MESSAGE FROM THE IPPS PRESIDENT (Julie Scholes).................................................................2

MEETING REPORTS
XIX International Botanical Congress, Shenzhen, China, July 23-29, 2017.................................2
26th Asian Pacific Weed Science Society Conference, Kyoto, Japan, 19-22 September, 2017...............4

LITERATURE HIGHLIGHT
Amino acids for parasitic weed management (Monica Fernandez-Aparicio)............................5

STRIGA ASIATICA IN RWANDA (Lytton Musselman).........................................................................7

PRESS REPORTS
Weeding out Striga from African drylands..................................................................................8
Purdue poised to improve sorghum for millions with $5 million grant......................................9
Kenyan scientists find new Striga resistance genes in wild sorghum............................................9
Why the evolutionary link between flowerpeckers and mistletoes is crucial to the forests...........10
Mistletoe – control with WD-40?..................................................................................................10
This parasitic vine helps plants communicate (Cuscuta)...............................................................11
Native mistletoe (Ileostylymicranthus) makes a comeback in Canterbury (New Zealand)...........12
Tenbury mistletoe auction draws crowds in bumper year (plus video)........................................14

THESIS
Host range and intraspecific competition in the facultative root hemiparasite Odontites vulgaris. (Uwe T. Nickel) ....14

JONNE - MOVING ANNOUNCEMENT.................................................................................................14

BOOK REVIEW – Plants of the World: An Illustrated Encyclopedia of Vascular Plants (L. Musselman)...14

‘LORANTHUS MICRANTHUS’– CORRECTION...................................................................................14

FORTHCOMING MEETINGS:
28th German Conference on Weed Biology and Weed Control February 27 – March 1, 2018 ............15
7th International Food Legume Research Conference, May 6-8, 2018...........................................15
18th European Weed Research Society Symposium, June 17-20, 2018..........................................15
4th International Conference on Agricultural and Biological Sciences June 26-29, 2018..................15

GENERAL WEBSITES.....................................................................................................................15

LITERATURE.....................................................................................................................................16

IPPS membership..........................................................................................................................34

End Note........................................................................................................................................34
MESSAGE FROM THE PRESIDENT

Dear IPPS members,

I would like to wish everyone a very happy New Year!

In November this year the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in collaboration with the Biosciences eastern and central Africa – International Livestock Research Institute (BecA-ILRI) Hub, organized a two-day Striga workshop on ‘Renewed Strategies for Striga Management’. The workshop brought together ideas from stakeholders and experts in different areas of Striga management and research to discuss the current status of Striga control, the impact of available technologies and new developments in Striga research worldwide with the aim of improving Striga control. The meeting was extremely interesting and one outcome was the idea to form an ‘Alliance for Striga Control in Africa’ that would define and make recommendations for Striga research investment that would hopefully result in improved strategies for control of Striga in the near future. For an overview of this meeting please see the article written by Jerome Bossuet from ICRISAT India (http://news.trust.org/item/20171208092958-qfxpo/) (see also below under Press Reports)

Next year looks like a very busy year for meetings involving parasitic plants! There are already four conferences with likely sessions on parasitic weeds: the 28th German Conference on Weed Biology and Weed Control in March in Braunschweig, Germany, the 18th European Weed Research Society Symposium in June in Slovenia, the 7th International Food Legume Research Conference, Marrakech, Morocco, and the 4th International Conference on Agricultural and Biological Sciences in Habzhou, China. Further details can be found under Forthcoming meetings. Details of other meetings and of the venue for our next WCPP meeting in 2019 will appear in the next issue of Haustorium.

With very best wishes for a successful 2018

Julie

Julie Scholes, IPPS President (j.scholes@sheffield.ac.uk)

MEETING REPORTS


The 17th International Botanical Congress was held from July 23-29 in Shenzhen, China. Nearly 7000 participants from 109 countries attended the congress. In total, 212 symposia belonging to six themes were organized, with 1447 oral presentations and 51 specially invited lectures (5 public lectures, 12 plenary lectures and 34 keynote lectures). The weeklong gathering of scientists from all around the world over such a broad scope greatly facilitated academic exchanges across disciplines and encouraged the participants to think outside the box for a better understanding of their research questions. Abstracts can be downloaded at http://www.ibc2017.cn/Download/.

Symposium: Ecology and Evolution of Parasitic Plants

The keynote lecture by Claude dePamphilis, began with a brief introduction to 11 primary lineages of haustorial parasitic plants. The focus was then on data from the Parasitic Plant Genome project and how stage-specific transcriptome data, mainly from Phelipanche aegyptiaca, Striga hermonthica, and Triphysaria versicolor, has led to the discovery of a set of evolutionarily conserved ‘parasite genes’ that are upregulated in parasitic processes of the different parasites, and originated from both Old and New genes that evolved haustorial expression and function. Manipulation of the expression of these genes is helping to understand parasite processes and suggesting ways to interrupt the parasitic process. Stolen genes, obtained via functional horizontal gene transfer (HGT) from ancient host plant lineages, and now expressed in haustorial processes form a third category of parasite genes that can be detected through careful bioinformatic analysis in Orobanchaceae and also in Cuscuta where especially large numbers of HGT events are being detected.

The power of comparative transcriptomics was leveraged also by Yasunori Ichihashi, to get the first glimpse at stage-specific gene expression patterns in three different parasite lineages (Orobanchaceae, Cuscuta, and Thesium chinense). A new low cost method of RNA-seq library construction was used. Comparisons of Striga and Cuscuta showed stage specific expression patterns, with many similar gene categories being enriched in haustorial libraries. A gene co-expression network found 200 robust hub genes in the Cuscuta haustorium cluster. Related genes, encoding a plant-specific transcription factor, Late Organ Boundaries Domain (LBD), is upregulated in haustoria in all three groups. This suggests that recruitment of LBD genes that serve as key developmental regulators may enable the evolution of haustoria in parasitic plants. Functional analysis is underway, with an initial experiment showing that a promoter sequence cloned from Phtheirospermum japonicum (Orobanchaceae) LBD gene drives strong expression in specific haustorial cells of this parasite.

Joshua P. Der provided an overview of the astounding
diversity of structure and parasitic ability in plants of Santalales, the largest and one of the oldest groups of parasitic plants. Non-parasites, facultative parasite, obligate parasites, trees, shrubs, mistletoes, and highly modified holoparasites (Balanophoraceae) are all found in this order of 160 genera and over 2200 species. He then presented the history and current status of phylogenetic classification of the sandalwoods, which has remained challenging in part due to extremely divergent or missing plastid genes in the holoparasites that made the relationships of Balanophoraceae very difficult to resolve. Published classifications have also disagreed on how many families should be recognized, even when referring to the same phylogenetic evidence. Recent phylogenies, based on seven shared nuclear, mitochondrial, and plastid sequences provide a well-supported backbone phylogeny that places Balanophoraceae confidently within Santalales. Der has launched an extensive new genome sequencing effort of 51 diverse Santalalales species from 17 of 18 family-level clades, ‘skimming’ of data from all three genomic compartments that is rapidly expanding the molecular evidence available for high resolution phylogenetics. Alignments and phylogenies using multiple phylogenetic methods, provide 100% bootstrap support for all previously recognized families, and added resolution many areas in the tree, allowing inference of the evolutionary history of the mistletoe habit as well as further insights into relationships among major lineages within the order.

Lynton Musselman presented a study led by doctoral student Nicholas Flanders on factors that determine the distribution of the oak mistletoe, Phoradendron leucarpum, in the eastern United States. Although capable of parasitizing a wide range of hosts, P. leucarpum often has a narrow host range at a given location. What are the factors that determine host preference in a given area, and how are these patterns established and maintained? A combination of local census data and experimental plantings found overall Quercus nigra was the most common host, but maples were most common in other areas, intensity of parasitism varies from location to location. Experiments were done to investigate possible responses to volatile monoterpenec cues. Statistical analysis found no significant relationship between local light level and seedling survival and establishment, but hosts in wetlands were more frequently parasitized than the same host species in drier uplands. The foraging and movement patterns of avian frugivores like the cedar waxwing likely play a more influential role in determining the observed host preferences at a given site.

Ai-Rong Li described a rapid and very recent range expansion involving the hemiparasite Pedicularis kansuensis in western China. In just two decades, P. kansuensis has expanded into large tracts of grassland, reducing foraging quality, and threatening the local livestock industry. Dr. Li’s group is performing lab- and field-based experiments to understand what is behind this aggressive expansion and discover potential strategies for limiting its success. P. kansuensis appears to maintain high genetic variability as well as morphological and phenotypic plasticity, and like other Pedicularis species is a generalist species with many potential hosts. Imbalanced N:P ratios have a strong impact on P. kansuensis and the surrounding plant community. Results also indicate that shifts in climate are favoring P. kansuensis, as do monocultures of highly suitable hosts, overgrazing and degradation of soil quality, transport of contaminated seed lots, and a frequent lack of understanding about the dangers posed by this newly invasive species.

Peter Toth provided a fascinating analysis of plant-herbivore chemical interactions involving an oligophagous fly, Phytomyza orobanchia, that consumes the seed capsules of broomrape (Orobanche and Phelipanche species), and could act as a potential biocontrol agent for the parasites. Using Y-shaped tubes that allowed flies to choose whether to move toward either host plant or parasitic plant volatile compounds, flies were shown to be attracted by volatile chemical signals emitted by the parasites. Next, organic compounds were collected from 21 different broomrapes and their hosts, and subjected to GC-MS analysis, finding 40 mutually shared volatile compounds in all broomrapes tested. Then, detached antennae were used to measure antennal responses to the chemical signals, making it possible to pick out specific compounds that stimulated an antennal response. From a huge number of detected volatile compounds – about 150 compounds per species - field tests identified ones that were relatively attractive to P. orobanchia. Compounds eliciting a large response in the fly antenna included 3-octanol, nonanol, and tricosane, but mixtures of these three in specific ratios were particularly attractive to the fly. The results could be leveraged to create traps that could help to attract seed predators to broomrape infested fields.

Alex Twyford is using high resolution morphometrics and genome scale molecular evidence to better understand a taxonomically complex group of hemiparasites, the British eyebrights (Euphrasia spp.). Euphrasia plants and flowers are small and species display extensive phenotypic variation when grown on different hosts, leading to highly divergent classifications and recognized species numbers. Charles Darwin himself found this group to be particularly perplexing, and hoped that an energetic young scientist would one day devote himself to its solution, as Twyford is now doing! A huge common garden experiment was performed with many species grown on multiple hosts. Large host-induced phenotypic
differences were observed within and among species, but taxonomically important species traits remained relatively stable, providing support for recognized species. In contrast, ITS sequencing gave no species resolution, but did detect deeply diverged diploid vs. tetraploid lineages. Large scale genetic evidence from provided with genotyping by sequencing (GBS), resolved eight very clean clusters, some corresponding to species, and others corresponding to geographical areas such as a single island, suggesting the possibility of hybridization in local areas. This led to the important conclusion that species differences in Euphrasia could be due to differences in relatively small parts of the genome, and maintained by divergent natural selection.

Susanne Wicke provided a rigorous examination of the evolution of organellar genomes and how nuclear data are helping to better understand the biology and molecular evolution of Orobanchaceae with different degrees of heterotrophic dependence. Due in large part to data generated and analyzed by Dr. Wicke and colleagues, recent years have seen major steps toward the development of a comprehensive understanding of evolution of plastid genomes in parasitic Orobanchaceae. Plastid genomes undergo rampant - and surprisingly rapid - genome reduction and gene loss, as well as accelerated rates of sequence evolution with increasing heterotrophy. In contrast, mitochondrial genomes expand in size in more heterotrophic parasites. Nuclear gene data displays a surprising retention of nuclear-encoded components of photosynthesis-related genes, suggesting a slower loss process in the nuclear genome as compared to the plastome. Shifts in rates of molecular evolution and functional constraint can be detected in parasitic plants in hemiparasitic lineages long before the loss of photosynthesis. Wicke described a co-evolutionary feedback loop that progresses at different rates, but affects all three genomic compartments.

This session was co-chaired by Wenbin Yu and Airong Li under the theme Taxonomy, Phylogenetics and Evolution. Six speakers were invited (as below). Similar to research in other plant groups, investigations of taxonomy, evolution, and symbiotic interactions involving parasitic plants at genomic levels have been hot topics that contribute greatly to our understanding of plant parasitism.

Claude dePamphilis - Genomic and evolutionary insights into being a parasitic plant: old genes, new genes, stolen genes.

Yasunori Ichihashi - A potential key factor for the evolution of parasitic plants.

Joshua P. Der - Phylogenetic analysis of relationships within the sandalwood order (Santalales).

Lynton J, NMusselman - The role of generalist avian frugivores in determining the distribution of the mistletoes Phoradendron leucocarpum.

Ai-Rong Li - What makes Pedicularis kansuensis a successful invader?

Peter Toth - Insect plant interaction in broomrapes.

Alex Twyford - On the nature of species differences in hemiparasitic Euphrasia.

Susann Wicke - Integrating nuclear gene data sheds new light on organellar genome evolution in Orobanchaceae.

Symposia - The biology of mycoheterotrophic plants

Sasa Stefanovic - Comparative plastome genomics in Ericaceae: plastid gene losses and rearrangements across all trophic levels

Gerhard Gebauer - Partial mycoheterotrophy is more widespread among orchids than previously assumed: A multi-element stable isotope natural abundance approach

Vincent Merckx - Arbuscular mycorrhizal interactions of mycoheterotrophic plants

Sofia Gomes - Global distribution of mycoheterotrophic plants

Sean Graham - Organellar phylogenomics and molecular evolution in mycoheterotrophic plants

Craig Barrett - Plastid genome evolution in mycoheterotrophic orchids

E. Shepeleva - Phylogenetic Analysis of the Mycoheterotrophic Genus Thismia (Thismiaceae, Dioscoreales) Based on Molecular and Morphological Data

Lorenzo Pecoraro - Mycorrhizal Diversity and Nutritional Strategies in the Fully Mycoheterotrophic Orchid Epipogium roseum

Claude DePamphilis - Phylotranscriptomic Analysis of Mycoheterotrophic and Non-mycoheterotrophic Lineages in the Pandanales and Dioscoreales

AiRong Li and Claude de Pamphilis


Relevant presentations:

Shayanowako, A.I.T et al. - Screening maize for compatibility with F. oxysporum to enhance Striga Asiatica (L.) Kuntze. resistance

Na Zhang et al. - iTRAQ-based differential expression proteomics in roots of sunflowers differing in resistance to Orobanche cumana

Cumali Ozaslan et al. - Broomrape infestation in lentil crop and farmer knowledge on the management of parasitic weed species in Diyarbakr province, Turkey

Anil Kumar, R. et al. - Herbicidal management of parasitic Dendrophthoe in semi- temperate and temperate fruit crops of Jammu-Kashmir Himalayas
Amino acids for parasitic weed management.

Amino acids are the building blocks of proteins for all biota in agricultural systems. They are intermediaries in the soil nitrogen cycle between degradation of decaying organic matter and the mineralized nitrogen forms ammonium and nitrate. In addition, amino acids appear in the rhizosphere as a result of lysis and active efflux from microbial and plant root cells. While plants and microbes prefer to uptake inorganic nitrogen, they also present the capacity for taking up amino acids using different transport processes that present increased molecular complexity (Owen and Jones, 2001; Nasholm et al., 2009). An increased crop ability to uptake amino acids from the rhizosphere is an interesting trait to select for low nitrogen-input agronomic systems that rely on organic matter (Reeve et al., 2009; Moe 2013). Besides their role as a nitrogen source, the abundance and content of amino acids in the rhizosphere affect microbial phenotypes relevant for rhizosphere function. Microbial motility, colony development or sporulation are known to be influenced by amino acids (reviewed in Moe 2013). On the other hand, certain amino acids toxic to the microbial community are deposited in the soil by some particular species of rhizospheric biota which do not succumb themselves to their own delivered toxicity suggesting a function in ecological niche colonization (Valle et al., 2008). Microbial-derived efflux of amino acids can also be toxic for plants. As an example, Frenching disease is a crop physiological disorder caused by high levels of isoleucine efflux by saprophytic rhizobacteria. In Frenching soils, susceptible crops develop symptoms of chlorosis, wilting and stunting (Steinberg 1946).

Plant growth inhibition observed by abundance of certain amino acids is usually the result of the activation of negative feedback during amino acid biosynthesis. This is the case with branched enzyme networks such as the biosynthesis of aromatic, branched-chain or aspartate-derived amino acids. This regulatory mechanism maximizes efficient exploitation of resources preventing too much of a specific product to be made in detriment of other products that the cell needs as well. Too much of a specific end-product shuts off its production by deactivating an enzyme participating in its synthesis. In some cases, the deactivation of the enzyme induces starvation for other amino acids produced in parallel. For example, in the above-mentioned Frenching disease, high levels of isoleucine efflux by saprophytic bacteria causes the inhibition of acetolactate synthase (ALS) an enzyme in the branched-chain pathway causing valine and leucine starvation. Similarly, key enzymes in the aspartate-pathway of amino acid synthesis can be deactivated by abundance of lysine or threonine or their combination causing methionine starvation. On occasions, such inhibition phenomena limit protein synthesis and growth and can be abolished by exogenous provision of the offended amino acid (Piryns et al., 1988; Henke et al., 1974).

The patterns of amino acid inhibition and rescue depend on a variety of factors including plant species, plant growth stage and amino acid concentration (Henke et al., 1974) which are exploitable in crop protection in order to differentially target pests without detrimental inhibition for the crop species. In fact, several crop protection methods are inspired by the natural process of amino acid inhibition. For example, herbicides such as imidazolinones and sulfonylureas inhibit the enzyme ALS, slowly killing the weed by starving it of branched-chain amino acids (Duggleby et al. 2008). Another example is the use of mycoherbicides with enhanced efficacy against weeds through increased efflux of amino acids toxic to the target weed. Such is the case of the 45- to 65-% enhancement of mortality observed in wild hemp treated with valine-overproducing variants of the mycoherbicide Fusarium oxysporum f. sp. cannabis in comparison to the weed control obtained with the wild-type F. oxysporum f. sp. cannabis strain (Tiourebaev 1999; Tiourebaev et al. 2001). Another alternative is based on the innate ability of allelopathic crops to naturally compete against weeds. Plants deposit through root exudation a complex collection of chemicals with amino acids being the second most abundant class of compounds exuded (Jaeger et al., 1999) which in some cases include amino acids acting as natural herbicidal weapons. Such is the case of roots of festuca grasses that exude a potent herbicidal amino acid m-tyrosine whose weed killing action is probably caused by negative feedback for phenylalanine biosynthesis in weeds growing around them (Bertin et al., 2007). Finally, the direct application of inhibitory amino acids to agricultural soils has been effective not only for the control of weeds such as Canada thistle, red broomegrass, kudzu and cannabis (Sands and Pilgeram 2009) but also other pests such as plant-parasitic nematodes (Zhang et al., 2010).

Broomrapes (Orobanche and Phelipanche species) are holoparasitic weeds that attack crops withdrawing nutritive resources from their roots via haustorial connections (Parker 2013). They are very difficult to control because once seedlings of broomrape weeds attach to the crop root they merge as a whole organism. It becomes very difficult to inhibit the development of broomrape without damaging the crop. Although broomrapes depend on the crop for essential inorganic and organic resources, they possess their autonomous amino acid biosynthesis pathways which are targeted by the amino acid-inhibiting herbicides glyphosate, imidazolinones and sulfonylureas (Dor et al., 2017). Those herbicides are delivered on the foliage of an
herbicide-tolerant crop and transported downwards to the underground parasite across the haustorium (Eizenberg et al., 2013). Those herbicides exert the inhibitory action on the aromatic and branched-chain amino acid-biosynthesis pathways locally in the parasite by inhibiting the parasite encoded EPSPS and ALS without affecting amino acid synthesis in the crop which has been selected to resist the herbicide (Dor et al., 2017). A biotechnological alternative to amino acid-inhibiting herbicides could be engineering future transgenic crops harbouring silencing constructs against the broomrape-encoded ALS or EPSPS genes. Silencing signals that specifically target the expression of parasitic weed-encoded genes have been proved to translocate across the haustorium (Tomilov et al. 2008, Aly et al., 2009).

Parasitic weed growth is inhibited by exogenous application of specific amino acids but their mode of action has not been revealed (Vurro et al., 2006; Nzioki et al., 2016; Fernandez-Aparicio et al., 2017). The lack of identification of amino acids that abolish the inhibition renders uncertain whether the inhibitory action observed is caused by specific antimetabolite effect in which negative feedback triggered by the inhibitory amino acid causes starvation for another amino acid essential for parasitic weed growth or, by a separate phenomenon of general amino acid toxicity, of yet unknown molecular basis. Anyway, the effect of amino acids in weed parasitism is considered valuable for developing alternative control strategies because it has the potential to develop species-specific pesticides due to the differential inhibition patterns between parasitic weed species and also between parasitic weed species and their crop hosts. This strategy also has the potential to develop pesticides with low persistence in the soil as the applied amino acids is expected to be rapidly depleted by soil-dwelling microbes (Jones and Kielland, 2012). Preliminary steps towards including amino acids in sustainable management strategies have been taken. For example, the germination of Phelipanche ramosa and Orobanche minor is inhibited by amino acids such as methionine at concentrations that are not inhibitory to their respective hosts tomato and red clover. Leucine and tyrosine are toxic to Siriga hermonthica but innocuous to its host maize. The effects of these amino acids at field scale have been investigated in crops of red clover and maize respectively using strategies of direct soil application of methionine or using bioherbicides with high levels of leucine and tyrosine efflux. Both techniques showed significant reduction levels of parasitic weed infection (Nzioki et al., 2016; Fernandez-Aparicio et al., 2017). In addition to amino acid application via direct delivery or microbial efflux, the potential of root exudates containing orobanchicidal amino acids can be investigated in strategies of cover crops or intercrops. For example, root exudates of clover, a host crop for O. minor but not for P. ramosa are rich in glycine (Lesuffleur et al., 2007). Interestingly, glycine is reported to be a strong inhibitor of P. ramosa (Vurro et al., 2006), while it does not inhibit O. minor germination (Fernandez-Aparicio et al., 2017). Deploying such an approach opens the way to the design of sustainable alternatives finely crafted against the specific local weed problem. Another possibility could be selecting crops with altered amino acid exudation. In rhizotron experiments performed in our lab, Phelipanche seeds showed reduced capability to infect roots of tomato plants with increased efflux of lysine. This preliminary information warrants further investigations towards putting amino acid-based techniques into commercial practice for parasitic weed control.

Literature cited


Mónica Fernandez-Aparicio, CSIC, Institute for Sustainable Agriculture, Córdoba, Spain and Xavier Reboud, Agroécologie, AgroSup Dijon, INRA, Université Bourgogne Franche-Comté, Dijon, France

**STRIGA ASIATICA IN RWANDA**

In August 2017 I was part of an Anglican mission team partnered with ECHO ([https://www.echonet.org/](https://www.echonet.org/)), an NGO that works with subsistence farmers. We conducted a training session in the village of Mbyo, southeast of the Rwandan capital of Kigale. My part of the endeavor was a presentation on parasitic weeds. In my African experience I never thought of Rwanda as having a serious witchweed problem. But when I asked the farmers if they knew the plant based on images I showed, they said they were familiar with the parasite. So I asked them to bring plants from their farms to the next day’s session. To my amazement 18 of the approximately 35 farmers brought bunches of Striga asiatica from their farms, many of them in flower. These plants showed the typical habit of the parasite and had crimson flowers. They were obviously at the end of their growing season as most plants were loaded with seeds.

The crops that were reported as being affected were maize and sorghum. One farmer told me that 15 years earlier his maize field was so heavily infested that he stopped growing maize. After this interval he planted maize and sorghum. One farmer told me that 15 years earlier his maize field was so heavily infested that he stopped growing maize. After this interval he planted maize and sorghum. One farmer told me that 15 years earlier his maize field was so heavily infested that he stopped growing maize. After this interval he planted maize and sorghum. One farmer told me that 15 years earlier his maize field was so heavily infested that he stopped growing maize. After this interval he planted maize and sorghum. One farmer told me that 15 years earlier his maize field was so heavily infested that he stopped growing maize. After this interval he planted maize and sorghum. One farmer told me that 15 years earlier his maize field was so heavily infested that he stopped growing maize.

While *S. asiatica* has been reported from this central African nation, there are few reports of extent or damage. Farmers did not seem acquainted with *Striga hermonthica* nor with *S. gesnerioides.*

Lytton Musselman.
PRESS REPORTS

Weeding out *Striga* from African drylands

*Striga* experts from Europe, USA, Africa and Asia gathered for two days 28-29 November 2017 at the Biosciences Hub for Eastern and Central Africa (BecA) in Nairobi to discuss viable options for tackling this weed that has plagued sub Saharan African agriculture for decades. Despite its striking purple flowers and potential medicinal uses, the parasitic (nutrient sap sucking) *Striga* weed or witchweed is no innocent pest. A lasting and very damaging weed for the major cereal crops in sub-Saharan Africa, it can cause up to 100% crop losses across millions of hectares of farmland and an annual loss of several billion dollars. Once the field is infected with *Striga*, farmers can’t get rid of this pest easily. Like black dust, these tiny seeds produced in large quantities – one spikelet can produce over 50,000 seeds - spread rapidly within the farming community. The seeds can remain viable for up to 20 years under the right conditions until a host plant, usually a cereal crop like rice, maize, sorghum or millet, emits germination signal molecules called strigolactones at the root zone. The invisible pest develops underground, sucking life from the host root. After a month when it appears over ground, it is almost too late.

Researchers and practitioners have been on the case for decades, yet paradoxically, we still don’t know enough about the extent and intensity of *Striga* invasion, judging by the differences in the figures on damage impact circulated by different scientists during the workshop. And although *Striga* biology is now understood up to the molecular level, some practical aspects are not necessarily grasped by smallholder farmers. A young farmer who had just inherited a pristine plot of land borrowed ploughing equipment used in his father’s *Striga*-contaminated fields and ended up spreading the weed in one season.

Julie Scholes, a professor from Sheffield University in the UK says there is still a lot to discover at molecular level on how *Striga* and host plants interact. She uses rice as one of the host plants, which she inoculates with *Striga* seeds under rhizotrons, large perplex root chambers that facilitate easier observation of *Striga* invasion of the host and its development. Her work shows that there are different *Striga* ecotypes with varying levels of aggression depending on host plant and agroecologies.

It has been observed that poor soil fertility and drought are worsening *Striga* infection. Harro Bouwmeester, a professor from the University of Amsterdam has researched how soil fertility could affect plant signalling during *Striga* interaction with the host. He reports about 20 different types of strigolactones that may or may not be specific to the host. Experiments in West Africa showed that in phosphate deprived soils, sorghum host plants were producing more strigolactones. On the contrary, phosphate fertilization could reduce *Striga* occurrence by 40 to 80% and improve sorghum harvests by up to 142%. However, similar experiments in maize fields in Eastern Africa showed less effect with nitrogen fertility levels. It shows that further soil and water management research is needed to better understand which soil qualities could block or slow *Striga* infestation.

Prof Abdalla Mohammed who has been breeding *Striga* tolerant sorghum varieties using molecular marker-assisted technologies calls for integrated *Striga* management options combining soil fertility improvement, collective weeding, water conservation and use of improved seeds, as experienced by ICRISAT in Mali.

Many approaches have been tested to fight *Striga* with varying levels of success. These range from low tech solutions, like the use of trap crops, like desmodium a cover crop that induce “suicidal germination” of *Striga* seeds without allowing the *Striga* plantlet to anchor to their roots, to more sophisticated practices, like seed treatment – eg IM maize popularized by the African Agricultural Technology Foundation - or the development of *Striga* resistant crops through plant breeding. Most experts admit that adoption of such innovations has not been high in many African countries although there are limited studies to explain the observed low adoption among farmers.

While Jeff Ehlers, senior programme officer at the Bill and Melinda Gates Foundation recalled working in Western Kenya in late 1980s with 6 million people affected by the weed at the time, recent statistics provided by agricultural economist Hugo deGroot at CIMMYT, who studies *Striga* economics for years, shows that in many parts of Africa, the scenario unfortunately worsened with even more people affected.

There is a call to form an **Alliance for Striga Control in Africa** which could define a common research for fast action agenda to fight *Striga* and mobilize governments to reclaim *Striga* infested lands. Like the Economics of Land Degradation Initiative built a case assessing the global cost of inaction on soil fertility, *Striga* experts need to build a narrative on why the fight against *Striga* is still so important today.

Dr Senait Senay, research associate on ecological informatics at International Science & Technology Practice and Policy (INSTEPP), shows how mapping scenarios of pest invasions can help prioritize geography of interventions, evaluate costs and benefits of eradication programmes. The GEMS platform
(GEMS stands for Genetics x Environment x Management x Socioeconomical data) , modelling presence and absence of a pest – Striga in this case – against layers of environmental data like climate, soils, can then map the risks of Striga infestation now and in the future.

There is an urgent need to work with farmers and social scientists to understand what would trigger adoption or rejection of some interventions. The push pull approach for instance may be effective in pilot testing but farmers who practice intercropping may not want to replace essential food crop like groundnut with desmodium intercrop. While breeding for resistance, plant scientists should consider that farmers may reject a new variety if the shape of the plant, taste and colour of grain are far from their usual expectations.

We need to look at the practicalities, access and affordability of the solutions and ensure we use a multidisciplinary approach including microbiologists, breeders, agronomists, soil scientists, economists and sociologists.

Jerome Bossuet, ICRISAT
Friday, 8 December 2017

Purdue poised to improve sorghum for millions with $5 million grant

Gebisa Ejeta, a distinguished professor in the Department of Agronomy at Purdue University, has received a $5 million grant from the Bill & Melinda Gates Foundation to further his team’s research on stronger varieties of sorghum. Purdue University scientists will develop stronger, more versatile varieties of sorghum that have the potential to reach millions of African farmers, The foundation’s grant is the second for Gebisa Ejeta, a distinguished professor in the Department of Agronomy and director of the Purdue Center for Global Food Security.

Ejeta(above), the 2009 World Food Prize laureate, was recognized for his work in developing and distributing high-yielding varieties of sorghum that are also drought-tolerant and resistant to Striga, a parasitic weed that robs maize, sorghum, rice, pearl millet and sugarcane of necessary nutrients. Striga can devastate a crop and impacts more than 100 million people in Africa.

Over the last four years, Ejeta, along with his students and research collaborators, uncovered the basic genetic and biological processes that control Striga resistance in sorghum. They identified a gene involved with the release of a chemical from sorghum roots that signals Striga seed to germinate and attach to those roots. That has led to the creation of new sorghum varieties that combine Striga- and drought-resistance more readily using molecular technology. So far, 961 tons of seed have been distributed to more than 400,000 farmers in Ethiopia and Tanzania. ‘With more high-throughput phenotyping and the ability to sequence a large slate of genotypes, we identified an important gene that is foundational for imparting Striga resistance,’ Ejeta said. ‘It helps to move that gene with confidence and consider new ways of exploiting that gene. Some of that we’ve already been working on.’

This next phase of the program will focus on advancements in biological research, specifically identifying more genes involved in imparting broad-based and durable Striga resistance in sorghum and other crops. ‘We would have multiple genes that we can move around and pyramid together, so there is no risk of one gene breaking down in the future,’ Ejeta said.

The new project will expand to support researchers in Tanzania, Kenya, Rwanda, Sudan, Niger, Nigeria, Burkina Faso and Mali to develop a breeding pipeline for more high-yielding, nutritious, disease-resistant and drought-tolerant varieties of crops. The project plans to support private seed systems that will distribute high-quality hybrid sorghum seeds more effectively in those countries. ‘This creates opportunities for farmers and small businesses to engage in gainful employment and develop the agricultural industry in these countries,’ Ejeta said.

Brian Wallheimer,

Kenyan scientists find new Striga resistance genes in wild sorghum

Wild sorghum will soon provide a reservoir for resistance genes against Striga. A research team lead by Dr. Steven Runo of the Plant Transformation Laboratory (PTL) at Kenyatta University and Professor Michael Timko of University of Virginia has identified three wild sorghum accessions resistant to Striga hermonthica (witchweed), a parasitic plant devastating cereal production in Sub-Saharan Africa. Striga is a
growing pandemic in Africa and Asia, with ability to destroy a crop with up to a 100% yield loss. Today, 300 million farmers from over 25 countries in Sub-Saharan Africa incur losses in excess of $7 billion annually due to *Striga* infestation. Covering over 100 million hectares, the weed has particularly established host in key regional staple crops maize, sorghum, millet, and upland rice, greatly undermining the efforts to attain food security and economic growth. In a regional collaborative research programme published in *Frontiers in Plant Science*, the team reports having found potential sources of mechanical and biochemical barriers to *Striga* infection that could be employed in genetic improvement of cultivated sorghum. Wild sorghum immune to *Striga* infestation coexists with the parasite in uncultivated lands in northeastern Africa. This offers an opportunity to pinpoint key resistance genes in wild sorghum that can be stacked in farmer-preferred varieties. This study provides a potential to increase the genetic basis of cultivated sorghum with wide-reaching implications for *Striga* control in other cereal crops by pyramiding multiple resistance genes.

(For more information: e-mail mkarembu@isaaa.org)

Biotechnology News. Outlooks on Pest Management, December 2017

**Why the evolutionary link between flowerpeckers and mistletoes is crucial to the forests**

(abridged)

Mistletoes sustain a large number of species worldwide – flowerpeckers, the barbet-like tinkerbirds of Africa, the mistletoebird and honeyeaters of Australia, the sunbirds and white-eyes of Asia, mouse lemurs and sifakas of Madagascar, tyrant and silky flycatchers and colocolo opossums of the Americas, the eponymous mistle thrush of Europe, myriad insects and other creatures.

You would hardly notice a flowerpecker in the rainforest – the bird is small enough to hide behind a leaf or to hold in a closed fist, and drab enough to escape the attention of anyone but an ardent birdwatcher. The undistinguished little bird is dull olive brown on top and a rather dingy white below, with a sharp, glinting, dark and attentive eye and a gently curved beak to poke among the flowers. A metallic, fidgety tick-tick-tick call announces her presence as she darts through the boughs. You have to be quick to spot her before she disappears.

I’ve traveled far from my home in the mountains of the Western Ghats in South India, to see this flowerpecker. And not just any plain flowerpecker, but a particular one: a bird flitting among the mistletoes on the same trees where I had seen the species two decades earlier.

I am seated on the steps of the Dampatlang watchtower in Dampa Tiger Reserve in Mizoram. Seated two stories high on the watchtower, I am almost eye-to-eye with the flowerpecker. The bird flits from branch to branch, dives into each mistletoe cluster, peeking, probing, seeking with eye and beak. Flowerpeckers remain closely tied to the mistletoes that grow on trees. Their territories span a few hectares at most. The birds consume mistletoe flower nectar and fruits, but this is a two-way relationship. The birds pollinate the plant’s flowers and disperse its seeds.

Mistletoes have tube-like flowers. When probed by a flowerpecker’s beak, these flowers part like a curtain or pop open, dusting the bird’s head and face with pollen. After the bird sips the sugary nectar with a special tube-like tongue (who needs a straw when your tongue can roll into one?) she flies to the next flower, rubbing off some of the pollen onto the flower’s receptive female parts, triggering the latter plant’s reproduction.

Despite the flowerpecker’s name, the birds remain fruit-lovers at heart. Mistletoes often have long and overlapping flowering and fruiting seasons so there is always food for a hungry flowerpecker to find. Ripe mistletoe fruit never fails to attract flowerpeckers. The
plain flowerpecker and its close cousin in South India, the Nilgiri flowerpecker, manipulate mistletoe fruits in their beaks to gently squeeze the seed from the pulp. They swallow the sugary, nutritious pulp and wipe their bills on twigs to remove the sticky seed. If the flowerpecker swallows the fruit, the seed passes rapidly through the bird’s gut to be excreted out. To remove the still sticky seed, the birds wipe their rears on twigs or tree branches. In either case, these actions have the same result, which biologists call directed dispersal: the mistletoe seed gets planted where it is likely to germinate.

An hour later, I leave with the sense that there is more to this than just a symbiotic evolutionary link between bird and mistletoe in a forest webbed with ecological connections. Perhaps, behind the gleam of that flowerpecker’s eye, there resides, too, a desire to cultivate and protect what she consumes and an aesthetic to adorn the trees in her forest with the prettiest little plants she can find.

TR Shankar Raman is a scientist with the Nature Conservation Foundation, Mysore. His email address is: trsr@ncf-india.org

Mistletoe – WD-40?

(This appeared as a Google Alert, August 2nd 2017. We shall be interested to learn if anyone has any experience of the technique.)

Question: I read your column regularly and am interested in the one on mistletoe. I lived in Sierra Vista for 10 years and had five mature mesquite trees that had mistletoe on them. A friend who had lived there for 20 years had a new way to get rid of the parasite. He told me an entomologist friend told him that WD-40 would stop or slow down the mistletoe’s return. His instructions were: First cut small branches off at 12 to 14 inches below the growth. Be sure to clean up the stems that come off while removing them. When it’s on large branches or the trunk, skin all the mistletoe down to the bark. Spray this area right after with WD-40. The next day, spray again. Watch the spots and if any new sprouts return, do the same thing, the sooner the better. In the remaining years I lived there, it didn’t return in those spots and very few new sprouts ever came out. His theory was that WD-40 followed the ingrown fiber of the mistletoe and killed it, like it follows rust on a nut and bolt and softens it.

Answer: Cutting the small branches below the growth is an effective way to reduce the mistletoe if the infection is caught early enough. I hadn’t heard of the WD-40 method. The ingredients of WD-40 are a secret according to the manufacturer, so it’s hard to be sure of its toxicity to plants. So there might be something to this method, but because we have no research to back it up, it is still a theory. Otherwise, WD-40 is hazardous to breathe, ingest and get on your skin, so be careful when using this product. It is also not registered as an herbicide, so it’s technically illegal to use it as such.

This parasitic vine helps plants communicate

Dodder vines (Cuscuta species) can tap into multiple hosts, causing damage but also providing botanical wires that let host plants share valuable information.

Plants are quietly communicating all around us. Some send out chemical signals by air, for example, and many rely on an underground internet built by soil fungi. And some, a new study finds, can use parasitic vines as communication cables. The parasites may be harmful, but they also link multiple plants into a network, and these ‘bridge-connected hosts’ seem to capitalize by communicating through the vines. The parasites in this study are Cuscuta, a genus of about 200 species in the morning glory family. They don’t look like much at first, initially rising from the soil as a thin tendril with no roots or leaves. Their growth depends on finding a host, which they do by sniffing out odors from nearby plants. (They can even use scent to track down their favorite hosts, such as tomatoes instead of wheat.) ‘It’s really amazing to watch this plant having this almost animal-like behavior,’ biocommunication researcher Consuelo M. De Moraes told NPR in 2006.

Once it finds a suitable host, a dodder wraps around the stem and inserts fang-like ‘haustoria’ into the plant’s vascular system. A dodder can end up with haustoria in many hosts, forming clusters of connected plants that may include multiple species. As Ed Yong reports in the Atlantic, a single dodder vine is capable of linking dozens of hosts together. ‘In our lab, we could connect at least 100 soybean plants with a dodder seedling,’ study co-author Jianqiang Wu, a botany professor at the Chinese Academy of Sciences, tells Yong.
The parasites are known to take water, nutrients, metabolites and mRNA from their hosts, and their bridges ‘even facilitate host-to-host virus movement,’ the study’s authors point out. But, as they report in the Proceedings of the National Academy of Sciences, those bridges also seem to boost the hosts’ communication abilities. And they aren’t just enabling idle chatter: A dodder’s network of ‘bridge-connected hosts,’ as the researchers call them, can perform valuable community services, such as warning each other about an attack from leaf-eating caterpillars.

Many plants are able to resist herbivorous insects, using a variety of tactics to warn their neighbors as well as defend themselves. They may produce defensive toxins, for example, rallying various parts of the plant to coordinate a systemic response. ‘Insect herbivory not only activates defenses at the site of feeding,’ the researchers write, ‘but also induces unknown mobile signals that travel through vasculatures’ to other parts of the damaged leaf as well as undamaged leaves and roots. Since plants send these signals through their vascular systems, the researchers wondered if a dodder vine can inadvertently share them among its hosts, creating another channel for communication. To find out, they placed two soybean plants near each other and allowed both to be parasitized by the Australian dodder (Cuscuta australis), which soon formed a bridge between the two hosts.

Next, they infested one of the soybean plants with caterpillars, while keeping its partner pest-free. The second plant hadn’t suffered any bites, yet when the researchers examined its leaves, they found it had regulated hundreds of genes — many of which encode anti-insect proteins often used when under attack. When the researchers did let caterpillars attack the second soybean, it ‘consistently exhibited elevated resistance to insects,’ they write, suggesting its pre-emptive defenses paid off. But what triggered those defenses? To see if its fellow host had really sent a warning via parasitic vine, they conducted similar experiments without the dodder bridge — and found no anti-insect proteins or increased resistance in the second host. They also tested for airborne signals between two unconnected soybean plants, finding no warning like the one between bridge-connected hosts.

Dodder vines may not rival high-speed data cables, but they do transmit their hosts' signals in as little as 30 minutes, the researchers report. The vines can also carry the signals over long distances — at least 10 meters (33 feet) — and even between hosts from different species, such as rockcress and tobacco. Since caterpillars could spell disaster for a soybean plant, this kind of alert seems like a pretty big benefit. Dodder vines are still parasites, though, a term for organisms that sustain themselves at the expense of their hosts. According to the study’s authors, a dodder likely harms its victims more than it helps them.

Yet parasites also have an incentive to keep their hosts alive and viable, since they rely on them for long-term support. And even if the net impact is negative, the authors note that some parasites offer benefits beyond not killing their hosts. Roundworms have been shown to increase human fertility, for example, while other helminths can reduce autoimmunity and allergies in human hosts. Being wrapped up by a dodder definitely takes a toll, but the vines ‘could alleviate resource-based fitness costs by providing information-based benefits to their hosts,’ the researchers write. And the parasite might benefit, too, ‘given that better defended and prepared hosts could provide Cuscuta with more nutrients than undefended or naïve hosts in the face of a rapidly dispersing herbivore.’

Still, they add, dodder vines are generalists that can target a wide range of plants, and their networking services are probably a coincidence, not a co-evolved response. More research is needed to really understand this relationship, the researchers say, including how exactly the hosts’ signals are spread, how much a dodder's perks offset its costs, and whether those benefits are ‘ecologically meaningful.’

In the meantime, research like this can help illustrate how the ecosystems around us — including apparently passive plants — are more sophisticated than they seem.

Russell McLendon  September 13, 2017.

Native mistletoe makes a comeback in Canterbury (New Zealand)

Ask me what I was doing in late June, up a ladder smearing bright yellow, rice-sized globules of goo onto one of my kōwhai trees. I could say I was making kissing a whole lot easier in my neighbourhood over Christmas. Or I could have just said I was one of more
than 300 Cantabrians taking part in a biodiversity initiative designed to get more native mistletoe growing in the region. Last year, a team led by Christchurch ecologist Kristina Macdonald, along with the University of Canterbury and the Christchurch Botanic Gardens, managed to establish 33 piritia, also known as the green mistletoe (*Ileostylus micranthus*) in the Gardens. It was no easy task. Establishment rate of the mistletoe by human dispersal of the seed is usually about 5 per cent, though the team managed nearly 9 per cent. It is spread naturally by native birds tūī, bellbird and silvereye, and to a lesser extent kererū and (the non-native) blackbird, who eat the berries and pass the seeds out the other end.

Green mistletoe, *Ileostylus micranthus*, is naturally spread by tūī, bellbird and silvereyes.

Although green mistletoe is found throughout New Zealand, it is now seldom seen in Christchurch. Kristina thinks it is an interesting aspect of our native vegetation that people often don’t think about. ‘We wanted to showcase this and bring it back into the city,’ she says. Over two days in late June, when the fruit is at its rippest, about 9000 seeds were collected from two sites, one in the Port Hills and one in Teddington at the head of Lyttelton Harbour. Hundreds responded to the call for volunteers to grow the seed in their own garden. Each was given 20 seeds and, because the seeds’ viability drops quickly once picked, was told they had two days to place them in trees.

Like its European counterpart, the green mistletoe is hemiparasitic. It does not grow in soil, but takes nutrients and water from a host plant. However, it still photosynthesises and produces flowers and fruit. One of nine native mistletoes – including the presumed extinct Adams’s mistletoe, which was last seen in 1954, and the two beech forest-inhabiting scarlet species – the green mistletoe (as its name suggests) has small green flowers in summer and bright yellow fruit in autumn and winter. An evergreen, it forms dense balls up to 2m in diameter, but more commonly only 1m. It is considered a sight to behold on deciduous trees in winter.

One reason this particular species of mistletoe was chosen was that it has the lowest host specificity, with more than 200 different host species, says Kristina. This meant people were more likely to have a host species in their backyard. Other mistletoes only have between 13 and 48 host species each. I chose kōwhai to plant my seeds in. But coprosma, houhere, mānuka, olearia, pittosporum, pseudopanax, tōtara and wineberry would have all been suitable natives. Recommended among the exotics are acacia, ash, lemon, maple, oak, plum (and other Prunus), robinia, silver birch, tree lucerne and willow.

After duly squishing the seeds onto and into the forks of branches, I waited… and waited. Several months later, most seeds are still there, still glistening, but there does not appear to be much happening. Not to worry, Kristina assures me. ‘Some of our ones from last season have taken more than a year to establish,’ she says. ‘On some of the ones I have looked at from this year, there is a green tip at the edge of the seed, and others haven’t changed much. I would hope for germination – cotyledons emerge and look like two tiny leaves – in the next few weeks, but as long as they are holding on there is still hope.’

*Peraxilla tetrapetala* - red mistletoe in flower, one of the species of New Zealand native mistletoe, much favoured as a food source by possums, in flower at Arthurs Pass. Photo: Nancy Bell.

*Peraxilla colensoi* - scarlet mistletoe in the Abel Tasman National Park is an 'at risk' plant. It has flowers
that are an important source of nectar for birds like tūī, kākā and bellbird.

Mary Lovell-Smith, NZ Gardener

Tenbury mistletoe auction draws crowds in bumper year

From Kent to Scotland, people from across the UK have travelled to Tenbury Wells, Worcestershire, for the town’s annual holly and mistletoe auction. One thousand lots of the plant were sold in the second of three auctions held at Burford House Garden Stores. Auctioneer Nick Champion said it was a particularly good year for mistletoe, which may be down to the weather.

For one minute video see: http://www.bbc.co.uk/news/av/uk-england-herford-worcester-42240007/tenbury-mistletoe-auction-draws-crowds-in-bumper-year (Video journalist: Catherine Mackie)


THESIS

Host range and intraspecific competition in the facultative root hemiparasite Odontites vulgaris. Uwe Tobias Nickel, MSc Thesis, September 2012. Advisor: Prof. Dr. Diehtart Matthies: Philipps University of Marburg.

Abstract

Host plants are for hemiparasites both their main source of water and nutrients and potential competitors for light. Autotrophic plants can differ widely in their quality as hosts. To investigate the host range of the facultative hemiparasite Odontites vulgaris the parasite was grown in single combinations with 25 host species and also without a host in a climate chamber. O. vulgaris is a quite independent parasite that can complete its lifecycle without a host. The tested species varied largely in their quality as hosts and affected the growth of the parasites significantly. Shading of the parasite by its hosts had a strong negative effect on the growth of the parasite. The parasite showed most vigorous growth without a host. Legumes were good hosts, grasses were hosts of intermediate quality and non-legume forbs were bad hosts. However, there were good hosts in each of these groups. Good hosts were Medicago sativa, Capsella bursa-pastoris, Trifolium repens, Bromus erectus, Lolium perenne and Matricaria chamomilla. Very poor hosts were Plantago lanceolata, Achillea millefolium, Chrysanthemum leucanthemum, Sanguisorba minor, Hieracium pilosella, Daucus carota, Cynosurus cristatus and Anthoxanthum odoratum. These results show that plants to which haustoria are formed in natural surroundings do not necessarily have to be hosts for the parasite. Surprisingly O. vulgaris could accumulate more biomass with the same amount of leaf area when grown without a host than when grown with a host. The different host species influenced architecture and morphology of the parasite and they had a highly significant effect on the chemical composition of the leaves of O. vulgaris. Hemiparasites often form haustoria to individuals belonging to the same species. With increasing density in moniculture O. vulgaris showed a decrease in biomass, needed more time to flower and formed more roots. Nutrients that were applied on the leaves of single plants were not translocated among individuals. Leaf fertilisation had even a negative effect on the treated plants.

JONNE - MOVING ANNOUNCEMENT

As of 1 January 2018, Jonne Rodenburg will be affiliated to the Natural Resources Institute (NRI) of the University of Greenwich. He will work as Senior Lecturer/Researcher, Agroecology, in the Agriculture, Health and Environment Department. Jonne plans to continue and deepen the type of parasitic weed research he has been doing over the past ten years at the Africa Rice Center, with a focus on cereal production systems in Africa. His contact details will be: NRI, Chatham Maritime, Kent, ME4 4TB, UK; e-mail: j.rodenburg@greenwich.ac.uk.

BOOK


The bulk of this 7.2 pound (3.3 kilograms) tome is plant families arranged according to the scheme of the Angiosperm Phylogeny Group (APG). Families are listed under their respective orders in the APG system. For the parasitic plant enthusiast this book is a wonderful source on information on every parasitic plant family. Lavishly illustrated, each family treatment has a section on evolution of the group, distribution, economic importance, and uses. Finding a book of 800 pages with over 2500 full color images for less than $100 is noteworthy.

‘LORANTHUS MICRANTHUS’– CORRECTION

I have in the past been making the wrong assumption in many past editions of Haustorium in equating ‘Loranthus micranthus’ in literature from West Africa,
with *Ileostylus micranthus*. I may have continued to do so in spite of Dan Nickrent pointing out in *Haustorium* 66 that ‘*L. micranthus*’ is most probably a mis-spelling of *Loranthus micrantherus*, an accepted synonym for *Englerina gabonensis*, and that *I. micranthus* does not occur in Africa. I apologise for having continued to mislead. By chance there is an item on *I. micranthus* under Press Reports above. I thank Dan for reminding me of my error and for providing the following pics of the two species, very different in flower and in distribution. If any reader has any comment on this correction, we would be pleased to hear from them. We would particularly welcome comment from West Africa, confirming the true identity of ‘*L. micranthus*’. Pictures below show just how different they are!

Chris Parker.

*Ileostylus micranths* Photo Pieter Pelser

*Englerina gabonensis* Photo Jan Wieringa

**FORTHCOMING MEETINGS**

**28th German Conference on Weed Biology and Weed Control** 27th February to 1st March 2018 in Braunschweig, Germany.
http://www.unkrauttagung.de/index.php?menuid=1


**4th International Conference on Agricultural and Biological Sciences** (ABS2018), to be held from June 26th to 29th, 2018, in Hangzhou, China.
http://www.absconf.org/

**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 Dan Nickrent’s ‘The Parasitic Plant Connection’ see: http://www.parasiticplants.siu.edu/

For the Parasitic Plant Genome Project (PPGP) see: http://ppgp.puck.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 a description of the PROMISE project (Promoting Root Microbes for Integrated *Striga* Eradication), see: http://promise.nioo.knaw.nl/en/about

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

For the Index of Orobanchaceae prepared by Óscar Sáchez Pedraja, Gerald Schneeweiss and others see:
http://www.farmalierganes.com/Otrospdf/publica/Orobanchacea%20Index.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 the work of Forest Products Commission (FPC) on Striga control in Kenya, including periodical ‘Strides in Striga Management’ and ‘Partnerships’ newsletters, see: http://www.fpc.wa.gov.au/sandalwood

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

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

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

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*indicates web-site reference only

Items in bold selected for special interest

Items in blue relate to therapeutic uses of parasitic plants

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Abate, M., Hussien, T., Bayu, W. and Reda, F. 2017. Diversity in root traits of sorghum genotypes in response to Striga hermonthica infestation. Weed Research 57(3): 303-313. [Comparing the root traits of 9 sorghum genotypes with varying susceptibility to S. hermonthica under infested and uninfested conditions. Claiming to show that low root traits are an indication of resistance.]


Agbo, M.O., Olimegwu, D.C., Okoye, F.B.C. and Osadebe, P.O. 2017. Antiviral activity of Salidroside from the leaves of Nigerian mistletoe (Loranthus micranthus Linn) parasitic on Hevea brasiliensis against respiratory syncytial virus. Pakistan Journal of Pharmaceutical Sciences 30(4): 1251-1256. [Describing the isolation of a polyphenol, salidroside, from ‘L. micranthus’ (presumably a misspelling of L. micrantherus which is a synonym of Englerina gabonensis), showing potential as an antiviral agent against respiratory syncytial virus infection.]


Albert, S., Rhumeur, A., Rivière, J.L. Chauvrat, A., Sauroy-Toucouère, S., Martos, F. and Strasburg, D. 2017. Rediscovery of the mistletoe Bakereilla hoyifolia subsp. bojeri (Loranthaceae) on Reunion Island: population status assessment for its conservation. Botany Letters 164(3): 229-236. [This species, thought to be extinct, was rediscovered on Reunion. One population consisting of six individuals was found growing on five host plant species from different families. The grey white-eye,
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Badu-Apraku, B., Oyekunle, M., Talabi, A.O., Annor, B.
Ba XueLi, Zhang AiLian, Huang Jiong, Cao Hui, Zhao Bing
Aybeke, M.  2017. Evaluation of evaluated under drought and well-watered conditions at
155(4): 629-642. [Three cycles of selection were
based on C selection for grain yield and other traits. Predicted gain
variability, gains from selection and predict response to
two locations in Nigeria for 2 years to determine genetic
inhibiting growth of
response and showed no undesirble side effects.]

Aybeke, M.  2017.  *Fusarium* infection causes genotoxic
disorders and antioxidant-based damages in *Orobanchaceae*
spp. Microbiological Research 201: 46-51. [Including conclusions that *F. oxysporum* induced significant
irrevocable genotoxic effects on the DNA of unspecified
*Orobanchaceae*, degraded protein metabolism and synthesis, and finally triggered apoptosis.]

Ba XueLi, Zhang AiLian, Huang Jiong, Cao Hui, Zhao Bing
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Sinica 48(8): 1535-1542. [A preparation of ‘crude
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period, significantly enhanced the T cell immune
response and showed no undesirable side effects.]

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heritabilities in an early white maize population
following *S* selection for grain yield, *Striga* resistance
and drought tolerance. Journal of Agricultural Science
155(4): 629-642. [Three cycles of selection were
evaluated under drought and well-watered conditions at
two locations in Nigeria for 2 years to determine genetic
variability, gains from selection and predict response to
selection for grain yield and other traits. Predicted gain
based on *C* was 0.282 and 0.583 t/ha under drought and
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parasite capsules and presumably reduced carry-
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International Journal of Environmental Studies 74(5): 744-751. [The species of *Pedicularis*
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production ranges from 57.1 to 261.3 seeds per
stem. Germination depends on cold stratification.
Host plants include 27 species.]

Bellot S., Cusimano N., Luo S., Sun G., Zarre S.,
Groger A., Temsch E., and Renner S.S. 2016. Assembled plastid and mitochondrial genomes, as
well as nuclear genes, place the parasite family
Cynomoriaceae in the Saxifragales. Genome
Biology and Evolution 8(7):2214–2230. [The
*Cynomorium* mitochondrial genome consists of up
to 49 circular subgenomes and has a gene content
similar to that of photosynthetic angiosperms. Its
plastome retains only 27 of the normally 116 genes.
Nuclear, plastid and mitochondrial phylogenies
place Cynomoriaceae in Saxifragales, a placement
already shown by Nickrent et al. 2005.]

Bentley, J., van Mele, P., Touré, S., van Mourik, T.,
weed: local knowledge and learning from videos in
Mali. In:  Sillitoe, P. (ed.) Indigenous knowledge:
enhancing its contribution to natural resources
management: 75-85. [A series of videos relating to
control of *Striga hermonthica* are described,
including the use of hand pulling, making compost,
micro-dosing fertilizer. Organizational changes
included: strengthening women  groups, adding
*Striga* pulling to their repertoire of services and
organizing farmers to watch videos. The videos are
claimed to have made a significant contribution.]

*Bisi-Johnson, M.A., Obi, C.L., Samuel, B.B., Eloff,
J.N. and Okoh, A.I. 2017. Antibacterial activity of
 crude extracts of some South African medicinal
plants against multidrug resistant etiological agents
of diarrhoea. BMC Complementary and Alternative
Medicine 17(321): 19 June 2017. (https://bmccomplementalttermmed.biomedcentral.co
m/track/pdf/10.1186/s12906-017-1802-4) [Hydnora
Charney, N.D. and; Record, S. 2016. Combining incidence and demographic modelling approaches to evaluate metapopulation parameters for an endangered riparian plant. AoB Plants 8: plw044.


Bukowiec, G. and Bednarz, B. 2017. (Effect of common fir-tree mistletoe (Viscum album ssp. abietis) on tree-ring widths of silver fir (Abies alba).) (in Polish) Acta Scientiarum Polonorum - Silvarum Calendarium Ratio et Industria Lignaria 16(2): 77-83. [Higher levels of infestation by V. album ssp. abietis significantly reduced annual tree-ring widths. During water deficiency periods it could be an important factor contributing to the silver fir decay.]

Caraballo-Ortiz, M.A., González-Castro, A., Yang, S., dePamphilis, C.W. and Carlo, T.A.. 2017. Dissecting the contributions of dispersal and host properties to the local abundance of a tropical mistletoe. Journal of Ecology 105: 1657–1667. [The dispersal and adaptation of the mistletoe Dendropemon caribaenus (Loranthaceae) in Puerto Rico was studied. Compatibility between the mistletoe and host, measured by mistletoe survival and growth rate, was the most important factor for mistletoe abundance followed by phenological characteristics of the hosts.]

*Charney, N.D. and; Record, S. 2016. Combining incidence and demographic modelling approaches to evaluate metapopulation parameters for an endangered riparian plant. AoB Plants 8: plw044.


Colbach, N., Bockstaller, C., Colas, F., Gibot-Leclerc, S., Moreau, D., Pointurier, O. and Villerod, J. 2017. Assessing broomrape risk due to weeds in cropping systems with an indicator linked to a simulation model. Ecological Indicators 82: 280-292. [Assessing the various potential for weeds to influence infestations of Phelipanche ramosa by e.g. increasing infestation causing germination near crop roots, or by supporting the parasite to maturity and increasing the soil seed bank; or by reducing soil seed bank via suicidal germination. Early summer-emerging weed species increased parasite risk. No other notable correlations were found.]


Coulterie, P. and Poullain, C. 2016. New Caledonia: a hot spot for valuable cheiodiversity Part 3: Santalales, Caryophyllales, and asterids. Chemistry & Biodiversity 13(4): 366-379. [A total of 176 original natural compounds identified from Santalales, Caryophyllales, and asterids. Showing that the high rate of endemism is correlated with the
originality of phytochemicals encountered in New Caledonian plants and discussing the economic potential of plants and molecules with consideration of their medicinal and industrial perspectives.]
das Silva Freitas, L., Moreira, L.M., de Avila Júnior, R.S., Felestrino, É.B., Demarco, D., de Sousa, H.C. and Ribeiro, S.P. 2017. Reproductive phenology and floral visitors of a *Langsdorffia hypogaea* (Balanophoraceae) population in Brazil. Flora (Jena) 233: 51-57. [Recording high levels of both pollinators and herbivores on *L. hypogaea*, ants being the most frequent floral visitor but a coleopteran (Nitidulidae, Stelidota) more important as a pollinator. Because of herbivory only 12% of flowers fruited.]


**Dor, E., Galili, S., Smirnov, E., Hacham, Y., Amir, R. and Hershenhorn, J. 2017. The effects of herbicides targeting aromatic and branched chain amino acid biosynthesis support the presence of functional pathways in broomrape. Frontiers in Plant Science 8(May) 707. (https://www.frontiersin.org/articles/10.3389/fpls.2017.00707/full) [The mode of action of herbicides targeting aromatic and branched-chain amino acid, imazapic and glyphosate, in controlling *Phelipanche aegyptiaca* was studied to clarify if this obligatory parasite has its own machinery for amino acid biosynthesis. It was found that *P. aegyptiaca* is able to synthesize branched-chain and aromatic amino acids through the activity of acetolactate synthase (ALS) and 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS), respectively.]**


**Duca, M. and Tabara, O. 2016. Histochemical aspects of *Helianthus annuus* L. - *Orobanche cumana* Wallr. pathosystem. Analele Științifice ale Universității 'Al I Cuza' din Iași. (Serie Nouă) Secțiunea II a. Biologie Vegetală 62(2): 19-28. [Histological study revealed abundant accumulation of lignin and callose in the roots of sunflower resistant to *O. cumana* cultivated in infested soil. The results indicated that the phenylpropanoid pathway was activated, synthesis of lignin was increased and the cell wall was fortified.]


**Ennami, M., Briache, F.Z., Gaboun, F., Abdelwahd, R., Ghaouti, L., Belqadi, L., Westwood, J. and Mentag, R. 2017. Host differentiation and variability of *Orobanche crenata* populations from legume species in Morocco as revealed by cross-infestation and molecular analysis. Pest Management Science 73(8): 1753-1763. [Demonstrating race specificity of *O. crenata* adapted to lentil. The ability to parasitize faba bean is retained, but races adapted to lentil fare better on lentil hosts than those adapted to faba bean]

**Evcl, G., Pekcan, V., Yilmaz, I.M., Citak, N., Tuna, N., Ay, O., Pilash, A. and Kay, Y. 2016. Determination of yield performances of oleic type sunflower (Helianthus annuus L.) hybrids resistant to broomrape and downy mildew. EKIN, Journal of Crop Breeding and Genetics 2(1): 45-50. (https://www.cabdirect.org/cabdirect/FullTextPDF/2017/20173259264.pdf) [Reporting from trials in Turkey, on a range of hybrids, at least some showing good resistance to *Orobanche cumana* and high oil content.]**

O. minor. Field research confirmed their inhibitory effect but revealed that methionine was more effective than the others, and that two successive applications of 6 L m$^{-2}$ of 20mM solution at 308 and 543 growing degree days inhibited O. minor emergence in red clover up to 67%.

Fontürbel, F.E., Jordano, P. and Medel, R. 2017. Plant-animal mutualism effectiveness in native and transformed habitats: assessing the coupled outcomes of pollination and seed dispersal. Perspectives in Plant Ecology, Evolution and Systematics 28: 87-95. [Unexpectedly finding that in the tripartite system of mistletoe Tristerix corymbosus, hummingbird pollinator, and marsupial seed disperser, pollination and seed dispersal was not reduced in a transformed habitat, suggesting that the overall system benefited from the presence of a native understory vegetation that attracts pollinators and seed dispersers and compensates for the often detrimental effects of habitat transformation.]


(http://onlinelibrary.wiley.com/doi/10.1002/ecs2.1768/ful)

[Studying the pollination of Tristerix corymbosus in Chile by the hummingbird, Sephanoides sephaniodes, and its dispersed by the marsupial. Dromiciops gliroides in relation to habitat modification. Both are most effective in the presence of shrub and bamboo cover and moss abundance. More open habitats favour other fleshy-fruited plants which provide alternative food for the marsupial. Same study as above!]


(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5559707/) [Phylogenetic analysis of three nuclear and two plastid genes indicated holoparasitism evolved in the family three times. Gleadovia and Phacellanthus were placed in tribe Orobancheae and the latter should be merged with Orobanche sect. Orobanche (the authors apparently do not recognize segregate genera such as Phelipanche).]

*Fukui, K., Yamagami, D., Ito, S. and Asami, T.A 2017. Taylor-made design of phenoxyfuranone-type strigolactone mimic. Frontiers in Plant Science 8(June): 936. (https://www.frontiersin.org/articles/10.3389/fpls.2017.00936/full) [Through the chemical modification of debranones (phenoxyfurarones), that are highly active in inhibiting rice tillering but less active on Striga germination, novel debranones have been developed carrying two electron-withdrawing groups on the benzene ring with higher Striga germination stimulation activities and lower inhibitory activities on rice tillering.]

Funamoto, D.and Sugiura, S. 2017. Japanese white-eyes (Aves: Zosteropidae) as potential pollinators of summer-flowering Taxillus kaempferi (Loranthaceae). Journal of Natural History 51(27/28): 1649-1656. [Field observations in Japan showed that Z. japonicus was the almost exclusive flower visitor of T. kaempferi. Pollen was observed on the bill and face of Z. japonicus, and it is believed that it may act as an important pollinator of the mistletoe.]

Gaba, S. and 15 others. 2017. Response and effect traits of arable weeds in agro-ecosystems: a review of current knowledge. Weed Research 57(3): 123-147. [Including a detailed discussion of the factors influencing the success of parasitic weeds, including Orobanche, Phelipanche, etc. in arable systems.]

Gao HongWei and 12 others. 2017. Isoacteoside, a dihydroxyphenylethyl glycoside, exhibits anti-inflammatory effects through blocking toll-like receptor 4 dimerization. British Journal of Pharmacology 174(17): 2880-2896. [Isoacteoside from Monochasma savatieri (a hemi-parasite in Orobancheae occurring in Eastern Asia and widely used in Chinese madicine) blocked TLR4 dimerization, which activates the MyD88-TAK1-NF-κB/MAPK signalling cascades and TRIF pathway. The results indicate that isoacteoside has potential for the treatment of inflammatory diseases.]

Gao YuQiu, Qin GuangQiu, Wen PingJing, Wang YanWu, Fu WeiZhong, He Li, Yao Siyu and Zhao Peng. 2017. Safety assessment of powdered Cistanche deserticola Y. C. Ma by a 90-day feeding test in Sprague-Dawley rats. Drug and Chemical Toxicology 40(4): 383-389. [No toxicity to rats was detected in a diet containing up to 8% of powdered C. deserticola. The upper safety level was a total 8 g/kg body weight.]
commercial samples supposedly containing *Cuscuta chinensis* or *C. australis* were analysed against a DNA bar-code and only 10 were found to be genuine. Two thirds were based on a wide range of other species including *C. japonica, C. alata* asnd *C. monogyna.*


Gong Bin, Wu Xin, Wei Ting, Liao RiQuan, Su BenWei, Song JingJing, Jiang GuoHuan and Zhu KaiXin. 2017. (Isolation, identification and antitumor activity of endophytic fungi in Taxilli herba from Salix babonica in Guangxi.) (in Chinese) Guangxi Zhiwu / Guihaia 37(5): 634-641. [A range of endophytic fungi were isolated and identified from stems, leaves and roots of Taxillus chinensis growing on Salix babonica and some found to have anti-tumour properties.]

González F, Pabón-Mora N. 2017. Floral development and morphoanatomy in the holoparasitic Pilostyles boyacensis (Apodanthaceae, Cucurbitales) reveal chimeric half-staminate and half-carpellate flowers. International Journal of Plant Science 178(7): 522-536. [The floral anatomy of this Pilostyles species is illustrated with LM and SEM, and features, apomorphic and synapomorphic with other members of Cucurbitales illustrated with LM and SEM, and features, apomorphic and synapomorphic with other members of Cucurbitales ,are described. The presence of chimeric flowers shows a more labile sex expression than pure monoecy.]

Griffiths, M.E., Ruiz, N. and Ward, D. 2017. Mistletoe species richness patterns are influenced more by host geographic range than nitrogen content. African Journal of Ecology 55(1): 101-110. [Challenging a previous hypothesis that mistletoes preferentially parasitize hosts with high nitrogen, this study concluded that mistletoe species richness increases on hosts with larger geographic ranges.]


Haiul, G., Khan, Z.R., Pittchar, J.O. and Ochatum, N. 2017. Radio and mobile phone ownership or access by smallholder farmers of eastern Uganda and its potential use for push-pull technology dissemination. International Journal of Agricultural Extension 5(2): 19-28. [A survey concluding that most farmers have access to both radio and mobile phones but radio is much more used for information on agricultural technology including the use of the push-pull technique for control of stem borers and Striga.]

Hasenstab-Lehman, K.E. 2017. Phylogenetics of the borage family: delimiting Boraginales and assessing closest relatives. Aliso 35(1): 41-49. [A molecular phylogeny using three chloroplast genes was used to assess the relationship of Boraginales to other orders and examine family relationships within. Recognition of Lennoaceae as separate from Ehretiaceae is supported.]

*Hill, R., Loxterman, J.L., and Aho, K. 2017. Insular biogeography and population genetics of dwarf mistletoe (*Arceuthobium americanum*) in the Central Rocky Mountains. Ecosphere 8(5): e01810. (http://onlinelibrary.wiley.com/doi/10.1002/ecs2.1810/full) [A detailed ecological study comparing populations of *A. americanum* on lodgepole pine (*Pinus contorta* subsp. latifolia), in isolated ‘island’ populations with those in ‘mainland’ populations. As predicted by biogeographic theory, island allelic richness was positively correlated with geographic size of the population and negatively correlated with distance from mainland populations.]

Hira Lal, Devendra Singh and Jat, B.L. 2017. *Orobanche* infestation in Indian *Brassica juncea* L. in Ajmer districts of Rajasthan and its management. Asian Journal of Environmental Science 12(1): 1-22. [A long and detailed paper concluding that the most economically effective means to control *P. aegyptiaca* in *B. juncea* involved 125% of recommended fertilizers (N and P) plus foliar sprays of glyphosate at 25 and 50g/ha (plus ammonium sulphate) at 25 and 55 days after sowing. Applications of neem cake with or without pendimethalin and metalaxyl were not suitable.]

Hasenstab-Lehman, K.E. 2017. Phylogenetics of the borage family: delimiting Boraginales and assessing closest relatives. Aliso 35(1): 41-49. [A molecular phylogeny using three chloroplast genes was used to assess the relationship of Boraginales to other orders and examine family relationships within. Recognition of Lennoaceae as separate from Ehretiaceae is supported.]
Huanguli, N., Saifuding, A., Naerhulan, Z. and Ayiguli, M.
Hosseini, P., Ahmadvand, G., Oveisi, M., Morshedi, P. and Gonzalez-Andujar, J.L. 2017. A modelling approach for predicting the initial phase of Egyptian broomrape (Phelipanche aegyptiaca) parasitism in potato Crop Protection 100: 51-56. [P. aegyptiaca is important as a weed of potato in Iran. Using Gompertz and Weibull soil thermal time the lag time and 50% of P. aegyptiaca attachments occurred after 613.75 (124.8) and 999.49 (5.98) TT respectively.]
Hoyt, H.M., Hornsby, W., Huang Ching-Hsun, Jacobs, J.J. and Gonzalez-Andujar, J.L. 2017. A modelling approach for predicting the initial phase of Egyptian broomrape (Phelipanche aegyptiaca) parasitism in potato Crop Protection 100: 51-56. [P. aegyptiaca is important as a weed of potato in Iran. Using Gompertz and Weibull soil thermal time the lag time and 50% of P. aegyptiaca attachments occurred after 613.75 (124.8) and 999.49 (5.98) TT respectively.]

Hozumi, A., Bera, S., Fujiwara, D., Obayashi, T. and Yokoyama, R. 2017. Arabino-galactan proteins accumulate in the cell walls of searching hyphae of the stem parasitic plants, Cuscuta campestris and Cuscuta japonica. Plant and Cell Physiology 58(11): 1868–1877. [The spatial distribution patterns of cell wall components at a parasitic interface using parasite–host complexes of C. campestris–Arabidopsis thaliana and C. japonica–Glycine max were examined, focusing on arabinogalactan proteins (AGPs), because AGPs accumulate in the cell walls of searching hyphae of both C. campestris and C. japonica. The results suggest that AGPs are involved in hyphal elongation and adhesion to host cells, and in the adhesion between the epidermal tissues of Cuscuta and its host.]
Hu Bin, Sakakibara, H., Takebayashi, Y., Peters, F.S., Schumacher, J., Eiblmeier, M., Arab, L., Kreuzwieser, J., Polle, A. and Rennenberg, H. 2017. Mistletoe infestation mediates alteration of the phytohormone profile and anti-oxidative metabolism in bark and wood of its host Pinus sylvestris. Tree Physiology 37(5): 676-691. [Noting that V. album causes widespread damage to P. sylvestris in Central European forests. The study details the the ways in which infection by the parasite affects both the host’s anti-oxidative defense system and the phytohormone profile.]

*Haber, R., Schlodder, D., Effertz, C., Rieger, S. and Tröger, W. 2017. Safety of intravenously applied mistletoe extract - results from a phase I dose escalation study in patients with advanced cancer. BMC Complementary and Alternative Medicine 17(465):(18 September 2017). (https://bmccomplementalternmed.biomedcentral.com/track/pdf/10.1186/s12906-017-1971-1) ]Concluding that weekly infusions of 2000 mg of an aqueous extract of Viscum album were tolerated and can be used in further studies but had a risk of causing allergic reactions and fever.]

*Ishida, J.K., Yoshida, S. and Shirasu, K. 2017. Quinone oxidoreductase 2 is involved in haustorium development of the parasitic plant Phtheirospermum japonicum. Plant Signalling and Behaviour 12(7): e1319029. (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5586360/) [Showing that while quinine oxidoreductase 1 (QR 1) is involved in signal transduction leading to haustorium induction in Triphysaria versicolor, QR 2 has the equivalent function in P. japonicum.]


Ito, S., Yamagami, D., Umehara, M., Hanada, A., Yoshida, S., Sasaki, Y., Yajima, S., Kyozuka, J., Ueguchi-Tanaka, M., Matsuoka, M., Shirasu, K., Yamaguchi, S. and Asami, T. 2017. Regulation of strigolactone biosynthesis by gibberellin signaling. Plant Physiology 174(2): 1250-1259. [The cross talk between gibberellin (GA) and strigolactones (SLs) was studied in rice. The regulation of SL biosynthesis by GA was found to be dependent on the GA receptor GID1 and F-box protein GID2. GA treatment also reduced the infection of rice plants by Striga hermonthica. These data suggest that GA could be used to control parasitic weed infections.]

*Kaitera, J., Hiltunen, R. and Hantula, J. 2017. Nasa, Nemesis and Euphrasia: new alternate hosts of Cronartium spp. Forest Pathology 47(2): e12306. [Confirming E. stricta and Bartisia alpina as alternate hosts for the rust fungus C. flaccidum. E. stricta was also a host for C. ribicola.]


[Finding that α-santalol is toxic to fish and together with inulavosin to the dermatophytic fungus, Trichophyton rubrum: α-santalol was further revealed to be a potent antimiotic agent with potential as a therapeutic agent for cancers as well as fungal skin infections.]


[Showing that the endophyte communities of P. aegyptiaca were significantly different from that of non-parasitized tomato root, but no significant differences were observed between the parasite and its host after parasitization, suggesting the occurrence of bacterial exchange between these two plants. Also the potentially valuable finding that a Pseudomonas strain PhelS10, originating from the tomato roots, suppressed approximately 80% of P. aegyptiaca seed germination and significantly reduced P. aegyptiaca parasitism.]


Latvis, M., Jacobs, S.J., Mortimer, S.M.E., Richards, M., Blischat, P.D., Mathews, S. and Tank, D.C. 2017. Primers for Castilleja and their utility across Orobanchaceae: II. Single-copy nuclear loci. Applications in Plant Sciences 5(9): 1700038. [From low-coverage genomes of 3 Castilleja taxa, 87 primers were designed for the single-copy conserved ortholog set (COSII) and the pentatricopeptide repeat (PPR) gene families, 27 of which had broader utility within Orobanchaceae.]

Latvis, M., Mortimer, S.M.E., Morales-Briones, D.F., Torpey, S., Uribe-Convers, S., Jacobs, S.J., Mathews, S. and Tank, D.C. 2017. Primers for Castilleja and their utility across Orobanchaceae: I. chloroplast primers. Applications in Plant Sciences 5(9): 1700020. [76 primer pairs to variable regions of the plastome were developed for Castilleja but also showed utility across other major clades in Orobanchaceae.]

Li BaoDing. 2016. Study on flavor development of chicken stewed with Cistanche deserticola Ma. China Condiment 42(4): 96-98. [Chicken stewed with C. deserticola is a nutritious dish with unique flavour, claimed to have additional benefits of including anti-aging, enhancing immunity and cardiovascular system protection.]


Lin WeiYong, Yao Chun, Cheng, J., Kao ShungTe, Tsai FuulJen and Liu HsinPing. 2017. Molecular pathways related to the longevity promotion and cognitive improvement of Cistanche tubulosa in Drosophila. Phytomedicine 26: 37-44. [Concluding that extracts of C. tubulosa, used in Chinese medicine to improve sexual function and treat kidney dysfunction, can contribute to slowing aging and alleviating memory loss in Drosophila. Rapamycin and Notch networks, have been identified as causing these pharmacological effects and alterations in the gene expression of glutamate receptors.]

Lin Yun, Bi HaiYan, Yang ZhiRong, Luo TianLin, He ShanShan, Chen YaLi, Jing Xuan, Yun

Linares-Holguín O.O., Sánchez-Peña P., Molina-Freaner F. 2016. (Genetic diversity of the chloroplast (TrnL-F) region among populations of Pholisma culiacaunum Y.) (in Spanish) Agrociencia 50:799-809. [Analysis of trnL-F sequences using 70 samples from 7 populations of this species revealed 11 haplotypes. Within-population variation was 86.5% and between was 13.5% with no significant relationship between genetic and geographic distance.]

*Logacheva, M.D., Schelkunov, M.I., Shtratnikova, L., Lorenz, P., Knittel, D.N., Conrad, J., Lotter, K., Linares-Holguín O.O., Sánchez-Peña P., Molina-Freaner F. 2016. Determination of photosynthetic plastomes of the nonphotosynthetic V. Y., Matveeva, M. and Penin, A.A. 2016. Comparative distance. [Reviewing information on strigolactone signaling which is leading to insights into parasitic plant infections, specifically focusing on how the development of chemical probes can be used in combination with model plant systems to dissect strigolactone's perception in the parasitic plant Striga hermonthica.]

Lumba, S., Holbrook-Smith, D., McCourt, P. 2017. The perception of strigolactones in vascular plants. Nature Chemical Biology 13(6): 599-606. [Reviewing information on strigolactone signaling which is leading to insights into parasitic plant infections, specifically focusing on how the development of chemical probes can be used in combination with model plant systems to dissect strigolactone's perception in the parasitic plant Striga hermonthica.]

Lamba, S., Subha, A. and McCourt, P. 2017. Found in translation: applying lessons from model systems to strigolactone signaling in parasitic plants. Trends in Biochemical Sciences 42(7): 556-565. [Two approaches are presented to understand how parasitic plants respond to host-derived SLs. The first involves extrapolating information on SLs from model genetic systems to dissect their roles in parasitic plants. The second uses chemicals to probe SL signaling directly in the parasite Striga hermonthica. These approaches indicate that parasitic plants have co-opted a family of α/β hydrolases to perceive SLs.]


Mariko, M., Sarr, S.O., Diop, A., Modi, I.A., Dackouo, B. and Diop, Y.M. 2016. Antioxidant activity study and total phenolic determination of leaf extracts of Ximenia americana L. (Olacaceae) an antitumor plant used traditionally in Mali. Journal of Applied Biosciences 106: 10258-10265. [The results suggest significant anti-oxidant activity in extracts of Xcnitaes_Bruneiences_8_Macrosolem_brunsing_Lor antheaceae_a_new_hemiparasitic_shrub_from_Brun ei_Darussalam] [M. brunsing growing on a Hydnocarpus sp. (Achariaceae) differs from other Macrosolem spp. in its very narrow (1-2mm wide) leaves.]
Ximenia americana, of potential as anti-cancer agents.]


Marques, F.M., da Costa, M.R., Vittorazzi, C., Gramma, L de S.dos S., Barth, T., de Andrade, T.U., Endringer, D.C., Scherer, R. and Fronza, M. 2017. In vitro and in vivo anti-inflammatory effects of Struthanthus vulgaris. Planta Medica 83(9): 770-777. [S. vulgaris is probably the most common medicinal mistletoe plant in Brazil, and has been used in folk medicine as an anti-inflammatory agent and for cleaning skin wounds. The study confirmed that an ethanol leaf extract exhibited prominent anti-inflammatory effects, endorsing its usefulness as a medicinal therapy against inflammatory diseases.]


Medina M.N.D. and Cruz R.D. 2016. Partial mitochondrial DNA barcode of Rafflesia mira Fernando & Ong, 2005 (syn. Rafflesia magnifica Madulid, Tandang, Agoo, 2005) using matR with phylogenetic analysis of selected Rafflesia species in the world. International Journal of Environment, Agriculture and Biotechnology (IJEB) 1:374-380. [Partial matR sequences from three accessions of R. mira were analyzed along with 15 other Rafflesia species. Weaknesses include the use of Neighbor-Joining instead of model-based phylogenetic methods (that have been proven to be superior with these holoparasites) and no other taxa within or outside Rafflesiaeaceae were included that would allow the root of the tree to be inferred.]

Mengesha, W.A., Menkir, A., Unakchukwu, N., Meseka, S., Farniola, A., Girma, G. and Gedil, M. 2017. Genetic diversity of tropical maize inbred lines combining resistance to Striga hermonthica with drought tolerance using SNP markers. Plant Breeding 136(3): 338-343. [Results from a study of 128 drought and Striga-resistant lines showed four distinct groups consistent with the pedigrees of the lines.]


MingLang, RyiYu, YongQingMa, WeiZhang and McErlean, C.S.P. 2017. Extracts from cotton over the whole growing season induce Orobanche cumana (sunflower broomrape) germination with significant cultivar interactions. Frontiers of Agricultural Science and Engineering 4(2): 228-236. (http://www.engineering.cae.cn/fase/EN/10.15302/J-FASE-2017150#1) [Confirming that extracts and exudates from cotton roots induced germination of O. cumana but displayed some significant cultivar interactions.]

Miyao, G. 2017. Egyptian broomrape eradication effort in California: a progress report on the joint effort of regulators, university, tomato growers and processors. Acta Horticulturae 1159: 139-142. [Following its first detection in 2014, the localised infestation of Phelipanche aegyptiaca has been treated with glyphosate, hand pulling, flaming and fumigation. No recurrence is apparent at the time of this report.]

Moniodis, J., Jones, C.G., Renton, M., Plummer, J.A., Barbour, E.L., Ghisalberti, E.L. and Bohmann, J. 2017. Sesquiterpene variation in western Australian sandalwood (Santalum spicatum). Molecules 22(6): 940. (http://www.mdpi.com/1420-376X/22/6/940/htm) [Studying the varied sesquiterpene content of extracts of S. spicatum from the arid northern and southeastern and semi-arid southwestern regions of West Australia. Total content was generally the same but populations from the nort and south-west contained the highest levels of desirable α- and β-santalol, while southeastern populations were higher in undesirable E,E-farnesol and α-bisabolol.]

environment. Antonie van Leeuwenhoek 110(6): 819-832. [Molecular analyses confirm two new species Fusarium sudanense and F. terricolae in the F. fujikuroi species complex. One of these was isolated from Striga herminthica in Sudan but not clear which from the abstract.]

Mpika, J., Wahounou, P.J., Kossonou, K.A., Soumahin, E.F., Konan, E., Gnagne, M. and Obouayeba, S. 2017. Chemical control of Phragmangthera capitata in plantations of three clones (GT 1, PB 235 and PB 217) of Hevea brasiliensis (Euphorbiaceae) in Côte d’Ivoire. Journal of Animal and Plant Sciences (JAPS) 32(3): 5212-5222. [Noting that P. capitata may reduce rubber yields by 10% in Côte d’Ivoire. 10 ml glyphosate injected per tree at the base of the trunk provided 65 to 86% mortality of P. capitata and had no negative effect on rubber yield.]

Mudavath, C.N., Kailas, J.G., Salamma Sugali, Devender Ravula, Ramakrishna Hari and Boyina, R.P.R. 2017. The non-arborescent diversity of the Andaman Islands, India, based on pollen analysis. Palynology 41(4): 41-461. [Among 118 species studied, only Macroisolen cochin chinensis has oblate pollen grains.]

Mulso, K., Delebinski, C., Seifert, G. and Melzig, M.F. 2017. (Quantification of the mistletoe lectin I from pharmaceutical products.) (in German) Zeitschrift für Phytotherapie 38(4): 148-151. [Using two different ELISA (enzyme-linked immunosorbent assay) analyses to show that the levels of lectin I differed among the five commercial preparations available in Germany.]


*Nativ, N., Hacham, Y., Hershchenorn, J., Dor, E. and Amir, R. 2017. Metabolic investigation of Phelipanche egyptiaca reveals significant changes during developmental stages and in its different organs. Frontiers in Plant Science 8(April): 491. (https://www.frontiersin.org/articles/10.3389/fpls.2017.00491/full) [The detailed results on a wide range of metabolites contribute to our knowledge of the metabolic behavior of parasites such as P. egyptiaca that rely on their host for their basic nutrients.]


Nickrent D.L. 2017. Status of the genera Colpoon, Osyris and Rhoicarpus in South Africa. Bothalia: African Biodiversity & Conservation 47(1):1-7. [Comparative morphology and phylogenetics were used to support the position that these three genera are distinct.]

Niklöff, H. 2016. (New floristic records from Austria (170-235).) (in German) Neireichia 8: 181-238. [Orobanche alsatica subsp. libanotis (= O. bartlingii) is newly recorded in Upper Austria.]


Oancea, F., Georgescu, E., Matusova, R., Georgescu, F., Nicolescu, A., Raut, I., Jecu, M.L., Vladulescu, M.C., Vladulescu, L. and Deleanu, C. 2017. New strigolactone mimics as exogenous signals for rhizosphere organisms. Molecules 22(6): 961. [http://www.mdpi.com/1420-3049/22/6/961/htm] [Theree strigolactone mimics, pyrimidylphenoxy-, benzisoquinolinedionyloxy-, and naphtoquinoloinoloxo-D ring, were synthesized and examined for their activities on seed germination in different root parasites and radial growth and hyphal branching in pathogenic fungi. These mimics exhibited low to moderate stimulation effects on parasite seed germination and different potentials on growth and hyphal branching of pathogenic fungi.]

influencing host specificity in mistletoes based largely on South African species, with examples such as *Viscum rotundifolium* a generalist mistletoe species that parasitizes at least six tree species, *Agelanthus natalitius*, which has a limited number of host species and predominantly parasitizes *Acacia caffra*. *Viscum combretum* mainly parasitizes *Combretum erythrophyllum* and rarely is found on *Dombeya rotundifolia* while *Tapinanthus rubromarginatus* parasitizes only *Protea caffra*.


*Olsen, S. and Krause, K. 2016. Activity of xyloglucan endotransglucosylases/hydrolases suggests a role during host invasion by the parasitic plant *Cuscuta reflexa*. PLoS ONE 12(4): e0176754. (http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0176754) [Showing that the level of xyloglucan endotransglycosylation (XET) activity was found to peak at the penetrating stage of *Cuscuta reflexa* on its host *Pelargonium zonale*. A known inhibitor of XET reduced the number of haustorial invasions.]


*Omoigui, L.O., Kamara, A.Y., Moukoumbi, Y.D., Ogunkanmi, L.A. and Timko, M.P. 2017. Breeding cowpea for resistance to *Striga gesnerioides* in the Nigerian dry savannas using marker-assisted selection. Plant Breeding 136(3): 393-399. [The *Striga* resistance gene from the donor parent IT97K-499-35 was introduced into an elite farmer preferred cowpea cultivar ‘Borno Brown’. A number of desirable improved lines were selected, immune to *Striga*, and having local genetic background with higher yield than those of their parents and standard varieties.]

*Ongachi, W., Onwonga, R., Nyanganga, H. and Okry, F. 2016. Comparative analysis of Video Mediated Learning and Farmer Field School approach on adoption of *Striga* control technologies in Western Kenya. International Journal of Agricultural Extension 5(1): 1-10. [Results indicated that Video Mediated Learning alone could be better than FFS in promoting *Striga*-control technologies, but best results can be expected from a combination of video and FFS as the two approaches complement each other.]


*Parker, T.J., Chambers, C.L. and Mathiasen, R.L. 2017. Dwarf mistletoe and breeding bird abundance in ponderosa pine forests. Western North American Naturalist 77(1): 40-50. [Finding that the density of breeding birds was not well correlated with density of *Arceuthobium vaginatum* but rather with ‘snag’ density, snags being a result of past rather than current parasite infection.]

*Perronne, R., Gibot-Leclerc, S., Dessaint, F., Reibel, C. and le Corre, V. 2016. (Differences in the germination abilities of two pathovars of branched broomrape on Brassicaceae and Fabaceae hosts.) (in French). In: Proceedings, 23e Conférence du COLUMA. Journées Internationales sur la Lutte contre les Mauvaises Herbes, Dijon, France, 6-8 décembre 2016: 48-57. (https://www.cabdirect.org/cabdirect/FullTextPDF/2017/20173254403.pdf) [Laboratory study comparing the germination of hemp and rape-seed pathovars of *Phelipanche ramosa* by 25 crop and weed species. Showing little difference between pathovars and wide differences between host species, the species causing highest germination (ca. 90%) being *Lotus corniculatus*, thus of potential interest as a trap crop.]

*Pointier, O., Gibot-Leclerc, S., Moreau, D. and Colbach, N. 2016. Modelling cropping system effects on branched broomrape dynamics in...
interaction with weeds [Conference poster]. 23e Conférence du COLUMA. Journées Internationales sur la Lutte contre les Mauvaises Herbes, Dijon, France, 6-8 décembre 2016.


The effects of tillage, delayed sowing and catch crops are characterized at the species level and at the plant scale. Interactions between the parasite and crops and weeds were characterized at the species level and at the plant scale. The effects of tillage, delayed sowing and catch crops are discussed.

Punia, S.S., Anil Duhan, Yadav, D.B. and Sindhu, V.K. 2016. Use of herbicides against Orobanche in tomato and their residual effect on succeeding crop. Indian Journal of Weed Science 48(4): 404-409. [Noting that Phelipanche aegyptiaca is troublesome in tomato in Harayana, India and concluding that that post-emergence applications of ethoxysulfuron or sulfosulfuron at 30 and 60 days after transplanting provided 85-90% control without any adverse effect on the current or following crops and with yield increases of 46-58%]


Qurashi, Y.A., Ganawa, E.S., Kheiralla, A.F. and Hassabala, A.A. 2017. Application of satellites imagery in detecting and mapping Striga hermonthica in a sugar cane field. Advances in Bioreresearch 8(82):146-152. [Remote sensing was used to survey intensity of S. hermonthica in cane in SE Sudan. Most was detected in field borders. Losses due to Striga over 3 seasons was estimated at 150-200 tons over the studied fields.]


Ragazzi, A. and Moricca, S. 2016. (Pseudotsuga menziesii: pathogens introduced and whose introduction is feared.) (in Italian) Georgofili 13(Supplemento 1): 107-126. [Discussing the risks from introduction of Douglas fir into Europe, including that from Arceuthobium douglasii.]

Rajan, N.M. and Shanmugam Jayalakshmi. 2017. Predictive species habitat distribution modelling of Indian sandalwood tree using GIS. Polish Journal of Environmental Studies 26(4): 1627-1642. [Concluding that that the toolbox designed in this research is able to give 90.6% accuracy in the resulting maps of Santalum album that it produces.]


Ratlhatloleng, N.M., Madibela, O.R. and Machete, J.B. 2016. Anthelmintic effects of a diet containing a traditional plant Viscum verrucosum on faecal egg count and ecosinophils of naturally infected Tswana goats. In Proceedings, 3rd International conference on neglected and underutilized species (NUS): for a food-secure Africa. At Accra, Ghana, 25-27 September 2013: 140-145. [A V. verrucosum based diet was as effective as the chemical, valbazen, in reducing faecal egg count, indicating that the use of natural flora may be a beneficial option for low-resource farmers who cannot afford to purchase drugs control internal parasites.]

Razavifar, Z., Karimmojeni, H and Sini, F.G. 2017. Effects of wheat-canna intercropping on Phelipanche aegyptiaca parasitism. Journal of Plant Protection Research 57(3): 268-274. (https://www.degruyter.com/downloadpdf/j/jppr.2017.37.issue-3/jppr-2017-0038/jppr-2017-0038.pdf) [A range of wild and cultivated wheat varieties were planted with canola (rapeseed) and P. aegyptiaca in pots. There were apparently significant but rather modest reductions in the parasite with some wheat varieties and allelopathy is claimed, but there are no data and no consideration of the possible effects via competition from the wheat on the canola host.]

Risnoveanu, L., Jiota-Păcuraru, M. and Anton, F.G. 2016. The virulence of broomrape (Orobanche cumana Wallr.) in sunflower crop in Braila area, in Romania. Helia 39(6): 189-196. [Noting that O. cumana was first recorded in Romania in 1940. This study determined that all races A to F are present in the country and some virulence greater than F, and the situation is changing annually.]

Sá, R.R., Matos, R.A., Silva, V.C., Caldas, J.daC., Sauthier, M.C.daS., dos Santos, and mapping
Saraj, B.S., Kafaki, S.B., Kiadaliri, H. and Akhavan, R. 2017. Determination of bioactive phenolics in herbal medicines containing *Cynara scolymus*, *Maytenus ilicifolia* Mart ex Reiss and *Ptychopetalum unciniatum* by HPLC-DAD. Microchemical Journal 135: 10-15. [HPLC-DAD found to be reliable for measurement of phenolics in *P. unciniatum* (Oleaceae).]


*Saraj, B.S., Kafaki, S.B., Kiadaliri, H. and Akhavan, R. 2017. (Classification of worldview 2 satellite image by using object-based technique to identifying the infection of Zagros forests by *Loranthus europaeus*. (in Persian) Iranian Journal of Forest 8(4): e445-Pe457. (http://www.ijf-isaforestry.ir/article_46269_8a70ce07f0a4b9ba3b43de1c44ca22d2.pdf) [Concluding that Random Forest algorithm with 1000 trees was the best for indentifying the various intensities of infection by *L. europaeus* in forests in Zagros, Iran, with a reliability of 85-92%] Sari-Krsmanovic, M.M., Bozic, D.M., Radiojjevi, L.M., Umljendic, J.S.G. and Vrbnicanin, S.P. 2017. Effect of *Cuscuta campestris* parasitism on the physiological and anatomical changes in untreated and herbicide-treated sugar beet. Journal of Environmental Science and Health B. 52(11): 812-816. [*C. campestris* shown to cause 20-28% reductions in chlorophyll a and b and carotenoids in sugar beet. These reductions were only 2-5% in crop treated with propyzamide, suggesting it as 'an adequate herbicide for control of field dodder at the stage of early infestation'.] Sarić-Krsmanović, M. and Vrbničanin, S. 2017. Field dodder life cycle and interaction with host plants. Pesticides and Phytochemistry (Belgrade) 32(2): 95–103. [A general review, incidentally noting that about 10 *Cuscuta* species occur in Serbia, *Cuscuta campestris* being the most frequent.]
- Soil & Plant Science 67(9): 1-11. [Reviewing the methodology of breeding for resistance to *S. asiatica* in South Africa and promoting the use of integrated methods of *Striga* control including the use of *Fusarium oxysporum f.sp. strigea*.


Sobeh, M., Mahmoud, M.F., Abdelfattah, M.A.O., El-Beshbissy, H.A., El-Shazly, A.M. and Wink, M. 2017. Hepatoprotective and hypoglycemic effects of a tannin rich extract from *Ximenia americana var. caffra* root. Phytomedicine 33: 36-42. [Results confirm a hepatoprotective potential for the root extract from *X. americana var. caffra*. It can also mediate an antidiabetic effect by reducing elevated blood glucose and serum lipid peroxides levels and by increasing insulin in STZ-diabetic rats by -107%, -31.1% and +11.3%, respectively.]

Spallek, T., Melnyk, C.W., Wakatake, T., Zhang Jing, Sakamoto, Y., Kiba, T., Yoshida, S., Matsuenga, S., Sakakibara, H. and Shirasu, K. 2017. Interspecies hormonal control of host root morphology by parasitic plants. Proceedings of the National Academy of Sciences of the United States of America 114(20): 5283-5288. [The results demonstrate that the interspecies movement of cytokinin from the parasite, *Phtheirospermum japonicum* modified both host root morphology and fitness. Other microbial and animal plant pathogens use cytokinins during infections, highlighting the central role of this growth hormone during the establishment of plant diseases and revealing a common strategy for parasite infections of plants.]


*Steinborn, C. and 12 others. 2017. *Viscum album* neutralizes tumor-induced immunosuppression in a human in vitro cell model. PLoS ONE 12(7): e0181553. (http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0181553) [Two *V. album* extracts were tested for their effects on the maturation of human dendritic cells and on T cell function using flow cytometry, automated fluorescence microscopy and cytokine bead array assays, leading to their potential mode-of-action as an additive cancer therapy based on immunomodulatory effects.]

*Sun Ting, Renner, S.S., Xu YuXing, Qin Yan, Wu JianQiang and Sun GuiLing. 2016. Two hAT transposon genes were transferred from Brassicaceae to broomrapes and are actively expressed in some recipients. Scientific Reports 6: No.30192. (http://www.nature.com/articles/srep30192) [Concluding that the broomrape genera *Phelipanche* and *Orobanche* acquired two related nuclear genes (christened BO transposase genes), a new group of the hAT superfamily of class II transposons, from Asian Sisymbrieae or a closely related tribe of Brassicaceae, by horizontal gene transfer. The collinearity of the flanking genes, lack of a classic border structure, and low expression levels suggest that BO transposase genes cannot transpose in Brassicaceae, whereas they are highly expressed in *P. aegyptiaca*.]

Susatya A, Hidayati SN, Riki S. 2017. *Rafflesia kemumu* (Rafflesiaceae), a new species from Northern Bengkulu, Sumatra, Indonesia. Phytotaxa 326: 211-220. [A new species was named from plants occurring in two populations from the Palak Siring area of West Sumatra, that are sympatric with *R. gadetensis*. This taxon is morphologically very similar to *R. gadetensis* and sympatric with it, thus they may be conspecific (molecular data are needed).]


bidirectionally between parasite and host plants. The study was to investigate the miRNA of *S. hermonthica* and miRNA mediated regulation of the host plant *Oryza sativa* genes. Thirteen conserved miRNAs were identified in *S. hermonthica*, and showed homology with their host plants *O. sativa* and *Sorghum bicolor*. Out of the thirteen miRNAs, 12 miRNAs are predicted to regulate 185 target mRNA of *O. sativa.*

Talabi, A.O., Badu-Apraku, B. and Fakorede, M.A.B. 2017. Genetic variances and relationship among traits of an early maturing maize population under drought-stress and low nitrogen environments. Crop Science 57(2): 681-692. [Studyng genetic variances in a maize population which had undergone 4 cycles of selection for drought tolerance, and 4 cycles for resistance to *Striga hermonthica* and concluding that there was insufficient variation for further yield enhancement and there was a need to introgress new sources of favorable alleles for drought-stress and low N tolerance into the population.]


*Tilk,* M., *Tullus,* T. and *Ots,* K. 2017. Effects of environmental factors on the species richness, composition and community horizontal structure of vascular plants in Scots pine forests on fixed sand dunes. Silva Fennica 51(3): article id 6986. (https://silvaefennica.fi/article/6986) [Melampyrum pratense among the four most frequent species in the understory of *Pinus sylvestris*. The relative importance among species is influenced by elevation and aspect of the, soil nitrogen, potassium and phosphorus, pH, moisture conditions and thickness of the litter. No comment on possible hosts of the parasite.]

*Tippe,* D.E., *Rodenburg,* J., *Schut,* M., *van Ast,* A., *Kayeke,* J. and *Bastiaans,* L. 2017. Farmers’ knowledge, use and preferences of parasitic weed management strategies in rain-fed rice production systems. Crop Protection 99: 93-107. [A valuable analysis of farmer reactions to *Rhamphicarpa fistulosa* in lowland rice and *Striga asiatica* in upland rice in Tanzania, and to the available control options. Concluding that the most favourable options for control of *R. fistulosa* were early crop establishment and use of the local variety Supa India. For *S. asiatica* late planting is preferred, requiring a short-duration variety such as NERICA-10. But emphasising the importance of farmer participation in technology testing and the need for improved credit and input supply.]

Tippe, D.E., Rodenburg, J., van Ast, A. And Bastiaans, L.L. 2017. Delayed or early sowing: timing as parasitic weed control strategy in rice is species and ecosystem dependent. Field Crops Research 214: 14-24. [In general, delaying sowing of dry-land rice in Tanzania resulted in less serious damage from *Striga asiatica*, while for *Rhamphicarpa fistulosa*, early sowing of lowland rice, before soil saturation, was preferable. For upland rice, drought conditions may influence results with *S. asiatica* and require the use of an early-maturing variety.]


Tjurutue, M.C., Sandler, H.A., Kersch-Becker, M.F., Theis, N. and Adler, L.S. 2017. Gypsy moth herbivory induced volatiles and reduced parasite attachment to cranberry hosts. Oecologia 185(1): 133-145. [Gypsy moth damage significantly reduced subsequent attachment by *Cuscuta* spp. (mainly *C. gronovii*). This effect was associated with increased Jasmonic acid levels, total volatile emissions, and the flavonol, quercetin aglycone (see also the senior author’s PhD thesis at - http://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1683&context=dissertations_2 )]


Vali-allah Yousefabad, Mohammad Taghi Alebrahim, Ahmad Tuobe, Eskandar, Z. and Mohammad Abdollahian-Noghabi. 2017. The effect of seedling transplantation and post-emergence herbicides application on field dodder (*Cuscuta campestris*) control in sugar beet. Romanian Agricultural Research 34(May 2017): 377-384. (http://www.incdagfundulea.ro/rar/nr34/rar34.42.pdf) [In a field experiment in Iran, transplanting sugar beet resulted in greatly reduced infestation by *C. campestris* and 2.5 times increase in beet yield. Transplanting was simultaneous with direct sowing, but age of transplants not indicated.]

*Venditti, A., Frezza, C., Foddai, S., Serafini, M., Nicoletti, M. and Bianco, A. 2017. Chemical traits of hemiparasitism in *Odontites luteus*. Chemistry & Biodiversity 14(4): e1600416. (http://onlinelibrary.wiley.com/doi/10.1002/cbdv.201600416/abstract) [Identifying a range of monoterpene glycosides in *O. luteus* in Italy, several of which had not previously been reported in Lamiales and had presumably been derived from hosts in such as Oleaceae and Ericaceae.]

*Venezian, A., Dor, E., Aachdari, G., Plakhine, D., Smirnov, E. and Hershenhorn, J. 2017. The influence of the plant growth regulator maleic hydrazide on Egyptian broomrape early developmental stages and its control efficacy in tomato under greenhouse and field conditions. Frontiers in Plant Science 8(May): 691. (https://www.frontiersin.org/articles/10.3389/fpls.2017.00691/full) [Laboratory and field experiments confirm the excellent selectivity of maleic hydrazide. Five applications at 100, 200, 400, 700, and 1000 GDD, each at 400 g/ha provide a high degree of control and increased yields, and are now registered and widely used in Israel.]


Wang YaJiao, Ji LiJing, Li QiuSheng, Wang LianSheng and Kong LingXiao. 2017. Broomrape bio-control agent Br-2 labeled by red fluorescent protein and its colonization. Journal of Plant Protection 44(4): 664-670. [*Fusarium oxysporium* (Br-2) was converted to exhibit red fluorescence and could then be traced as it infected the epidermis of *O. aegyptiaca* stem one day after inoculation, infected the intercellular of the epidermis and sclerenchymatous cells three days after inoculation, and finally cells of the sclerenchyma and vascular bundle, leading to stem rot after five days. It was restricted to the surface of the tomato root and did not penetrate.]

Wang ZhiQiang, Hwang SeungHwan, Quispe, Y.N.G., Arce, P.H.G. and Lim SoonSung. 2016. Investigation of the antioxidant and aldose reductase inhibitory activities of extracts from Peruvian tea plant infusions. Food Chemistry 231: 222-230. [Confirming that extracts of a *Phoradendron* sp. (unspecified in abstract) can be a potent functional *food* ingredient as an antioxidant, aldose reductase inhibitor and anti-inflammatory agent.]


*Wu ChunYan and Wang XueFeng. 2017. Preliminary research on the identification system for anthracnose and powdery mildew of sandalwood leaf based on image processing PLoS ONE 12(7): e0181537. (http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0181537) [SVIM image segmentation, feature extraction and digital image classification and recognition technology was used successfully to identify and distinguish anthracnose and powdery mildew in leaves of unspecified Santalum sp.]

Xi Li, Baohai Hao, Da Pan and Schneeweiss, G.M. 2017. Marker development for phylogenomics: the case of Orobanchaceae, a plant family with contrasting nutritional modes. Frontiers in Plant Science 8(22 November 2017). (https://doi.org/10.3389/fpls.2017.01973) [Phylogenomic approaches, employing next-generation sequencing (NGS) techniques, have revolutionized systematic and evolutionary biology. Target enrichment is an efficient and cost-effective method in phylogenomics and is becoming increasingly popular. Here, a highly flexible bioinformatic pipeline, BaitsFinder, was established to identify putative orthologous single copy genes (SCGs) and to construct bait sequences in a single workflow. Transcriptome data of differing quality available for four Orobanchaceae species were used and, as reference, SCG data from monkeyflower (Erythranthe guttata, syn. Mimulus g.; 1,915 genes) and tomato (Solanum lycopersicum; 391 genes). Based on the results it was suggested that BaitsFinder is expected to be broadly applicable in groups, where only transcriptomes or partial genome data of differing quality are available.]

Xie XiaoNan, Kisugi, T., Yoneyama, K., Nomura, T., Akiyama, K., Uchina, K., Yokota, T., McErlean, C.S.P. and Yoneyama, K. 2017. Methyl zealactonate, a novel germination stimulant for root parasitic weeds produced by maize. Journal of Pesticide Science 42(2): 58-61. [Describing the isolation of a new strigolactone, methyl zealactonate, which is highly active on Striga hermonthica and Phelipanche ramosa but less so on Orobanchaceae minor. It is shown to be derived from carlactone in maize.]


Yan Yang, Goldstein, G., Wang Miao, Zhang WeiWei, Wang AiYing, Liu YanYan and Hao GuangYou. 2017. Microenvironment in the canopy rivals the host tree water status in controlling sap flow of a mistletoe species. Tree Physiology 37(4): 501-510. [Showing that the transpiration of Viscum coloratum was substantially higher than that of the (unspecified) host during clear days, and that the development of a dense tree canopy functions as a potential mechanism for the reduction of the competitive water use of the parasite.]


Polysaccharide from *Cuscuta chinensis* can exert a protective effect on H$_2$O$_2$ injured SH-SY-5Y cells. This antioxidant effect could be related to increasing expression of PSD-95 and p-ERK.