in *Santalum album* L. Physiology and Molecular Biology of Plants 22(3): 331-340. [Highest glutamione synthetase activity was expressed in a *Mimosa pudica* – *S. album* association compared to other leguminous and non-leguminous host associations. The association of N_2 fixing host with *S. album* enhanced C and N levels in order to maintain the C/N value. The relative increase in *Sa*AMT1;2 expressions and up-regulated glutamine synthetase activity positively affected the growth parameters in sandal when associated with leguminous hosts.]

Diptirani Rath, Kar, D.M., Panigrahi, S.K. and Laxmidhar Maharana. 2016. Antidiabetic effects of *Cuscuta reflexa* Roxb. in streptozotocin induced diabetic rats. Journal of Ethnopharmacology 192: 442-449. [Concluding that the methanolic extract of *C. reflexa* has significant antidiabetic effects and improves metabolic alterations thereby justifying its traditional folkloric claims.]

Dossou-Aminon, I., Dansi, A., Ahissou, H., Cissé, N., Vodouhè, R. and Sanni, A. 2016. Climate variability and status of the production and diversity of sorghum (*Sorghum bicolor* (L.) Moench) in the arid zone of northwest Benin. Genetic Resources and Crop Evolution 63(7): 1181-1201. [A useful analysis of factors affecting sorghum cultivation, noting *Striga hermontjhica* among the three most serious problems, along with climate change and soil fertilioty. Also commenting on serious genetic erosion as older varieties are being lost.]

Efimov, P.G., Konechnaya, G.Yu. and Sokolova, I.G. 2016. (On the maritime elements in the Pskov Region flora.) (in Russian) Botanicheskiĭ Zhurnal 101(6): 724-733. [Including the first record of *Orobanche cumana* in this area of NW Russia. Host not specified in the abstract.]

Einzmann, H.J.R., Döcke, L. and Zotz, G. 20167. Epiphytes in human settlements in rural Panama. Plant Ecology & Diversity 9(3): 277-287. [Cataloguing epiphytes on trees in 'settlements' including 3 mistletoes – many *Struthanthus orbicularis* and *Phoradendron quadrangulare* and a few *Oryctanthus occidentalis*.]

*Endharti, A.T., Wulandari, A., Listyana, A., Norahmawati, E. and Permana, S. 2016. *Dendrophthoe pentandra* (L.) Miq extract effectively inhibits inflammation, proliferation and induces p53 expression on colitis-associated colon cancer. BMC Complementary and Alternative Medicine 16: 374. (http://bmccomplementalternmed.biomedcentral.com/articles/10.1186/s12906-016-1345-0)

*Fernández-Aparicio, M., Flores, F. and Rubiales, D. 2016. The effect of *Orobanche crenata* infection severity in faba bean, field pea, and grass pea productivity. Frontiers in Plant Science 7(September): 1409. (http://journal.frontiersin.org/article/10.3389/fpls.2016.01409/full) [Studying different levels of *O. crenata* infection on faba bean, field pea and grass pea (*Lathyrus sativus*). Damaging effects were to some extent proportional to the dry weight of the parasite, but somewhat greater and were greatest on reproductive organs. Grass pea was most susceptible and pea least.]

Furuhashi, T., Nakamura, T., Fragner, L., Roustan, V., Schön, V. and Weckwerth, W. 2016. Biodiesel and poly-unsaturated fatty acids production from algae and crop plants - a rapid and comprehensive workflow for lipid analysis. Biotechnology Journal 11(10): 1262-1267. [*Cuscuta japonica* among plants on which the technique was used.]

Gatto, M..A., Sergio, L., Ippolito, A. and di Venere, D. 2016. Phenolic extracts from wild edible plants to control postharvest diseases of sweet cherry fruit. Postharvest Biology and Technology 120: 180-187. [An extract of *Orobanche crenata* reduced post-harvest disease of cherry by 64-76%.]

Gao Jing, Wang JinNiu, Xu Bo, Xie Yu, He JunDong and Wu Yan. 2016. (Plant leaf traits, height and biomass partitioning in typical ephemerals under different levels of snow cover thickness in an alpine meadow.) (in Chinese) Chinese Journal of Plant Ecology 40(8): 775-787. [Assessing plant leaf traits, height and biomass partitioning in relation to variations in snow cover thickness, in 3 alpine species including *Pedicularis kansuensis*. Showing some tendency for medium snow cover to favour below-ground growth, more than thin or thick snow cover.]

Georgiev, G. 2016. Characterization of the Bulgarian sunflower hybrid Valin. Agricultural Science and Technology 8(3): 183-188. [Describing the origin and characteristics of sunflower hybrid Valin, which shows high resistance to mildew and 100% resistance to *Orobanche cumana* races A-F.]

Gibot-Leclerc, S., Perronne, R., Dessaint, F., Reibel, C. and Le corre, V. 2016. Assessment of phylogenetic signal in the germination ability of *Phelipanche ramosa* on Brassicaceae hosts. Weed Research 56(6): 452-461. [Looking for correlation between the phylogenetic closeness of wild relatives to each other, or to oilseed rape (*Brassica napus*) and their ability to germinate *P. ramosa* - and failing.]

Gnangle, C.P., Honfo, S.H. and Gbemavo, C. 2016. Agrarian systems dynamics of shea trees (*Vitellaria paradoxa* Gaertn) parklands in Northern Benin. International Journal of Biological and Chemical Sciences 10(1): 13-22. [Reporting changes and reductions in abundance of *V. paradoxa* partly attributable to unspecified mistletoes, presumably *Tapinanthus* spp.]

Gramma, L.S.dos S., Marques, F.M., Vittorazzi, C., de Andrade, T.A.M., Frade, M.A.C., de Andrade, T.U., Endringer, D.C., Scherer, R. and Fronza, M. 2016. *Struthanthus vulgaris* ointment prevents an over expression of inflammatory response and accelerates the cutaneous wound healing. Journal of Ethnopharmacology 190: 319-327. [Concluding that a preparation from *S. vulgaris* might be beneficial for treating healing disorders.]

Hacham, Y., Hershenhorn, J., Dor, E., Amir, R. 2016. Primary metabolic profiling of Egyptian broomrape (*Phelipanche aegyptiaca*) compared to its host tomato roots. Journal of Plant Physiology 205: 11-19. [Primary metabolic profiling using GC-MS for the early developmental stage of *P. aegyptiaca* and of infested and non-infested tomato roots indicated that the levels of metabolites in *P. aegyptiaca,* including intermediates of TCA cycle, amino acids (aspartate family, branched chain, and aromatic), sugars, polyols, sugar acids, and organic acids were significantly higher compared to the infected roots, while the levels of some metabolites such as sucrose and arabinose were lower. Infection did not change the levels of most metabolites in the tomato except for maltose, trehalose, etc., whose levels increased in the infected roots. These results indicate that the parasite did not significantly affect the host primary metabolic pathways.]

Harrison, S. and Harrison, R. 2016. Financial modelling of mixed-species agroforestry systems in Fiji and Vanuatu, based on traditional tree species. In: Meadows, J., Harrison, S. and Herbohn, J. (eds) Small-scale and community forestry and the changing nature of forest landscapes, 11-15 October 2015, Sunshine Coast, Australia 2016 pp. 110-125. [*Santalum yasi* among species considered.]

Hayatu, M., Shehu, M. and Haruna, H. 2016. Effect of different levels of *Striga gesnerioides* on the growth and yield of some local and improved cowpea (*Vigna unguiculata* (L) Walp) varieties. Bayero Journal of Pure and Applied Sciences 9(1): 76-81. [In a pot experiment, cowpea varieties IT99K-241-2 and DANILA were proportionately damaged by additions of 0.1 or 0.5 g. *S. gesnerioides* seed per pot, while IT97K-499-35 and IT98K-205-8 showed immunity and were undamaged.]

Hegenauer, V., Fürst, U., Kaiser, B., Smoker, M., Zipfel, C., Felix, G., Stahl, M. and Albert, M. 2016. Detection of the plant parasite *Cuscuta reflexa* by a tomato cell surface receptor. Science (Washington) 353(6298): 478-481. [Showing that the tomato plant is resistant to *C. reflexa* because it can sense a small-peptide factor (*Cuscuta* factor) thanks to the cell surface receptor-like protein CUSCUTA RECEPTOR 1 (CuRe1) and this increases resistance to *C. reflexa* infestation. Other factors also contribute to establish full resistance of tomato to *C. reflexa*.]

Heilmann, H. 2016. (Do heterotrophic growth factors determine occurrence and distribution of the creeping thistle (*Cirsium arvense* (L). Scop.) in the landscape?) (in German) In: Nordmeyer, H. and Ulber, L. (eds) Tagesband 27. Deutsche Arbeitsbesprechung über Fragen der Unkrautbiologie und -bekämpfung, 23.-25, Februar 2016, Braunschweig, Germany. Julius-Kühn-Archiv 452: 136-144. [Apparently suggesting *C. arvense* to be mixotrophic.]

Heredia, M.D. and Robbins, R.K. 2016. Natural history of the mistletoe-feeding *Thereus lomalarga* (Lepidoptera, Lycaenidae, Eumaeini) in Colombia. Zootaxa 4117(3): 301-320. [Detailing the life history of the butterfly *T. lomalarga* on *Oryctanthus alveolatus*. The larvae are tended by a wide range of ant species, attracted by the dorsal nectaries of the host. Adult butterflies feed on the nectar and on Hemipteran secretions. Parasitoids include Campopleginae and Chalcidinae.]

Hu WeiJie, Fu Jian, Tang XiaoYan and Wang Yan. 2016. (Study on quality standard of Zhuangyao Jianshen pills.) (in Chinese) Journal of Guangdong Pharmaceutical University 32(3): 330-334. [Describing a method for assessing the content of quercetin and caffeic acid in Zhuangyao Jianshen pills which include *Taxillus chinensis*.]

Ishida, J.K., Wakatake, T., Yoshida, S., Takebayashi, Y., Kasahara, H., Wafula, E., dePamphilis, C.W., Namba, S. and Shirasu, K. 2016. Local auxin biosynthesis mediated by a YUCCA flavin monooxygenase regulates haustorium development in the parasitic plant *Phtheirospermum japonicum.* Plant Cell 228(8): 1795-1814. [Highest glutamione synthetase activity was expressed in a *Mimosa pudica* – *S. album* association compared to other leguminous and non-leguminous host associations. The association of N_2 fixing host with *S. album* enhanced C and N levels in order to maintain the C/N value. The relative increase in *Sa*AMT1;2 expressions and up-regulated glutamine synthetase activity positively affected the growth parameters in sandal when associated with leguminous hosts.]

Jage, H., Klenke, F. Kruse, J., Kummer, V. and Scholler, M. 2016. (A contribution to the flora of plant parasitic microfungi from Rügen and Vilm Island (Mecklenburg-Vorpommern).) (in German) Bulletin : BfN - Skripten (Bundesamt für Naturschutz) 435: 47 pp. [A mycofloristic survey on plant parasitic microfungi yielded 232 species on 233 host species, and 351 parasite-host-combinations were detected, including *Cronartium flaccidum* on *Euphrasia stricta*, *Melampyrum arvense* and *Odontites vulgaris*, and *Podosphaera phtheirospermi* on *Euphrasia stricta* and *Melampyrum arvense*.]

Jiang ZhiHui, Wang Jian, Li XinPing and Zhang XiaoYing. 2016. Echinacoside and *Cistanche tubulosa* (Schenk) R. Wight ameliorate bisphenol A-induced testicular and sperm damage in rats through gonad axis regulated steroidogenic enzymes. Journal of Ethnopharmacology 193: 321-328 . [Echinacoside and *C. tubulosa* extract attenuated poor sperm quality and testicular toxicity in rats through up-regulation of steroidogenesis enzymes, suggesting that echinacoside is the active compound of *C. tubulosa* - a potential natural reproductive agent.]

Kambham Venkateswarlu, Preethi, J.K. and Chandrasekhar, K.B. 2016. Antiurolithiatic activity of ethanolic extract of *Taxillus tomentosus* plant on ethylene glycol and ammonium chloride induced urolithiasis in Wistar rats. Indonesian Journal of Pharmacy 27(2): 66-73. [Reporting good results from *T. tomentosus* in treatment of urolithiasis (kidney stones) in Indonesia.]

Karagöz, A., Kesici, S., Vural, A., Usta, M., Tezcan, B., Semerci, T. and Teker, E. 2016. Cardioprotective effects of *Viscum album* L. ssp. *album* (Loranthaceae) on isoproterenol-induced heart failure via regulation of the nitric oxide pathway in rats. Anatolian Journal of Cardiology 16: 923-938. [*V. album* exerted favorable effects on left ventricular function in isoproterenol-induced heart failure rats. Up-regulation of the NO pathway seems to be the possible pathophysiological mechanism. Favorable vascular outcomes can also be speculated considering the reduction in serum hs-CRP levels.]

Khan, Z.**,** Midega, C.A.O.**,** Hooper, A. and Pickett, J. 2016**.** Push-pull: chemical ecology-based integrated pest management technology. Journal of Chemical Ecology 42(7): 689-69. [An overview of the push-pull technique which, for control of *Striga hermonthica,* depends on *Desmodium* intercrops exuding flavonoid compounds some of which stimulate germination of *Striga* seeds, such as Uncinanone B, and others that dramatically inhibit their attachment to host roots, such as Uncinanone C and a number of di-*C*-glycosylflavones, resulting in suicidal germination. The technique has already been adopted by about 125,000 farmers in eastern Africa, significantly increasing maize yields.]

Khan, S.W., Surayya Khatoon, Qammar Abbas, Ghulam Raza and Azhar Hussain. 2016. Inventory of the Alpine flora of Haramosh and Bagrote valleys (Karakoram Range) District Gilgit, Gilgit-Baltistan, Pakistan.Pakistan Journal of Botany 48(4): 1559-1572. [Noting the occurrence of 10 species of *Pedicularis*.]

Khosla, A. and Nelson, D.C. 2016. Strigolactones, super hormones in the fight against *Striga*. Current Opinion in Plant Biology 33: 57-63. [Reviewing recent studies on the strigolactone signalling system in angiosperms and parasites, as well as downstream targets that are polyubiquitinated and proteolyzed following strigolactone perception. The basis for protein-protein interactions among these signaling components has been explored. Proposing strategies to translate current knowledge of strigolactone transport and signaling into parasite control methods.]

*Kienle, G.S., Mussler, M., Fuchs, D. and Kiene, H. 2016. Intravenous mistletoe treatment in integrative cancer care: a qualitative study exploring the procedures, concepts, and observations of expert doctors. Evidence-based Complementary and Alternative Medicine 2016: ID4628287. (http://dx.doi.org/10.1155/2016/4628287) [Reviewing interviews with 35 doctors specialized in integrative and anthroposophic medicine, who reported long-term disease stability and improvements in patients' general condition, vitality, strength, thermal comfort, appetite, sleep, pain from bone metastases, dyspnea in pulmonary lymphangitis carcinomatosa, fatigue, and cachexia from *Viscum album* treatments, with minimal adverse side-effects.]

Kim JunHeon, Jang MiYeon, Shin EunSik, Kim JeongMin, Lee SiHyeock and Park ChungGyoo. 2016. Fumigant and contact toxicity of 22 wooden essential oils and their major components against *Drosophila suzukii* (Diptera: Drosophilidae). Pesticide Biochemistry and Physiology 133: 35-43. [*Santalum album* oil among essential oils showing useful toxicity towards adult *D. suzuki*.]

Klutsch, J.G., Najar, A., Cale, J.A. and Erbilgin, N. 2016. Direction of interaction between mountain pine beetle (*Dendroctonus ponderosae*) and resource-sharing wood-boring beetles depends on plant parasite infection. Oecologia 182(1): 1-12. [Describing the complex interaction between *D. ponderosae* and wood-boring beetles depending on the level of infection of *Pinus banksia* by *Arceuthobium americanum.*]

Kolb, T.E., Fettig, C.J., Ayres, M.P., Bentz, B.J., Hicke, J.A., Mathiasen, R., Stewart, J.E. and Weed, A.S. 2016. Observed and anticipated impacts of drought on forest insects and diseases in the United States. Forest Ecology and Management 380: 321-334. [Observing that drought – likely to be exacerbated by climate change – puts trees infected by *Arceuthobium* spp. under increased stress, making them more susceptible to insects, particularly bark beetles and wood borers.]

Kosachev, P.A. 2016. (The system and conspectus of the genus *Pedicularis* (Orobanchaceae) of Altay Mountains and Tian Shan.) (in Russian) Biological Bulletin of Bogdan Chmelnitskiy Melitopol State Pedagogical University 6(1): 115. [A classification of *Pedicularis* spp. from this central Asian moutainous region was proposed based on previous molecular phylogenetic studies. The conspectus included 61 apecies in 32 series and 7 sections.]

Kuijt J. 2016. Measurements and taxonomy in *Arceuthobium* (Viscaceae). Phytologia 98:186-189. [Recent studies of the *Arceuthobium campylopodum* complex utilized standardized internodal measurements. Because stem internodes continue to elongate from year to year, such measurements should not be used as support for recognizing infraspecific taxa.]

Laitinen, R.K., Hellström, K.O. and Wäli, P.R. 2016. Context-dependent outcomes of subarctic grass-endophyte symbiosis. Fungal Ecology 23: 66-74. [Infection of *Festuca rubra* by the endophyte *Epichloë festucae* made it resistant to parasitism by *Rhinanthus minor*, but increased the susceptibility of unspecified 'riverside grasses' to the parasite (in Finland).]

Lallemand, F., Gaudeul, M., Lambourdière, J., Matsuda, Y., Hashimoto, Y. and Selosse, M.A. 2016. The elusive predisposition to mycoheterotrophy in Ericaceae. New Phytologist 212(2): 314-319. . [Phylogenetic analyses of mycoheterotrophic Ericaceae and their fully photosynthetic relatives were conducted using nuclear (ITS, 28S) and chloroplast (matK) genes. Pterosporeae was sister to Monotropeae, thus their common ancestor was likely mycoheterotrophic, and this clade was sister to autotrophic Arbutoideae. In Pyroleae, *Pyrola* and *Orthilia* (mixotrophic) were sister to autotrophic *Chimaphila* and *Moneses*. Thus, mycoheterotrophic had two independent origins in Ericaceae.]

Lee JaeHyeon, Lyu DongPyo and Kim GabTae. 2016. (A study on the habitat environment and mutualism with ants of genus *Melampyrum.*) (in Korean) Korean Journal of Environment and Ecology 302 139-145. [Studying *M. setaceum* var. *nakaianum*, *M. roseum* var. *ovalifolium* and *M. roseum* on hosts thought to be *Quercus mongolica* and/or *Carex siderosticta* and their associated ant species.]

Leite de Vasconcelos, G.C. and Miranda de Melo, J.I. 2016. (Flora of the Parque Nacional do Catimbau, Pernambuco State, Brazil: Loranthaceae) (in Portuguese). Hoehnea 43. [This flora, in a semiarid region on Pernambuco state, northeast of Brazil, found two species each of *Psittacanthus* and *Struthanthus*.]

Li Lang, Madriñán, S. and Li Jie. 2016. Phylogeny and biogeography of *Caryodaphnopsis* (Lauraceae) inferred from low-copy nuclear gene and ITS sequences. Taxon 65(3): 433-443. [[Focused mainly upon relationships among Old and New World *Caryodaphnopsis*, additional sampling in the family included 12 other genera including the parasitic vine *Cassytha*. It emerged with strong support as sister to a clade containing core Lauraceae plus *Neocinnamomum*. Molecular dating indicated this split occurred in the Cretaceous.]

Li Meng, Li YunJing, Liu WeiWei, Li RongLi, Qin CuiYing. Liu Nan and Han Jing. 2016. The preparation of *Cistanche* phenylethanoid glycosides liquid proliposomes: optimized formulation, characterization and proliposome dripping pills in vitro and in vivo evaluation. European Journal of Pharmaceutical Sciences 93: 224-232. [Results showed that *Cistanche* phenylethanoid glycoside liquid proliposome dripping pills offer a good way to improve the oral delivery of *Cistanche* extracts.]

Li WeiQiang, Kien Huu Nguyen, Watanabe, Y., Yamaguchi, S. and Lam Son Phan Tran. 2016. OaMAX2 of *Orobanche aegyptiaca* and *Arabidopsis* AtMAX2 share conserved functions in both development and drought responses. Biochemical and Biophysical Research Communications 478(2): 521-526. [A *MAX2* ortholog was cloned from *O. aegyptiaca* for complementation analyses using the *Arabidopsis Atmax2* mutant. The so-called *OaMAX2* gene could rescue phenotypes of the *Atmax2* mutant in various tested developmental aspects, including seed germination, shoot branching, leaf senescence and growth and development of hypocotyl, root hair, primary root and lateral root. *OaMAX2* could enhance the drought tolerance of *Atmax2* mutant, suggesting its ability to restore the drought-tolerant phenotype of mutant plants defected in *AtMAX2* function. Thus, this study provides genetic evidence that the functions of the MAX2 orthologs, and perhaps the MAX2 signaling pathways, are conserved in parasitic and non-parasitic plants. Furthermore, the results of this study enable development of a strategy to fight against parasitic plants by suppressing the MAX signaling, which ultimately leads to enhanced productivity of crop plants.]

*Lim YaChee, Rajabalaya, R., Lee HuanFang, Tennakoon, K.U., Quang Vuong Le, Idris, A., Zulkipli, I.N., Keasberry, N. and David, S.R. 2016. Parasitic mistletoes of the genera Scurrula and *Viscum*: from bench to bedside.Molecules 21(8): 1048. (http://www.mdpi.com/1420-3049/21/8/1048/htm) [Reviewing therapeutic uses and noting that *Scurrula* spp. have many of the same characteristics as *Viscum* spp.. inhibiting cancer growth due to presence of phytoconstituents such as quercetin and fatty acid chains. They also possesses TNFα activity to strengthen the immune system to combat cancer. Both genera are rich in antioxidants that confer protection against cancer as well as neurodegeneration, etc. Suggesting the need for clinical trials on *Scurrula* extracts.]

Liu XiaoJin, Xu DaPing, Yang ZengJiang and Zhang NingNan. 2016. Effects of abscisic acid on growth, photosynthesis and antioxidant enzyme activities of *Santalum album* seedlings. Journal of Nanjing Forestry University (Natural Sciences Edition) 40(3): 57-62. [Foliar application of 1 mg/l abscisic acid increased net photosynthesis rate, stomatal conductance, transpiration rate and chlorophyll *a*) content in leaves of sandal wood seedlings. Rates of 10 and 100 mg/l were detrimental.]

Liu XiaoJin, Xu DaPing, Yang ZengJiang and Zhang NingNan. 2016. Heartwood proportion and distributions of essential oil content and composition of *Santalum album* in Jianfeng mountain, Hainan. Journal of South China Agricultural University 37(5): 66-71. [Concluding that Hainan is a suitable region for growth of *S. album* given the good growth performance, high heartwood proportion and essential oil content. Noting that sapwood may have greater quantity of oil but lower quality.]

*Louarn, J., Boniface, M.C., Pouilly, N., Velasco, L., Pérez-Vich, B., Vincourt, P. and Muños, S. 2016. Sunflower resistance to broomrape (*Orobanche cumana*) is controlled by specific QTLs for different parasitism stages. Frontiers in Plant 7(May): 590. (http://journal.frontiersin.org/article/10.3389/fpls.2016.00590/full) [A population of 101 recombinant inbred lines derived from a cross between HA89 and LR1 with differing resistance characteristics, were assessed for resistance to *O. cumana* races F and G at 3 stages after attachment. Results indicated that there are several quantitative resistance mechanisms controlling the infection by *O. cumana* that can be used in sunflower breeding.]

Lu ChengWei, Lin TzuYu, Huang ShuKuei and Wang Su. 2016. Echinacoside inhibits glutamate release by suppressing voltage-dependent Ca2+ entry and protein kinase C in rat cerebrocortical nerve terminals. International Journal of Molecular Sciences 17(7): 1006. [Results suggest that the inhibitory effect of echinacoside from 'Herba Cistanche' (based on unspecified *Cistanche* sp(p). but probably *Cistanche deserticola* and/or *C. tubulosa*) on evoked glutamate release is associated with reduced voltage-dependent Ca^{2+} entry and subsequent suppression of protein kinase C activity.]

Luebert, F. and 20 others. 2016. Familial classification of the Boraginales. Taxon 65(3): 502-522. [The familial classification in this order has been controversial, thus a consensus classification was proposed based on molecular and morphological characters and that considered nomenclatural stability. The order contains eleven families: Boraginaceae s.str., Codonaceae, Coldeniaceae, Cordiaceae, Ehretiaceae, Heliotropiaceae, Hoplestigmataceae, Hydrophyllaceae, Lennoaceae (parasitic), Namaceae, and Wellstediaceae.]

Lumbroso, A. and 13 others. 2016. Simplified strigolactams as potent analogues of strigolactones for the seed germination induction of *Orobanche cumana* Wallr. Pest Management Science 72(11): 2054-2068. [Strigolactams in which the lactone moiety of the C ring in canonical strigolactones was replaced with a lactam moiety were synthesized and examined for their germination stimulation of *O. cumana* seeds. Among them, GR28 (double bond isomer of GR7) strigolactam was found to be ca. 100-fold more active than GR24 and the activity resides only one of its four stereoisomers. Simple chemical modifications to its dihydro- and diacetyloxydihydro-derivatives further enhanced the activity. These strigolactoms were slightly more resistant to hydrolysis than strigolactones as expected.]

Macedo, D.G. and 15 others. 2016. Versatility and consensus of the use of medicinal plants in an area of cerrado in the Chapada do Araripe, Barbalha-CE-Brazil. Journal of Medicinal Plants Research 10(31): 505-514. [*Ximenia americana* among the species considered most worth further study.]

Maffei, H.M., Filip, G.M., Grulke, N.E., Oblinger, B.W., Margolis, E.Q. and Chadwick, K.L. 2016. Pruning high-value Douglas-fir can reduce dwarf mistletoe severity and increase longevity in Central Oregon. Forest Ecology and Management 379: 11-19. [Concluding that 'pruning' to remove *Arceuthobium douglasii* from *Pseudotsuga menzieseii* reduces host tree growth initially but is beneficial in the long-term – but nature of pruning not clear from abstract.]

*Martín-Sanz, A., Malek, J., Fernández-Martínez, J.M., Pérez-Vich, B. and Velasco, L. 2016. Increased virulence in sunflower broomrape (*Orobanche cumana* Wallr.) populations from Southern Spain is associated with greater genetic diversity. Frontiers in Plant Science 7(May) 589. (http://journal.frontiersin.org/article/10.3389/fpls.2016.00589/full) [Identifying a new race of *O. cumana* G_{GV} from the Guadalquivir Valley, virulent on race F-resistant sunflower varieties, which has apparently arisen from admixture of populations from the Guadalquivir Valley and Cuenca followed by recombination of avirulence genes.]

Mbogo, P.O., Dida, M.M. and Owuor, B. 2016. Effect of *Striga hermontnica* (Del.) Benth. on yield and yield components of maize (*Zea mays* L.) hybrids in western Kenya. Journal of Agricultural Science 8(8): 112-125. [Recording useful degrees of resistance to *S. hermonthica* in 6 experimental maize hybrids and reporting the release of hybrids EH12 and EH 14 for commercialisation in *Striga*-infested areas.]

Mellado, A., Morillas, L., Gallardo, A. and Zamora, R. 2016. Temporal dynamic of parasite-mediated linkages between the forest canopy and soil processes and the microbial community. New Phytologist 211(4): 1382-1392. [*Viscum album* ssp. *austriacum*, presumably on pine and/or larch, increased the amount, quality, and diversity of organic matter beneath the host canopy, directly through its nutrient-rich litter and indirectly through a reduction in host litterfall and an increase in bird-derived debris, resulting in enriched hotspots able to support larger and more functionally even soil microbial communities.]

Mohamed, N., Charnikhova, T., Bakker, E.J., van Ast, A., Babiker, A.G.T. and Bouwmeester, H.J. 2016. Evaluation of field resistance to *Striga hermonthica* (Del.) Benth. in *Sorghum bicolor* (L.) Moench. The relationship with strigolactones. Pest Management Science 72(11): 2082-2090. [Studying a range of sorghum varieties and assessing their *Striga*-resistance and their exudation of sorgomol, orobanchol and 5-deoxystrigol, and finding 5-deoxystrigol to have a significant correlation with *Striga* infection.]

*Mohsen Marvibaigi, Neda Amini, Eko Supriyanto, Fadzilah Adibah, A.M., Saravana Kumar Jaganathan, Shajarahtunnur Jamil, Javad Hamzehalipour Almaki and Rozita Nasiri. 2016. Antioxidant activity and ROS-dependent apoptotic effect of *Scurrula ferruginea* (Jack) Danser methanol extract in human breast cancer cell MDA-MB-231. PLoS ONE 11(7): e0158942. (http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0158942) [Demonstrating that a *S. ferruginea* methanol extract mediated human breast cancer MDA-MB-231 cell growth inhibition via induction of apoptosis, confirmed by Western blot analysis. It may be a potential anticancer agent; however, its *in vivo* anticancer activity needs to be investigated.]

Moon MinHo, Jeong HyunUk, Choi JinGyu, Jeon SeongGak, Song EunJi, Hong SeonPyo and Oh MyungSook. 2016. Memory-enhancing effects of *Cuscuta japonica* Choisy via enhancement of adult hippocampal neurogenesis in mice. Behavioural Brain Research 311: 173-182. [Results indicate that *C. japonica* stimulated neuronal cell proliferation, differentiation, and maturation, processes associated with neurogenesis. Additionally, they suggest that it may improve learning and memory *via* the enhancement of adult hippocampal neurogenesis.]

*Moreau, D., Gibot-Leclerc, S., Girardin, A., Pointurier, O., Reibel, C., Strbik, F., Fernández-Aparicio, M. and Colbach, N. 2016. Trophic relationships between the parasitic plant species *Phelipanche ramosa* (L.) and different hosts depending on host phenological stage and host growth rate. Frontiers in Plant Science 7(July): 1033. (http://journal.frontiersin.org/article/10.3389/fpls.2016.01033/full) [The reduction in host growth resulting from *P. ramosa* parasitism on *Brassica napus* (oilseed rape), *Capsella bursa-pastoris* and *Geranium dissectum* varied from 34-84%. The complex of variation according to host species, growth stage and light level is to be incorporated into a model.]

Mrinmoy Nag, Mukherjee, P.K., Rajarshi Biswas, Joydeb Chanda and Amit Kar. 2016. Evaluation of antimicrobial potential of some Indian Ayurvedic medicinal plants. Pharmacognosy Journal 8(6): 525-533. [Confirming high activity of extracts of *Viscum articulatum* against *Staphylococcus aureus*, in keeping with its traditional use for the management of microbial infections.]

Müller-Stöver, D. Nybroe, O., Baraibar, B., Loddo, D., Eizenberg, H., French, K., Sønderskov,M., Neve, P., Peltzer, D.A., Maczey, N. and Christensen, S. 2016. Contribution of the seed microbiome to weed management. Weed Research 56(5): 335-339. [Including comment on the value of fungal microflora (*Fusarium* spp.) in the control of *Striga* and *Orobanche* spp.]

Mustarichie, R., Warya, S., Saptarini, N.M. and Musfiroh, I. 2016. Acute and subchronic toxicities of Indonesian mistletoes *Dendrophthoe pentandra* L. (Miq.) ethanol extract. Journal of Applied Pharmaceutical Science 6(9): 109-114 ref.27. [Traditionally *D. pentandra* is used in Indonesia is to cure cough, hypertension, diabetes, cancer, ulcers, smallpox, diuretic, skin infection and after child-birth. This study suggested that there is a level of toxicity which would make it unsafe for prolonged use.]

Ndagurwa, H.G.T., Ndarevani, P., Muvengwi, J. and Maponga, T.S. 2016. Mistletoes via input of nutrient-rich litter increases nutrient supply and enhance plant species composition and growth in a semi-arid savanna, southwest Zimbabwe. Plant Ecology 217(9): 1095-110. [Infestation of trees by mistletoes (unspecified in abstract but presumably *Plicosepalus kalachariensis* and *Viscum verrucosum* as in following item) resulted in increases of soil nutrient concentrations by 34% for N, 36% for Mg, 46% for P and up to 72% for K , which in turn led to increase in the species richness, density and biomass yield of the understory grass community.]

Ndagurwa, H.G.T., Nyawo, E. and Muvengwi, J. 2016. Use of mistletoes by the Grey Go-away-bird (*Corythaixoides concolor,* Musophagidae) in a semi-arid savannah, south-west Zimbabwe. African Journal of Ecology 54(3): 336-341. [Survey showed an unexpectedly low survival rate of 22% for nests of *C. concolor* in mistletoes (*Plicosepalus kalachariensis* and *Viscum* *verrucosum*) compared with 90% for nests in other substrates over the 50-day nesting period.]

*Nimmy Kumar, Subhankar Biswas, Mathew, A.E., Subin Varghese, Mathew, J.E., Nandakumar, K., Aranjani, J.M. and Lobo, R. 2016. Pro-apoptotic and cytotoxic effects of enriched fraction of *Elytranthe parasitica* (L.) Danser against HepG2 Hepatocellular carcinoma. BMC Complementary and Alternative Medicine 16(420): (26 October 2016). (http://bmccomplementalternmed.biomedcentral.com/articles/10.1186/s12906-016-1395-3) [Studying the anti-proliferative, pro-oxidant and pro-apoptotic potential of stem of *Elytranthe parasitica* (Loranthaceae), finding potent cytotoxic activity in a against HepG2 hepatocellular carcinoma cell line and concluding that the active fraction could be a promising contender in the treatment of hepatocellular carcinoma.]

Nobis, M. and 15 others. 2016. Contribution to the flora of Asian and European countries: new national and regional vascular plant records, 5. Acta Botanica Gallica 163(2): 159-174. [Reporting new records for *Orobanche coerulescens* and *O. zajaciorum* from Iraq and *Phelipanche lavandulacea* from Armenia.]

Ntoukakis, V. and Gimenez-Ibanez, S. 2016. Parasitic plants - a cure for what ails thee. Science (Washington) 353(6298): 442-443. [Editorial comment on the paper by Hegenauer *et al.* see above.]

***Nzioki, H.S., Oyosi, F., Morris, C.E., Kaya, E., Pilgeram, A.L., Baker, C.S. and Sands, D.C. 2016. *Striga* biocontrol on a toothpick: a readily deployable and inexpensive method for smallholder farmers. Frontiers in Plant Science 7(August): 1121. (http://journal.frontiersin.org/article/10.3389/fpls.2016.01121/full) [A full description of the promising new biocontrol technique for *Striga hermonthica*. The new 'Foxy-14' strains have been selected for their exudation of amino acids L-leucine and L-tyrosine, which are toxic to *Striga* but not to maize, and also for lack of production of fungal toxins. Results from 500 paired field plots in Kenya indicate 80-90% reduction in *Striga* emergence and 40-50% maize yield increases. See 'Literature Highlight' above.]**

Obiang, C.S., Ondo, J.P., Atome, G.R.N., Engonga, L.C.O., Siawaya, J.F.D. and Emvo, E.N. 2016. Phytochemical screening, antioxidant and antimicrobial potential of stem barks of *Coula edulis* Baill. *Pseudospondias longifolia* Engl. and *Carapa klaineana* Pierre. from Gabon. Asian Pacific Journal of Tropical Disease 6(7): 557-563. [Finding that extracts of *C. edulis* (Olacaceae) contain greater antioxidant and antimicrobial properties than *P. longifolia* and *C. klaineana* extracts. Antimicrobial activity was demonstrated against *Neisseria gonorrhoeae*, *Enterococcus faecalis* CIP 103907, *Pseudomonas aeruginosa* and *Salmonella* sp.]

*Ortiz-Bustos, C.M., Pérez-Bueno, M.L., Barón, M. and Molinero-Ruiz, L. 2016. Fluorescence imaging in the red and far-red region during growth of sunflower plantlets. diagnosis of the early infection by the parasite *Orobanche cumana.* Frontiers in Plant Science 7(June): 884. (http://journal.frontiersin.org/article/10.3389/fpls.2016.00884/full) [UV-induced multicolor fluorescence imaging (MCFI) used to measure fluorescence emitted by chlorophyll (Chl) at 680 nm (red, F680) and 740 nm (far-red, F740) by seedlings of sunflower infested or otherwise by *O. cumana* . Effects of parasitism could be detected as early as 2 weeks after infection.]

*Pedraja, O.S., Moral, G.M., Carlón, L., Piwowarczyk, R., Laínz, M. and Schneeweiss, G. 2016. Annotated Checklist of Host Plants of Orobanchaceae (Index of Orobanchaceae) (http://www.farmalierganes.com/Flora/Angiospermae/Orobanchaceae/Host_Orobanchaceae_Checklist.htm) [A useful data base. See item above.]

Pelser, P.B., Nickrent, D.L. and Barcelona, J.F. 2016. Untangling a vine and its parasite: host specificity of Philippine *Rafflesia* (Rafflesiaceae). Taxon 65(4): 739-758. [A molecular phylogeny using nuclear and chloroplast genes was constructed for parasitized and non-parasitized *Tetrastigma* hosts (11 of the 13 species of Philippine *Rafflesia*). Six of the eight *Tetrastigma* lineages were parasitized, most hosting more than one *Rafflesia* species and four *Rafflesia* species parasitize multiple *Tetrastigma* lineages. Thus *Rafflesia* is less host-specific than previously thought, but specific to some degree given un-parasitized sympatric *Tetrastigma*.]

Pignone, D. and Hammer, K.. 2016. Parasitic angiosperms as cultivated plants? Genetic Resources and Crop Evolution 63(7): 1273-1284. [Reviewing the uses of parasitic plants, mainly as medicinal plants, fruit trees and some as vegetables. Olacaceae (1), Opiliaceae (1), Santalaceae (6), Viscaceae (1), Ximeniaceae (1) and Orobanchaceae (3) contain cultivated species (number in brackets). *Santalum* spp. and *Viscum album* are of greater importance for the production of sandalwood oil and anti-cancer medicine, respectively.]

*Ramón, P., De la Cruz, M., Zavala, I. and Zavala, M.A. 2016. Factors influencing the dispersion of *Arceuthobium oxycedri* in Central Spain: evaluation with a new null model for marked point patterns. Forest Pathology. (http://onlinelibrary.wiley.com/wol1/doi/10.1111/efp.12279/full) . [Models were used to simulate seed dispersal and these were compared to observed patterns].

Rajarshi Biswas; Mukherjee, P.K., Amit Kar, Shiv Bahadur, Harwansh, R.K., Sayan Biswas, Al-Dhabi, N.A. and Duraipandiyan, V. 2016. Evaluation of Ubtan - a traditional Indian skin care formulation. Journal of Ethnopharmacology 192: 283-291. [Studying the potential active ingredients of formulations involving extracts of turmeric, chickpea and *Santalum album* perhaps related to their phenolic and flavonoid contents.]

Rodenburg J. Demont , M., Zwart, S. and Bastiaans, L. 2016. Parasitic weed incidence and related economic losses in rice in Africa. Agriculture, Ecosystems and Environment 235: 306-317. (http://www.sciencedirect.com/science/article/pii/S016788091630528X) [A detailed, painstaking review of the occurrence of *Striga hermonthica, S. asiatica* and *Rhamphicarpa fustulosa* in rice in Africa – highlighting that Striga spp. occur in at least 31 countries with rain-fed upland rice systems; *R. fistulosa* threatens rice production in at least 28 countries; 1.34 million ha of rain-fed rice is infested with parasitic weeds in Afric; economic losses from parasitic weeds most likely reach US $200 M. and parasitic weed inflicted losses are estimated to increase by US $30 M annually.]

Ronald, M., Charles, M., Stanford, M. and Eddie, M. 2016. Existence of different physiological 'strains' of *Striga asiatica* (L.) Kuntze on sorghum species [*Sorghum bicolor* (L.) Moench and *Sorghum arundinaceum* (Desv.) Stapf] in Zimbabwe. Research on Crops 17(3): 468-478. [Reporting some differences in the response of 9 sorghum cultivars and one wild sorghum to *S. asiatica* at two widely spaced sites in Zimbabwe, but not clear how significant these differences were.]

Roquet, C., Coissac, É., Cruaud, C., Boleda, M., Boyer, F., Alberti, A., Gielly, L., Taberlet, P., Thuiller, W., van Es, J. and Lavergne, S. 2016. Understanding the evolution of holoparasitic plants: the complete plastid genome of the holoparasite *Cytinus hypocistis* (Cytinaceae). Annals of Botany 118(5): 885-896. [The complete plastome of *C. hypocistis* shows it is only 19.4 kb in size and contains only 23 genes. All coding regions had high substitution rates compared to photosynthetic Malvales. Some regions were under relaxed negative selection which typically follows loss of photosynthesis; however, strong positive selection was seen for rpl22.]

Rodriguez, P.A., Rodriguez, E.J., Norrbom, A.L. and Arévalo, E. 2016. A new species and new records of Cryptodacus (Diptera: Tephritidae) from Colombia, Bolivia and Peru. Zootaxa 4111(3): 276-290. [*C. bernardoi* reared from fruits of *Phoradendron* sp. near *piperoides*]

Roozbeh, N., Rostami, S. and Abdi, F. 2016. A review on herbal medicine with fertility and infertility characteristics in males. Iranian Journal of Obstetrics, Gynecology and Infertility 19 (13): Pe18-Pe32 . [A wide-ranging survey of literature on the effect of herbal remedies on male fertility concluded that mistletoe species (and in particular *Denrophthoe falcata*) tended to reduce male fertility rather than enhance it.]

Saha, C., Das, M., Stephen-Victor, E., Friboulet, A., Bayry, J. and Kaveri, S.V. 2016. Differential effects of *Viscum album* preparations on the maturation and activation of human dendritic cells and CD4+ T cell responses. Molecules 21(7): 912. [Among 5 available preparations based on *V. album,* 'VA Qu Spez', a fermented extract with high lectin content induced greatest maturation of dendritic cell and secretion of pro-inflammatory cytokines. It also stimulated IFN-γ secretion without modulating regulatory T cells and other $CD4^+$ T cytokines.]

Sahli, H.F., Krushelnycky, PD., Drake, D.R. and Taylor, A.D. 2016. Patterns of floral visitation to native Hawaiian plants in presence and absence of invasive Argentine ants. Pacific Science 70(3): 309-322. [Observing that where argentine ants (*Linepithema humile*) are present flowers of several species are less frequently visited by *Hylaeus* bees, effects on pollination and seed set of *Santalum haleakalae* not clear from abstract.]

Sakamoto, Y.. Ogura-Tsujita, Y., Ito, K., Suetsugu, K., Yokoyama, J., Yamazaki, J., Yukawa, T. and Maki, M. 2016. The tiny-leaved orchid *Cephalanthera subaphylla* obtains most of its carbon via mycoheterotrophy. Journal of Plant Research 129(6): 1013-1020 . [Stable isotope levels of ^{13}C and ^{15}N were used to examine the degree of mycoheterotrophism in five *Cephalanthera* species, one of which has reduced leaves (*C. subaphylla*). Species with leaves of normal size were significantly less enriched in ^{13}C than *C. subaphylla*, thus this species is strongly mycoheterotrophic whereas the others were partially mycoheterotrophic.]

*Samejima, H., Babiker, A.G., Mustafa, A. and Sugimoto, Y. 2016. Identification of *Striga hermonthica*-resistant upland rice varieties in Sudan and their resistance phenotypes. Frontiers in Plant Science 7(May): 634 . (https://www.cabdirect.org/cabdirect/abstract/20163264205) [Among 27 rice lines assessed for post-attachment resistance to *S. hermonthica*, Umgar and NERICA5 were consistently superior to others, confirmed in the field. NERICA13 showed partial resistance. Umgar was found also to show low stimulant activity.]

Samejima, H., Babiker, A.G., Takikawa, H., Sasaki, M. and Sugimoto, Y. 2016. Practicality of the suicidal germination approach for controlling *Striga hermonthica*. Pest Management Science 72(11): 2035-2042. [T-010, a simple carbamate containing the D ring structure was evaluated for its efficacy as a suicidal germination inducer for *S. hermonthica* in greenhouse and field experiments. Formulated (10% wettable powder) T-010 applied at 0.1, 1, and 10 kg a.i. ha^{-1} to the soil containing *S. hermonthica* seeds that had been conditioned by repeated irrigations effectively reduced *Striga* emergence in pots by 94-100%. A field trial with the same rates reduced *Striga* emergence by 33% and increased sorghum shoot and head dry weight by up to 40% and 240% respectively.]

Screpanti, C., Yoneyama, K., Bouwmeester, H.J. 2016. Strigolactones and parasitic weed management 50 years after the discovery of the first natural strigolactone *strigol*: status and outlook. Pest Management Science 72(11): 2016-2090.[An editorial describes a brief history of strigolactone research and summary of contributions to the special issue.]

*Shackleton, C. 2016. Do indigenous street trees promote more biodiversity than alien ones? Evidence using mistletoes and birds in South Africa. Forests 7(7): 134. (http://www.mdpi.com/1999-4907/7/7/134/htm) [Surveys suggested that indigenous trees had higher populations of birds and nests than alien ones, while alien species had more (unspecified) mistletoes. The native *Acacia karoo,* however was good for both birds and mistletoes.]

Schneider, A.C., Colwell, A.E.L., Schneeweiss, G.M. and Baldwin, B.G. 2016. Cryptic host-specific diversity among western hemisphere broomrapes (*Orobanche s.l.*, Orobanchaceae). Annals of Botany 118(6): 1101-1111. [Within the two currently recognized species of *O.* sect. *Gymnocaulis*, seven strongly supported clades were found. While commonly sympatric, members of these clades each had unique host associations. Strong support for cryptic host-specific diversity was also found in sect. *Nothaphyllon*, while other taxonomic species were well supported. We also find strong evidence for multiple amphitropical dispersals from central North America into South America. Concluding that host-switching is an important driver of diversification in western hemisphere broomrapes, where host specificity has been grossly underestimated. More broadly, host specificity and host-switching probably play fundamental roles in the speciation of parasitic plants.]

Shchennikova, A.V., Beletsky, A.V., Shulga, O.A., Mazur, A.M., Prokhortchouk, E.B., Kochieva, E.Z., Ravin, N.V. and Skryabin, K.G. 2016. Deep-sequence profiling of miRNAs and their target prediction in *Monotropa hypopitys*. Plant Molecular Biology 91(4/5): 441-458. [The identification of novel *M. hypopitys*-specific miRNAs, some with few target genes and low abundances, suggests their recent evolutionary origin and participation in highly specialized regulatory mechanisms fundamental for its non-photosynthetic biology.]

Shilo, T.**,** Zygier, L.**,** Rubin, B.**,** Wolf, S. and Eizenberg, H. 2016. Mechanism of glyphosate control of *Phelipanche aegyptiaca.* Planta 244(5): 1095-1107. [By using a glyphosate-resistant tomato genotype as the host for *P. aegyptiaca*, both endogenous 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) inhibition and a deficiency of aromatic amino acids in the parasite after glyphosate treatment were observed. These results clearly demonstrate that the presence of an active EPSPS and aromatic amino acid biosynthesis pathway in *P. aegyptiaca* which is effectively inhibited by the herbicide glyphosate.]

Shutoh, K., Kaneko, S., Suetsugu, K., Naito, Y.I. and Kurosawa, T. 2016. Variation in vegetative morphology tracks the complex genetic diversification of the mycoheterotrophic species *Pyrola japonica sensu lato.* American Journal of Botany 103(9): 1618-1629. [*Pyrola japonica* s.l. has at least three separate genetic lineages that have different leaf morphologies. The genetic lineages (assessed from three noncoding plastid regions) and their coexistence could have led to the variable leaf size and suggest the possibility that gene flow from partial to full mycoheterotrophs could reverse the evolutionary transition to full mycoheterotrophy.]

Smith, J.D., Woldemariam, M.G., Mescher, M.C., Jander, G. and de Moraes, C.M. 2016. Glucosinolates from host plants influence growth of the parasitic plant *Cuscuta gronovii* and its susceptibility to aphid feeding. Plant Physiology 172(1): 181-197. [Glucosinolates from *Arabidopsis thaliana* tended to reduce the vigour of *C. gronovii* but also reduced the feeding of pea aphids (*Acyrthosiphon pisum*) on the parasite, while the feeding of green peach aphids (*Myzus persicae*) was unaffected on the parasite but reduced on the *Arabidopsis*.]

Suaza-Gaviria, V., Pabón-Mora, N. and González, F. 2016. Development and morphology of flowers in Loranthaceae. International Journal of Plant Sciences 177(7): 559-578. [The anatomy and morphology (using LM and SEM) of eight species in six genera of New World Loranthaceae was examined. Based on this sampling, a number of plesiomorphic and apomorphic characters were proposed for the family.]

Sultanbawa, Y. and Sultanbawa, F. 2016. Australian native plants: cultivation and uses in the health and food industries. London, UK: CRC Press Inc., London, UK. pp. 376. [Describing the cultivation of native food and medicinal crops in Australia including *Santalum acuminatum*, and their uses in traditional aboriginal culture.]

Sun ShiGuo, Armbruster, W.S. and Huang ShuangQuan. 2016. Geographic consistency and variation in conflicting selection generated by pollinators and seed predators. Annals of Botany 118(2): 227-237. [Studies of pollination and seed predation in 17 populations of *Pedicularis rex* in China indicate opposing selection in operation: pollinators generated selection for greater floral exsertion beyond the bracts, but seed predators generated selection for reduced exsertion above the protective pools of water, although the strength of the latter varied across populations.]

Sun, T., Renner, S.S., Xu, Y.X., Qin, Y., Wu, J.Q. and Sun, G.L. 2016. Two hAT transposon genes were transferred from Brassicaceae to broomrapes and are actively expressed in some recipients. Science Reports 6: 12. [see Literature Highlight above.]

Takahashi, I., Fukui, K. and Asami, T. 2016. Chemical modification of a phenoxyfuranone-type strigolactone mimic for selective effects on rice tillering or *Striga hermonthica* seed germination. Pest Management Science 72(11): 2048-2053. [Chemical modification of phenoxyfuranone-type SL mimics (debranones) revealed that 2-chloro derivative was more active than GR24 in rice tillering assay but 20-fold less active in *S. hermonthica* seed germination assay.]

*Taous Khan, Sayyad Ali, Rahila Qayyum, Izhar Hussain, Fazli Wahid and Shah, A.J. 2016. Intestinal and vascular smooth muscle relaxant effect of *Viscum album* explains its medicinal use in hyperactive gut disorders and hypertension. BMC Complementary and Alternative Medicine 16: 251 (27 July 2016) (https://www.cabdirect.org/cabdirect/abstract/20163275241)

*Teixeira-Costa, L. and Ceccantini, G.C.T. 2016. Aligning microtomography analysis with traditional anatomy for a 3D understanding of the host-parasite interface - *Phoradendron* spp. case study. Frontiers in Plant Science 7(August): 1340. (http://journal.frontiersin.org/article/10.3389/fpls.2016.01340/full) [Describing the use of High Resolution X-ray Computed Tomography (HRXCT) to show striking differences between the endophytes of *P. perrottetii* on *Tapirira guianensis* (small woody galls) and *P. bathyoryctum* on *Cedrela fissilis* (long, deeply penetrating.]

Tinitana, F., Rios, M., Romero-Benavides, J.C., Rot, M.de la C. and Pardo-de-Santayana, M. 2016. Medicinal plants sold at traditional markets in southern Ecuador. Journal of Ethnobiology and Ethnomedicine 12(29): (5 July 2016). [*Gaiadendrum punctatum*, used to treat digestive and respiratory systems ailments.]

*Tjiurutue, M.C., Palmer-Young, E.C. and Adler, L.S. 2016. Parasite removal, but not herbivory, deters future parasite attachment on tomato. PLoS ONE 11(8): e0161076. (http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0161076) [Showing that prior mechanical damage, or feeding of *Spodoptera exigua,* on tomato, did not influence the host's susceptibility to *Cuscuta campestris*. Susceptibilty was also unaffected by current *Cuscuta* infection, but was reduced where the parasite had been removed,]

Tjiurutue, M.C., Stevenson, P.C. and Adler, L.S. 2016. Messages from the other side: parasites receive damage cues from their host plants. Journal of Chemical Ecology 42(8): 821-828, [Damage to lupin hosts (*Lupinus texensis*) by beet armyworm (*Spodoptera exigua*) significantly increased jasmonic acid (but not alkaloid) levels in both the lupin host and the attached parasite, *Castilleja indivisa.* However, feeding by the larvae of the butterfly *Junonia* *coenia* was greater on parasite when it was attached to the damaged than to the undamaged host plants.]

Tong ZeYu and Huang ShuangQuan. 2016. Pre- and post-pollination interaction between six co-flowering *Pedicularis* species via heterospecific pollen transfer. New Phytologist 211(4): 1452-1461. [Studying possible cross-pollination between 4 species of *Pedicularis*, in Wuhan, China, unspecified in the abstract except for the long-styled *P. densispica* and recording less than 10% pollen deposited in the 'wrong' flowers, thanks to *Bombus* species generally sticking to one species, while possibility of cross-fertilization is further reduced by variations in style length.]

Torres-Vera, R., García, J.M., Pozo, M.J. and López-Ráez, J.A. 2016. Expression of molecular markers associated to defense signaling pathways and strigolactone biosynthesis during the early interaction tomato-*Phelipanche ramosa*. PMPP Physiological and Molecular Plant Pathology 94: 100-107. [Results suggest that the three principal defence regulating hormonal pathways - salicylic acid, jasmonic acid and abscisic acid - are induced after infection, and are therefore, likely involved in the defence response in tomato. Additionally, an induction of the strigolactone biosynthesis genes *SlD27* and *SlCCD8* is thought to be involved.]

*Trabelsi, I., Yoneyama, K., Abbes, Z., Amri, M., Xie, X., Kisugi, T., Kim, H.I., Kharrat, M. and Yoneyama, K. 2017. Characterization of strigolactones produced by *Orobanche foetida* and *Orobanche crenata* resistant faba bean (*Vicia faba* L.) genotypes and effects of phosphorous, nitrogen, and potassium deficiencies on strigolactone production. South African Journal of Botany 108: 15–22. (http://isi-dl.com/download/136692) [Some Tunisian faba bean genotypes partially resistant to *O. foetida* and *O. crenata* were found to produce at least 3 strigolactones - orobanchol, orobanchyl acetate, and an isomer of fabacyl acetate. In the partially resistant genotypes, except for G5 which appeared to produce strigolactones at levels similar to those produced by susceptible cultivar G9 (Badï), impaired stimulant production confers resistance to *Orobanche*. Other mechanisms, acting after induction of seed germination seem to be implied in the resistance of G5. Both nitrogen and phosphate deficiencies enhanced stimulant exudation in genotypes G5 and G9.]

*Twardziok, M,, Kleinsimon, S., Rolff, J., Jäger, S., Eggert, A., Seifert, G. and Delebinski, C.I. 2016. Multiple active compounds from *Viscum album* L. synergistically converge to promote apoptosis in Ewing sarcoma. PLoS ONE 11(9): e0159749 . (http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0159749) [A combination of an aqueous extract from *Viscum album* and a triterpene extract solubilized with cyclodextrins demonstarted synbergistic activity on Ewing sarcoma (bone cancer) cells inhibiting proliferation and inducing apoptosis in a dose-dependent fashion and may be considered an adjuvant therapy option for pediatric patients with Ewing sarcoma.]

Wang Jing, Tan DongDong, Wei GuangZheng, Guo Yi, Chen ChunMei, Zhu HuCheng, Xue YongBo, Yin ChunPing and Zhang YongHui. 2016.Studies on the chemical constituents of *Cuscuta chinensis*. Chemistry of Natural Compounds 52(6): 1133-1136. [No abstract available. References at: http://link.springer.com/article/10.1007/s10600-016-1886-y]

Wang LiWei, Sun Jian, Zhao Bing and Zhao MingXia. 2016. (Laxative function of dietary fiber from *Cistanche deserticola*.) (in Chinese) Journal of Food Safety and Quality 7(9): 3740-3744. [Confirming a useful laxative function in fibre from *C. deserticola*.]

*WangYongLin, Li XueWu, Zhou WeiFen, Li Tao and Tian ChengMing. 2016. De novo assembly and transcriptome characterization of spruce dwarf mistletoe *Arceuthobium sichuanense* uncovers gene expression profiling associated with plant development. BMC Genomics 17: 771. (http://bmcgenomics.biomedcentral.com/articles/10.1186/s12864-016-3127-y) [Study of the transcriptomic processes underlying physiological traits and development in *A. sichuanense* on the host *Picea crassifolia* reveals tissue-specific gene expression patterns and pathways in *S. sichuanense* and suggest a difference between photosynthetic and non-photosynthetic tissues in plants. The data can potentially be used for future investigations on endophytic parasitism and *S. sichuanense* -host interaction, and it dramatically increases the available genomic resources for *Arceuthobium* and dwarf mistletoe communities.]

Wang XiangPing, Yu WenBin, Sun ShiGuo and Huang ShuangQuan. 2016. Pollen size strongly correlates with stigma depth among *Pedicularis* species. Journal of Integrative Plant Biology 58(10): 818-821. [Phylogenetic independent contrast analysis revealed that pollen grain volume was more strongly correlated with stigma depth than with style length in 42 bumblebee-pollinated *Pedicularis* species, consistent with Darwin's functional hypothesis between pollen size and stigma depth.]

Wat, E., Ng ChunFai, Koon ChiMan, Wong ChunWai ,Tomlinson, B. and Lau BikSan. 2016. The protective effect of Herba Cistanches on statin-induced myotoxicity *in vitro*. Journal of Ethnopharmacology 190: 68-73. [Concluding that the extract of *Cistanche* spp. could exert a protective effect on simvastatin-induced toxicity *in vitro*, suggesting its potential use in the situation of simvastatin-induced muscle toxicity.]

Watson, D.M. 2016. Fleshing out facilitation - reframing interaction networks beyond top-down versus bottom-up. New Phytologist 211(3): 803-808. [A discussion of the complex inter-relations of *Viscum album* with animals.]

*Weissenstein, U., Kunz, M., Urech, K., Regueiro, U. and Baumgartner, S. 2016. Interaction of a standardized mistletoe (*Viscum album*) preparation with antitumor effects of Trastuzumab in vitro. BMC Complementary and Alternative Medicine 16(August 2016): 271. (http://bmccomplementalternmed.biomedcentral.com/articles/10.1186/s12906-016-1246-2) [The study confirmed that the extract of *V. album* did not interfere with cytostatic effects of the standard drug Trastuzumab on SK-BR-3 breast cancer cells, had no adverse effect, and the combination exhibited complementary anti-cancer effects in vitro.]

Westerman, P.R., Hemerik, L., van der Werf, W., Stomph, T.J. and van Mourik, T.A. 2016. (Competition in populations of the hemi-parasitic plant *Striga hermonthica* on a sorghum host.) (in German) Julius-Kühn-Archiv 452: 100-102. [Pot experiments confirming strong intraspecific competition in populations of *S. hermonthica*, which was most intense during the holoparasitic phase.]

Wu ZhaoXi, Wang QianYang, Zhu KeShong, He Jun and He Jun. 2016. (Effect of different drying methods on the two flavonol glycosides content in *Thesium chinense* Turcz.) (in Chinese) Journal of Yunnan Agricultural University 31(4): 696-699. [Extracts of *T. chinense* have anti-inflammatory and analgesic activities. This study confirmed that the highest levels of kaempferol and quercetin glycosides are in the leaf and stem, and the best drying temperature is 60 or 80^{0}C.'The best drying method is drying' (*sic*!).]

*Xiaoxin Ye, Jie Chen, McErlean, C.S.P., Meng Zhang, Rui Yu and Yongqing Ma. 2017. The potential of foxail millet as a trap crop for sunflower broomrape. Acta Physiol Plant 39:1. doi:10.1007/s11738-016-2300-x [The rhizosphere soil of six foxtail millet cultivars grown in various sand/soil ratios and fertilizer levels were examined for their germination stimulation activities on *O. cumana*. The cultivar Hong Guzi grown in a 1:1 sand/soil ratio induced the highest germination. P application promoted while N greatly suppressed the germination inducing capacity of foxtail millet. These results suggest that using carefully selected cultivars of foxtail millet as trap crop is an effective way to reduce the *O. cumana* problem in China.]

Yagame, T., Ogura-Tsujita, Y., Kinoshita, A., Iwase, K. and Yukawa, T. 2016. Fungal partner shifts during the evolution of mycoheterotrophy in *Neottia*. American Journal of Botany 103(9): 30-1641. [Fungal partner composition and specificity level changed with speciation in both leafy and leafless *Neottia* species. In particular, mycorrhizal associations likely shifted from Sebacinales Group B to Group A during the evolution from autotrophy to mycoheterotrophy.]

Yan HongYu, Hu JiaLin, Bi Lei, Zhang Yuan and Yang Fei. 2016. Effects of *Loranthus tanakae* extracts on growth of *Rhodopseudanonas palustris*. (in Chinese) Zhongguo Weishengtaxixue Zazhi / Chinese Journal of Microecology 28(9): 1002-1004. [Confirming that the growth of *R. palustris*, a bacterium recognised as improving water quality, was promoted at low concentrations of *L. tanakae* extracts,]

Yang, C., Hu, L.Y., Ali, B., Islam, F., Bai, Q.J., Yun, X.P., Yoneyama, K. and Zhou, W.J. 2016. Seed treatment with salicylic acid invokes defence mechanism of *Helianthus annuus* against *Orobanche cumana*. Annals of Applied Biology 169(3): 408-422. [Seed treatment of an *O. cumana* –susceptible cultivar of sunflower with salicylic acid (SA) increased biomass of sunflower by reducing the number and biomass of established *O. cumana*. In the SA treated sunflower, systemic acquired resistance was induced and the endogenous SA level was increased in a dose-dependant manner. SA treatment, it was suggested, may also activate a hypersensitive reaction.]

Yang ShenMing, Wang Bo, Chen Jing, Wang ZhenJi, Jiang An and Zhang MingLan. 2016. Extraction of total flavonoids from *Yunnanopilia longistaminea* by ethanol reflux method and evaluation of its antioxidant activity. Storage and Process 16(4):61-66. [Describing a technique for extraction of active ingredients from *Y. longistaminata* (= *Champereia manillana*) (Opiliaceae).]

Yang XianYing, Liu AiLin, Liu ShuJing, Xu XiaoWei and Huang LinFang. 2016. Screening for neuraminidase inhibitory activity in traditional Chinese medicines used to treat influenza. Molecules 21(9): 1138. [Extracts from *Cynanchum wilfordii* and *Balanophora involucrata* significantly inhibited neuraminidase activity at a concentration of 40 µg/mL, confirming their clear anti-influenza viral effects.]

Yang, Z.Z., Zhang, Y.T., Wafula, E.K., Honaas, L.A., Ralph, P.E., Jones, S., Clarke, C.R., Liu, S.M., Su, C.H., Zhang, T., Altman, N.S., Schuster, S.C., Timko, M.P., Yoder, J.I., Westwood J.H. and dePamphilis, C.W. 2016. Horizontal gene transfer is more frequent with increased heterotrophy and contributes to parasite adaptation. PNAS 113(45): E7010-E7019. [see Literature Highlight above.]

Yao ZhaoQun, Tian Fang, Cao XiaoLei, Xu Ying, Chen MeiXiu, Xiang BenChun and Zhao SiFeng. 2016. Global transcriptomic analysis reveals the mechanism of *Phelipanche aegyptiaca* seed germination. International Journal of Molecular Sciences 17(7): 1139. [Deep RNA sequencing, including de novo assembly and functional annotation was performed on *P. aegyptiaca* germinating seeds. The assembled transcriptome was used to analyze transcriptional dynamics during seed germination. Key gene categories involved were identified. Overall, 5324 differentially expressed genes among dormant, conditioned, and GR24-treated seeds were identified. Moreover, ABA and ethylene were found to play important roles in this process. GR24 application resulted in dramatic changes in ABA and ethylene-associated genes.]

Yin XueZhe, Wang YuJiao, Yin JiFeng and others. 2016. (Effect of *Boschniakia Rossica* polysaccharides on expression of NF-κB in H2O2-damaged HepG2 cells.) (in Chinese) Chinese Journal of Gerontology 36(13): 3108-3110. [Concluding that *B. rossica* reduces the levels of iNOS and HO-1 proteins, probably via the reduction of NF-κB activation.]

Yoshida, S., Cui SongKui, Ichihashi, Y. and Shirasu, K. 2016. The haustorium, a specialized invasive organ in parasitic plants.Annual Review of Plant Biology 67: 643-667. [see Literature Highlight above.]

You ShuPing, Zhao Jun, Ma Long, Mukaram Tudimat, Zhang ShiLei and Liu Tao. 2016. (Effect and mechanism of *Cistanche* phenylethanoid glycosides on rats with immunological liver fibrosis.) (in Chinese) Chinese Journal of Pharmacology and Toxicology 30(5): 504-510. [Extracts of unspecified *Cistanche* sp. can significantly reduce the degree of BSA-induced liver fibrosis in rats. The mechanism may be associated with down-regulation of two types of collagens and suppression of the activation of hepatic stellate cells.]

Yule, K.M., Koop, J.A.H., Alexandre, N.M., Johnston, L.R. and Whiteman, N.K. 2016. Population structure of a vector-borne plant parasite. Molecular Ecology 25(4): 3332-3343 . [Studying the development of host specificity in *Phoradendron californicum* on hosts *Senegalia greggii* and *Prosopis velutina,* and relating it to synchronisation of flowering.]

Zamaloa, M.del C. and Fernández, C.A. 2016. Pollen morphology and fossil record of the feathery mistletoe family Misodendraceae. Grana 55(4): 278-285. [Fossil *Misodendrum* pollen was analyzed and features allowed differentiation of two groups that were in general agreement with subgenera *Misodendrum* and *Angelopogon*. UPGMA analyses of fossil and extant pollen showed Miocene pollen was most similar to subgenus *Angelopogon* whereas Eocene pollen was dissimilar to extant species.]

Zhang Chao, Chen Lei, Tian ChengMing, Li Tao, Wang Rong and Yang QiQing. 2016. (Predicting the distribution of dwarf mistletoe (*Arceuthobium sichuanense*) with GARP and MaxEnt models.) (in Chinese) Journal of Beijing Forestry University 38(5): 23-32. [While the main distribution area of *A. sichuanense* (on *Picea* spp.) is in Qinghai, Gansu, Sichuan and Tibet, the model suggests the junction area of Qinghai, Gansu and Sichuan as the most suitable for it.]

Zhang Li, Yue XinXia, Zhang Lei, Zhao JinFang, Chen YiMin, Cao ZhiJian and Lin YongLin. 2016. Anti-osteoporosis effect of *Cistanche deserticola* Ma extract in ovariectomized rats. Tropical Journal of Pharmaceutical Research 15(9): 1929-1933. [The study indicates that an extract from *C. deserticola* prevents OVX-induced osteoporosis in rats, 'and could be used for treating osteoporosis in elderly women'.]

Zhenzhen Yang, Yeting Zhang, and 14 others. 2016. Horizontal gene transfer is more frequent with increased heterotrophy and contributes to parasite adaptation. Proceedings of the National Academy 113(45): E7010-E7019. (http://www.pnas.org/content/113/45/E7010.abstract) [See Literaturen Highlight above.]

Zhou QinFen, Li Jie, Tan ManLiang and Luan LianJun. 2016. (Optimization of saponification of nervonic acid glyceride from *Malania oleifera* oil by response surface methodology.) (in Chinese) China Oils and Fats 41(8): 45-48. [Relating to *M. oleifera* (Olacaceae).]

Zimmermann, J., Musyoki, M.K., Cadisch, G. and Rasche, F. 2016. Biocontrol agent *Fusarium oxysporum* f. sp. *strigae* has no adverse effect on indigenous total fungal communities and specific AMF taxa in contrasting maize rhizospheres. Fungal Ecology 23: 1-10. [Confirming that *F. oxysporum* 'Foxy 2' had no adverse effect on other soil microflora when used as a biocontrol agent against *Striga hermonthica.*]

Zucca, P., Argiolas, A., Nieddu, M., Pintus, M., Rosa, A., Sanna, F., Sollai, F., Steri, D. and Rescigno, A 2016. Biological activities and nutraceutical potentials of water extracts from different parts of *Cynomorium coccineum* L. (Maltese Mushroom). Polish Journal of Food and Nutrition Sciences 66(3): 179-188. [Studies in Italy show that the different traditional medicinal uses of *C. coccineum* depend on different tissues. Thus antioxidant activity was mainly due to anthocyanins in the external layer, whereas the external layer and peeled plant extracts both inhibited the microbial growth of several Gram-positive strains. In contrast, the whole plant extract had the highest anti-tyrosinase activity and exhibited pro-erectile activity when administered subcutaneously.]

Zwanenburg, B., Mwakaboko, A.S. and Chinnaswamy Kannan. 2016. Suicidal germination for parasitic weed control. Pest Management Science 72(11): 2016-2025. [A general perspective describing suicidal germination inducers as a possible control measure for root parasitic weeds. Results of field experiments with Nijmegen-1 and Nijmegen-1 Me (containing an additional methyl group at 3' of the butenolide ring) at 6.25 g/ha to tobacco fields infested with *Phelipanche ramosa* resulted in generally good to excellent control when suitable pre-conditioning had occurred. Other options for parasitic weed control are also discussed.

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