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PRESIDENT'S MESSAGE

Dear IPPS Members,

Greetings and best wishes for 2015.

This will be a special year for IPPS as this summer the 13th World Congress on Parasitic Plants will take place on July 5-10 in Kunming, China, for the first time in Asia. Please see the meeting section of this issue to find and confirm important information on the Congress such as registration and abstract submission dates. John Yoder with other members of scientific committee have been working extensively on the scientific program and you will find session chairs/modulators and keynote lectures on the tentative program. I encourage all of you to attend and enjoy great scenery, food, culture, and of course science.

I am pleased to announce the result of the recent IPPS elections. First of all, I thank everyone who participated in the election process and extend congratulations to Hinanit Koltai and Pilippe Simier for being elected to office.

Full list of IPPS officers is now:
- President – Koichi Yoneyama (continuing)
- Vice President – Julie Scholes (continuing)
- Secretary – John Yoder (continuing)
- Treasurer – Philippe Simier (newly elected)
- Editor – Hinanit Koltai (newly elected)
- Member at large – Ahmet Uludag (continuing)

We are very grateful to Philippe Delavault and Harro Bouwmeester for their excellent service and contributions to the society. Philippe Delavault completed his second round of term as Treasurer (8 years!) to keep IPPS bank account safely in France. Harro as Editor has helped Chris and Lytton increase volume and contents, and deepen the science in Haustorium. Any contributions or other ideas you have for Haustorium can now be sent to Hinanit as well as to Chris or Lytton.

There will be another important meeting in 2015, the 1st International Congress on Strigolactones which will be held on 1-6 March in Wageningen, the Netherlands. Harro Bouwmeester and colleagues are busy organizing the congress. Although strigolactones were first identified as germination stimulants for root parasitic weeds, now they are recognized as a novel class of plant hormones. The Congress will summarize old and new evolving aspects in biology, biochemistry, chemistry, and molecular biology of strigolactones. Details can be found at www.strigolactones.org.

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

See you in Kunming, China!

Koichi Yoneyama, IPPS President
yoneyama@cc.utsunomiya-u.ac.jp

THE 13TH WORLD CONGRESS ON PARASITIC PLANTS

The 13th World Congress on Parasitic Plants (WCPP13) will be held on Sunday July 5 to Friday July 10, 2015 in Kunming, Yunnan Province, Southwest China. The venue will be Yunnan Dianchi Garden Resort Hotel & Spa. Further details can be found at the conference website http://wcpp13.csp.escience.cn/dct/page/65540. Abstract submission and online registration services are now available.

NOTE FROM THE NEW EDITOR

Dear all,

Initially, I would like to thank the members of the IPPS for the opportunity to fulfil the role of Editor for the IPPS, which I gladly accept.

I look forward to highlighting exciting new developments associated with Parasitic Plant research. The comparison between biological systems is, in my belief, a decided contributor to the better understanding of evolutionary and developmental processes. And it is through this comparison and integrative insight that I plan to present future developments. In the current issue I choose to highlight an exciting new development in the Parasitic Plant field of study, which relates to new findings about the exchange of signalling between host and parasite. Due to several new research studies we have gained better insight into both signals and receptors, thereby providing us a deeper understanding of the evolutionary process of this elaborate host-parasite communication.

I look forward to sharing with you my thoughts and insights, and hope to benefit the field of Parasitic Plants during these years of service.

Sincerely,
Hinanit Koltai, PhD
Editor, IPPS
STRIGOLACTONE AND KARRIKINS: SIGNALS AND THEIR RECEPTORS IN PLANT AND PARASITIC-PLANT GERMINATION

A marked advance was made in the last two years in our understanding of the signaling pathways associated with two classes of seed germination stimulators, strigolactones and karrikins. Back in 1966 strigolactones were first identified as crystalline, highly active germination stimulants of parasitic plants isolated from cotton-root exudates (Cook et al., 1966). In 1972, the structure of strigol was elucidated (Cook et al., 1972). Since then, numerous studies have shown that strigolactones are secondary metabolites, produced and exuded from the roots, which act as stimulators of seed germination in parasitic plants, including Striga and Orobanche (reviewed by Xie et al., 2010).

In plants, similarly to other plant hormones, strigolactones are sensed by a specific reception system (reviewed by Koltai, 2014). The F-box protein MAX2/D3/RMS4 component of this reception system was identified several years ago (Stirnberg et al., 2002; Ishikawa et al., 2005; Johnson et al., 2006). Significantly, max2 mutants were hyposensitive to both Red and Far-Red light-induced seed germination, suggesting a role for MAX2 in this process (Shen et al., 2007).

In the past 2 years additional components of the strigolactone receptor and signaling pathway were discovered. These include D14, identified in rice (Arite et al., 2009). Crystallization of its ortholog from petunia (DAD2), showed it to be a protein with an α/β-hydrolase fold and a canonical catalytic triad with a large internal cavity. Moreover, DAD2 interacted in a yeast two-hybrid assay with the petunia MAX2A only in the presence of the synthetic strigolactone GR24 (Hamiaux et al., 2012). This interaction resulted in hydrolysis of GR24 by DAD2 (Hamiaux et al., 2012). The rice D14 was shown to bind to GR24 (Kagiyama et al., 2013) and to function as a cleavage enzyme of strigolactones (Nakamura et al., 2013). Moreover, dependent on D14- and D3/MAX2, strigolactones induce in rice proteasomal degradation of D53. D53 acts as a repressor of strigolactone signaling, and its degradation promotes axillary-bud outgrowth (Jiang et al., 2013; Zhou et al., 2013). However, neither canonical strigolactones nor AtD14 control Arabidopsis seed germination (Waters et al. 2012; Scaffidi et al., 2014).

Another signal for seed germination in plants is the strigolactone-similar class of compounds, the karrikins, originally found in forest-fire smoke (Flematti et al., 2004). Karrikins use a KA12 (D14-LIKE)–MAX2-dependent pathway to regulate seed germination in Arabidopsis, as well as seedling growth and leaf and rosette development (Waters et al., 2012; Nelson et al., 2011; Waters et al., 2014) and require the F-box protein MAX2 (Nelson et al., 2011). However, karrikins in their pure form do not induce parasitic plant seed germination (Nelson et al., 2009; Scaffidi et al., 2014).

This strigolactone/karrikins reception module seem to have been conserved during plant evolution (Waldie et al., 2014). Therefore, it was expected to find similar components of strigolactone reception also in parasitic plants. Indeed, Liu et al. (2014) found in Striga hermonthica that ShMAX2 is involved in strigolactone perception. This is since expression of ShMAX2 in Arabidopsis was able to complement the Arabidopsis max2-1 mutant phenotypes, including the root and shoot phenotype, and the response to strigolactones (Liu et al., 2014). However, Striga MAX2 could not complement the hyposensitivity to Far Red light for seed germination in Arabidopsis max2-1. It might be that ShMAX2 does not recognize the Arabidopsis KA12, involved in Arabidopsis seed germination (Liu et al., 2014).

Together, these evidences suggest that karrikins and strigolactones operate by different mechanisms in their germination stimulation action (Nelson et al., 2009). This notion is fortified by the findings that parasitic plant germination activity is dependent on the part of the molecule attached to the D-ring (Zwanenburg et al., 2013), absent in karrikins (Chiwocha et al., 2009). Hence, the signal reception and/or response of seed germination might be different between parasitic plants and other plant species. Further studies may provide better insight into this subject and indicate some evolutionary changes evolved in parasitic plants in relation to plant signal recognition and response.

References


Hinanit Koltai

RESEARCH ON PARASITIC PLANTS IN TROPICAL BRUNEI DARUSSALAM, BORNEO

Brunei Darussalam is a tiny, natural gas- and oil-rich Sultanate situated on the north-western edge of the island of tropical Borneo, an island which is also a part of Indonesia and Malaysia. About 54% of Brunei’s land area remains covered by unlogged primary forest.

The Sultanate possesses a high level of biodiversity compared to other countries in the region, including parasitic plants. Surveys carried out researchers lead by Kushan Tennakoon, Linda Lim, Aywen Chak, Quang-Vuong Le and...
Roshanizah Rosli, (based at the Universiti Brunei Darussalam) with their collaborators Lytton Musselman (Old Dominion University, USA) and Jay Bolin (Catawba College, USA) have recorded large populations of identified and unidentified mistletoes of the families Loranthaceae and Viscaceae (Chak, 2009) parasitizing hedgerow trees and tropical heath forest trees, dodders (*Cuscuta*) parasitizing grass patches and shrubby vegetation along the closely- knit waterways and *Cassitya* growing extensively in the sea-shore strand vegetation.

This rich parasitic flora in the Sultanate provides multiple avenues for research and draws international and local students for studies of biology, physiology and biochemistry of parasite-host associations in the tropics. So far, four BSc. (Honours) and three MSc. students have completed research projects on parasitic plants (biology and physiology of *Cassitya filiformis* and *Cuscuta australis*; phytochemistry of mistletoes and *Cassitya*) at the Universiti of Brunei Darussalam. One PhD project on the investigation of physiology and biochemistry of Bornean mistletoes as well as *Cuscuta* is currently underway.

An overview of recently completed studies on parasitic plants in Brunei Darussalam is given here: The different levels of dependence of parasitic plants on associated hosts provide opportunities to study resilience and the physiological nature of parasite and host counterparts. The occurrence of the same parasitic plants parasitizing different host species, or different parasites growing on the same host species at similar sites in Brunei Darussalam (especially in tropical heath forests) aids the elucidation of mistletoe-host physiology under similar natural conditions. For example, in twelve mistletoe-host associations, Tennakoon *et al.* (2011) showed evidence of uncorrelated $\delta^{13}$C values and significantly correlated $\delta^{15}$N values between mistletoe and associated host, demonstrating the nitrogen dependence of mistletoe on its host. Le *et al.* (2014) evaluated the overall impact of hosts on tropical mistletoes by comparing photosynthetic capacity (light saturated photosynthesis, apparent quantum yield, light compensation point and instantaneous CO₂ assimilation rates) and photosynthesis-related characteristics (stomatal conductance, transpiration rate, water use efficiency, specific leaf area, leaf dry matter content, chlorophyll profiles) of four *Dendrophthoe curvata*-host associations. This study demonstrated that host-specific responses have driven the intra-specific variation in mistletoe physiology in aspects of photosynthesis and photosynthesis-related attributes.

Furthermore, Tennakoon *et al.* (2014) provided the first account of mineral nutrition and stable isotope relationships ($\delta^{13}$C and $\delta^{15}$N) of two hyperparasitic *Viscum articulatum-* primary parasitic plant (*Dendrophthoe curvata* and *Macrosolen cochinchinensis*)-host-plant (*Mangifera Indica* and *Durio zibethinus*) associations found in Brunei Darussalam. The $\delta^{13}$C partitioning patterns for hyperparasites, primary parasites and hosts were non-linear in contrast to linear patterns reported from the literature for autoparasitic mistletoe associations, demonstrating fundamental differences between nutrition in hyperparasites and autoparasites.

Other ongoing research includes the mineral accumulation and anti-oxidant properties of mistletoes (Yun 2014; Pin 2014, unpublished data), haustorial biology and the impacts of *Cassitya filiformis* on the growth and development of selected Bornean hosts (Rosli 2014, unpublished data) and the impact of *Cuscuta* on *Mikania* under drought stress (Le *et al.* unpublished data).

An interesting find is the paucity of flowering for *Cuscuta* that is widespread across the Sultanate in the vegetative state (Chak *et al.* 2010). In studies of 500 dodder populations in Brunei Darussalam over 7 years, only one produced flowers. DNA sequence analysis of internal transcribed spaces (ITS) of nuclear ribosomal RNA genes and chloroplast *trnl-F* intergeneric spacers (Bieber *et al.*, 2010) revealed that flowering and non-flowering dodders are the same species (*Cuscuta australis* Brown). The perennating mechanism originally described for *C. reflexa* (see Chak *et al.* 2010 and references therein) differs from the perennation of *C. australis* observed in Brunei, whereby the young perennating shoots originate directly from the central core of the *Cuscuta* vegetative body host pith instead of the ‘concealed’ absorbing tissues of haustoria embedded in host pith reported for *C. reflexa*. During the perennating stage of *Cuscuta*, several young shoots of varying lengths emerge at several points along the parental strands. Further elongation of these young shoots results in the fresh attack of any nearby potential host plants.

The dearth of flowering populations of *C. australis* in Brunei is still a mystery. Interestingly, ongoing studies reveal flowering and perennating *C. australis* populations with different total antioxidant capacity, phenolic and flavonoid contents suggesting the different potential medicinal constituent profiles (Le *et al.*, unpublished data).

Many questions related to biology and biogeography of angiosperm parasitic plants in Brunei remain. For example, identification of mistletoes in the canopies of tropical heath and mixed dipterocarp forests; what factors determine the distribution of mistletoes, *Cuscuta*, and *Cassitya* in Brunei Darussalam; why dodders growing here adopt different proliferative strategies (flowering and perennating); and how this trait affects the spread rate of dodders in Brunei Darussalam. In addition, the potential medicinal values of the
same parasitic plants associated with different hosts, and grown in contrasting habitats (seashore, tropical heat and mixed dipterocarp vegetations) of tropical Brunei Darussalam are yet to be unravelled. These questions need to be answered sooner than later before some of these pristine habitats in this tiny Sultanate are lost. Parasitic plant research at the University of Brunei Darussalam is supported by a research grant awarded to Kushan Tennakoon by the Brunei Research Council (UBD/S&T 8). Lytton Musselman acknowledges generous support of a Fulbright Specialist Award as well as the Mary Payne Hogan fund of Old Dominion University.

References
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BIÓLOGICAL CONTROL OF STRIGA IN KENYA - UPDATE

The development of biological control of Striga hermonthica began in West Africa back in the 1990s using the plant pathogen Fusarium oxysporum f.sp. strigae. In 2009 the idea of using the same pathogen isolate (Foxy 2) was initiated and field trials, though subject to quarantine restrictions were initiated in Western Kenya. In 2011, this work was supported by the ISMA project managed by IITA and funded by BMGF. An update of the ISMA project in West Africa was recently reported in Haustorium (No 65, page 7, July 2014). Despite extensive trials the isolate Foxy 2 showed little effect on Striga hermonthica in Kenya when growing in association with maize (Avedi et al, 2014 – see Literature section below).

Collection of infected Striga plants with the visible characteristics of Fusarium oxysporum was undertaken in maize fields in Western Kenya in 2012. These pathogens were isolated and sent to University of Stellenbosch to the laboratories of Altus Viljoen where comparative analysis of Kenyan and West African isolates from Striga plants showed that the populations from the two regions were genetically different from each other.

Plate 1. The effect of the Striga biocontrol agent Fusarium oxysporum f. sp. strigae isolate FK3 on the development of Striga plants when pots were inoculated with Striga hermonthica. CR = control, LR = low rate, MR = medium rate and HR = high rate of FK3 in the growing medium.

One of the Kenyan isolates, FK3, was selected for trials to evaluate the effect on Striga hermonthica development in
pot-grown maize. Trials over two seasons have shown a significant reduction in *Striga* development when FK3 was planted at low, medium and high rates (Plate 1). The FK3 was grown on a rice based product, dried and ground, before being incorporated into the pot soil prior to planting at rates of $7.5 \times 10^7$ (low rate), $1.5 \times 10^8$ (medium rate) and $6 \times 10^8$ (high rate) CFUs per pot. The performance of the isolate FK3 has shown considerable promise and plans to register this as a biopesticide in Kenya are being evaluated. Maize cob and grain weight were moderately increased and stover weight more significantly.

Henry Wainwright, The Real IPM Company (K) Ltd and Altus Viljoen, University of Stellenbosch, South Africa.

**MISTLETOES AND MEDICINE: A PLEA FOR BETTER TAXONOMY**

While reading some of the citations in Haustorium, I discovered a problem that, upon further examination, appears to be extensive. This involves the misidentification of mistletoes used in some biomedical studies. The high volume of publications is because, in some cases, research has demonstrated efficacy in treating serious human diseases such as hypertension, diabetes, epilepsy, and cancer.

The citations listed below that motivated me to write this were Ajani *et al.* (2014a, b) and Channabasava *et al.* (2014). I wish to state that I do not wish to single out these particular authors but am simply using them as examples of a pervasive problem. The authors use the name *Loranthus micranthus* (with no authority). If this were *L. micranthus* Hook. f., then this is a synonym for *Ileostylus micranthus* (Hook. f.) Tiegh. *But* *Ileostylus* is a mistletoe endemic to New Zealand that is highly unlikely to be the subject of these studies. In both cases the mistletoe was collected locally, in Nigeria and India, respectively. For the Nigerian mistletoe, a synonym exists with similar spelling: *Loranthus micrantherus* Engl. which is now correctly called *Englerina gabonensis* (Engl.) Balle. It is possible the mistletoe being used is *Englerina*, but this needs to be confirmed. Using the name *L. micranthus* for a mistletoe collected in India is more perplexing and is perhaps due to the unwise reliance on vernacular names.

About four years ago Chris Parker noticed this same error* and contacted an author working in Nigeria who also pointed out a similar problem on the misuse of the name *Viscum album* L. which does not occur in Nigeria. Despite these alerts, the practice of using incorrect names continues, even in recently published review articles.

In a search of my Endnote reference database that contains all of the citations listed in past Haustorium newsletters the name *Loranthus micranthus* was used in the following journals: African Journal of Biotechnology, American Journal of Pharmacology and Toxicology, Asian Journal of Biomedical and Pharmaceutical Sciences, Asian Pacific Journal of Tropical Medicine, Bio-Research, Current Research, Drug plants, European Journal of Medicinal Plants, Fitoterapia, International Journal of Pharma and Bio Sciences, Journal of Ethnopharmacology, Journal of Pharmacy and Pharmacology, Journal of Tropical Medicine, Pharmaceutical Biology, and Phytopharmacology and Therapeutic Values. I then searched for this binomial using Google Scholar and added the following journals: Biochemistry Research International, Current Research Journal of Biological Sciences, Evidence-Based Complementary and Alternative Medicine, Global Advanced Research Journal, Journal of Pharma and Bio Sciences, Journal of Pharmaceutical and Allied Sciences, Natural Product Research (Formerly Natural Product Letters), Pharmaceutical Biology, Phytochemistry Letters, Planta Medica, Research Journal of Medicinal Plant, and Scientia Africana. Although some of these journals are from developing nations, others are from the United States and Europe, demonstrating that this taxonomic problem is not being detected among a wide range of authors, journals, reviewers, and editors.

![Englerina gabonensis](Photo Jan Wieringa)

So is my plea for better taxonomy really relevant to this line of scientific inquiry? Should authors, reviewers, editors, etc. be more stringent when reviewing the biological sources of
the chemical constituents used in such pharmacological and biomedical studies? I propose that poor plant taxonomy can inhibit scientific progress and this view is shared by others (see Boyle et al. 2013, BMC Bioinformatics 14:16). The ability of, say, a British scientist to accurately replicate a study conducted in India depends upon gaining access to the exact same plant material used in the original study. Were vouchers deposited in herbaria? Are these available (ideally digitally) for the scientific community to examine and evaluate as to the taxonomic name being used?

To avoid sounding too accusatory, I want to end by being more introspective. As a taxonomist, I must ask myself if I have done a good job in providing to the scientific community and general public the tools needed to properly identify parasitic plants such as mistletoes. This is not an easy task as there are nearly 1000 species of Loranthaceae and 570 species of Viscaceae alone. As the author of the ‘Parasitic Plant Connection’ (http://www.parasiticplants.siu.edu/), I have attempted to make information about mistletoes readily accessible to everyone. But despite providing descriptions, images, literature, etc. there still does not exist a way to identify mistletoes worldwide in a ‘one stop shopping mode’. Yes, taxonomic keys exist for all of these plants but they were published in many different places, often in sources that are difficult to obtain. Moreover, the botanical terminology used is often technical thus not particularly accessible to the non-specialist. Given that many modern curricula often do not emphasize basic plant taxonomy, maybe it is not unexpected to see increasing problems among the consumers of taxonomic information, such as ethno-pharmacology and other biomedical disciplines. I view this trend as a ‘call to action’, motivating me to develop new, innovative methods for mistletoe identification.

Daniel L. Nickrent

*Chris Parker regrets that having identified this problem 4 years ago he continued to repeat the mistake in several more recent issues. Apologies for causing undue excitement to Ileostylus buffs.

PRESS REPORTS

MSU professor wins grant for work in Africa

BOZEMAN – Women in one Kenyan village are fighting malnutrition with a toothpick, fungus and a clump of treated rice, says Montana State University professor David Sands. Now women in 50 Kenyan villages can do the same with the $100,000 grant Sands just received from the Bill & Melinda Gates Foundation. The Gates Foundation announced Nov. 20 that Sands was one of more than 80 people this year to receive a Grand Challenges Explorations Grant to carry out their bold ideas for overcoming challenges to global health. As MSUs first recipient, Sands said he will share his 18-month grant with his Kenyan collaborators. ‘It’s very scary. Be careful what you dream for’, Sands said, explaining that he now has to prove his discovery in a wider arena.

Fifty-five women from the village of Ekwanda have been testing his discovery since 2006, said Sands, a professor in the Department of Plant Sciences and Plant Pathology. Ekwanda is a small rural village north of Kisumu, the principal city in western Kenya. The women - most of them widows whose husbands have died from HIV, malaria, dengue fever or other causes - are responsible for growing food and providing an income for their families. However, a parasitic weed called Striga, or witchweed, kills 30 to 80 percent of their corn, millet and sorghum before the crops break the surface of the ground. The women spend 80 percent of their waking hours during weeding season (three to five months a year) weeding. ‘If they can’t produce corn, they starve,’ Sands said.

Sands was inspired to help by his late brother, Dr. John P. Sands, Jr., who was chairman of the Urology Department and director of Surgical Services at the Naval Medical Center San Diego before retiring from the Navy in 2000. Later, while working in a hospital in west Kenya, John Sands realized that malnutrition was the number one problem behind his patients health issues. ‘They were starving to death,’ Sands said. To look for solutions, the brothers formed The Starfish Foundation about five years ago through the All Souls Episcopal Church of Point Loma in San Diego, and David Sands headed into the cornfields of Kenya. Perhaps he could find unhealthy Striga that would indicate the presence of a natural enemy or a weakness he might exploit. The search paid off when Sands discovered four strains of fungus among the weeds. After testing them in his MSU lab, he focused on improving one fungus to make it even more effective against Striga. Sands also developed a simple, inexpensive way to grow and plant the fungus. It involved growing the fungus in a petri dish. ‘After three days, its fungal paradise,’ Sands said. Then he placed about 50 wooden toothpicks in the petri dish so they were coated by fungus. After three days, he removed the toothpicks and set them aside to dry. The coated toothpicks will last five years if they stay wrapped, Sands said.

When the time came to plant corn, he placed one coated toothpick into a batch of boiled, cooled rice or sorghum, Sands said. After three days in a covered container, the rice turned pink and he had enough fungus to fight Striga. The
women of Ekwanda placed the rice into a hole on top of compost. Then they planted three kernels of corn on top of it. The women of Ekwanda helped prove that the fungus kills Striga without harming the environment, Sands said. They also demonstrated that the Striga biocontrol would save labor, increase crop yields and create more room to grow crops.

Sands shared his technique with Kenyan plant pathologist Sila Nzioka who came to MSU in 2011 to learn it from Sands. Nzioka works in the Kenya Agricultural Research Institute, the equivalent of the U.S. Department of Agriculture. Sands also described his discovery to the Gates foundation when he applied for a grant earlier this year. On the merit of that 1 ½-page application - without knowing Sands name, institution or research history, to avoid prejudice or preference - the Gates foundation awarded him a grant. It was his fifth attempt, Sands said. He encouraged other researchers to keep trying for such grants. He also urged MSU students to look for global problems they can help solve and warned them that problems are interwoven. In Kenya, for example, the women who tested his techniques not only faced malnutrition, but drought, the possibility of crop failure and socio-economic problems.

‘I teach all my students this: If you want to work on a world-class problem, you have to work on four,’ Sands said. ‘They don’t come in nice single packets. ... You have to figure out how to weave through them all.’ In addition to the grant from the Bill & Melinda Gates Foundation, Sands has received funding for his Striga research from other foundations, including the Charles A. and Anne Morrow Lindbergh Foundation. The Starfish Foundation paid for supplies, as well as the salary of Lydia Anderson of Missoula, who worked on the Striga project as an undergraduate student. Anderson graduated in 2012 with a bachelors degree in biology.


Desert mistletoe (Phorodendron californicum), unlike its commonly hung broadleaf cousins sold during this festive season, may not be so welcoming to those looking to steal a holiday kiss, since it grows in trees and shrubs covered with thorns. The desert mistletoe is a common perennial found in the Mojave and Sonoran Deserts, locations that are less than 4,000 feet (1,220 meters) in elevation. The plant is a hemi-parasite, which means it carries out photosynthesis in its many green stems while obtaining additional nutrients and water from the host plant upon which it grows. In these arid regions, the desert mistletoes’ most common host plants are the desert legume trees and shrubs that grow there. The common varieties of mesquite, palo verde, and ironwood, Olneya tesota, trees as well as an occasional catclaw acacia, Acacia greggii, creosote bush, Larrea tridentata and the varieties of desert buckthorn shrubs play host to these slow-growing invaders.

Desert mistletoe is also known in some desert areas by the name mesquite mistletoe. In the trees and bushes of this desert region, desert mistletoe often looks like a dense nest or hive. In reality, desert mistletoe is a dense cluster of brittle,
jointed green stems that are primarily leafless. The clusters tend to hang down from the host and can grow to lengths of 36 inches (1 m) in six to eight years. This non-aggressive pathogen’s leaves have been reduced to scales. The tiny, petal-less flowers bloom from January to March, and are known for producing a strong fragrance.

Shortly after blooming, the flowers produce an abundance of red fruit. The seeds of the fruit are covered with a gelatinous material that makes them extremely sticky. They are a favorite food for the birds of the desert that often get the sticky seeds stuck to their beaks or feet. As they wipe their beaks and feet clean on another branch, or even another tree, the mistletoe seeds now become planted on a new potential host. Since the seeds also have a tough seed coat, they easily pass through the bird’s digestive system and become deposited onto new branches through their droppings.

(Photo: Linda & Dr. Dick Buscher)

The Phainopepla (*Phainopepla nitens*), commonly known as a Silky Flycatcher, is a small, desert bird that seems to have a special relationship with desert mistletoe. The black, male Phainopepla looks like a miniature cardinal. The mistletoe berries are the bird’s main source of food in the winter. As such, the Phainopepla is one of the birds primarily responsible for the distribution of desert mistletoe seeds. (See separate story on this bird below)

Desert mistletoe seeds can germinate on any branch of the tree but its small, rootlike structures called haustoria can only penetrate young, thin bark. The haustoria grow in the microscopic spaces between the host plant cells, extracting water from the host xylem and nutrients from the host cells. Once the haustoria penetrates and begins to grow within a tree branch, it takes between two to three years for the first shoots of brittle stems to begin to grow. Once stem growth begins, it takes another year of maturing before the desert mistletoe begins to produce fruit. Botanists calculate that desert mistletoe plants can grow on their hosts for 60 to 70 years.

If desert mistletoe is a killer, it is surely a slow one. Death to a host tree usually occurs only when multiple clusters of mistletoe overtake the host tree, or when the host is weakened by other diseases or by a lack of water. Death of a host caused solely by mistletoe is very uncommon.

Man has long used the desert mistletoe for his survival. Both the indigenous Tohono O’odham and Seri people of this desert region ate the sweet mistletoe fruits that grew on mesquite, ironwood and acacia. They avoided the fruits that grew on desert buckthorn and palo verde, as they are bitter and were considered inedible. The Akimel O’odham, River Pima, crushed the berries and made a sweet pudding. The Seri people were also known to make a strong medicinal drink by boiling the plant’s jointed stems. The relationship between the trees and shrubs of the Mohave and Sonoran Deserts and the desert mistletoe is very old. Over the millennia they all have learned to survive together in this very arid and harsh environment. Even though one uses the others for survival, all have come to deal with each other and are able to co-exist together.

Linda & Dr. Dick Buscher, Live Science, December 18, 2014.

**Mistletoe depends upon bird**

We might not have mistletoe were it not for a bird known as the phainopepla (*Phainopepla nitens*).

For a variety of reasons the phainopepla is one of our most interesting desert inhabitants. It breeds in the desert but can’t be considered a resident since it departs at the beginning of summer. The male phainopepla is jet black, a color that absorbs more heat than any other - seemingly a poor adaptation for an animal spending a great deal of time in the desert. Finally, the phainopepla grows its own source of energy by planting mistletoe seeds.

Flocks, some of which contain 30 or 40 phainopeлас, return to the desert in October when temperatures begin to cool. Males establish territories around patches of mesquite, palo verde and related species but only those parasitized by mistletoe plants. Fruits of the mistletoe provide nourishment and moisture and are a critical component of the phainopepla’s winter diet. Only the flesh of mistletoe berries, however, is actually digested. The mistletoe seeds pass through the bird’s alimentary canal unharmed. Seed-laden droppings accumulate on branches lying beneath phainopepla perches and eventually a seed succeeds in germinating and pushing its rootlet into an aging stem. Ultimately, the new mistletoe plant produces berries eaten by phainopeлас, as well as other desert birds. In addition to mistletoe berries, flying insects are also captured and eaten. Insects are a
critical food resource especially during spring and summer when nestlings require a diet high in protein.

Courtship for the phainopepla begins as early as January and can last through April. One of the first indications of the breeding season is the building of a nest by the male. Nest construction is the male’s responsibility alone and if his creation is accepted, a female takes up residence in his territory. The female lays from 2 to 5 speckled eggs and the young fledge within 5 weeks after the last egg is laid. Usually by the end of April, all young have left the nest. In late spring phainopeplas disappear from the desert until the following October.

For many years it was not clear where phainopeplas went. Researchers now know, however, that phainopeplas travel to less stressful climates at higher elevations or along the southern California coast. In these localities a second brood is raised giving phainopeplas the distinction of being the only bird to nest in two entirely different environments within a single year. They utilize the mild climate of the warm Sonoran Desert during winter, nest there in early spring when a burgeoning insect population is available for their young and then vacate the desert during the stressful months of summer. Late spring departure may partially explain how male phainopeplas can get away with being black in a desert environment. By way of contrast, ravens (which are also black) must endure intense solar radiation year-round since they are permanent desert residents.

Male phainopeplas can be distinguished from other birds by their jet black coloration, red eyes and white wing patches that can only be seen in flight. Females are gray with paler wing patches and brown eyes. Both sexes have a distinctive head crest. A short, soft, single whistle characterizes the Phainopepla’s call.

Look for phainopeplas wherever large mistletoe plants are parasitizing cat’s claw, palo verde and other perennials belonging to the Pea Family of plants.

James Cornett, The Desert Sun, December 6, 2014

Native mistletoe, Western Australia’s Christmas tree, declining in urban areas

The Western Australian Christmas tree, a variety of mistletoe, has declined by 90 per cent in urban areas of Perth in the past 30 years. *Nuytsia floribunda* was dubbed the native Christmas tree by colonists because it bursts out in orange blooms in December. WA Wildflower Society's Bronwyn Keighery said the group had investigated where the trees grew. ‘Ever since Europeans started clearing the state, they left the trees because they were so beautiful,’ she told 720 ABC Perth. ‘What we have been doing is looking at the trees that were left amongst houses and parkland and found that most of those have disappeared. ‘The trees that were in patches of urban bushland were still there.’ We think about 90 per cent of the trees that are not in bushland have disappeared. In bushland nearly 100 per cent have remained.’

Ms Keighery said the findings highlighted the importance of preserving even small areas of bushland in the metropolitan area. ‘Places like the Inglewood Triangle and Kensingon Bushland in south Perth, these patches are really important for keeping even common plants,’ she said. The nuytsia have an additional Christmas association - the tree is also the world’s largest variety of mistletoe. In European tradition, mistletoe is hung as Christmas decoration and people caught beneath are expected to kiss. They are hemiparasitic plants, and grow by attaching themselves to host plants and draw water and nutrition from the host. ‘They grow from Kalbarri to Esperance, and have a number of Noongar words associated with them, including the name Mooja, and different groups of Noongars used them in different ways,’ Ms Keighery said. ‘It seems that the Noongar around Perth saw them as spirits of the dead and left them alone, while other Aboriginal groups pulled the roots up to eat that material, which is quite sweet.’

The WA Wildflower Society recently ran a treasure hunt to encourage Perth residents to take more notice of the Christmas trees, by attaching QR codes to 23 trees and awarding prizes of nuytsia seedlings for spotting them.

Emma Wynne 720 ABC Perth
19 Dec 2014
WEEDSBYet - THE AFRICAN WEED SCIENCE NETWORK

Weedsbook is a newly established online African Weed Science Network (www.afroweeds.org/network). It is a bilingual (English/French), free and open-access, online exchange platform for professionals working on weeds in Africa. It currently has more than 330 members from all over Africa and Europe. Weedsbook has been established to better inform weed scientists in the region and to enhance the outreach of their work.

Weedsbook contains discussion groups on topics such as weed identification, distribution and one on parasitic weeds. Members can discuss, ask questions or get assistance for instance with the identification of encountered weed species. Weedsbook provides recent relevant scientific publications and guides to weed identification, management recommendations, and information on research grants and scholarships and it enables members to share relevant news such as outcomes from their work (e.g. publications) and to upload or download photos, videos or other media.

Each member can generate a personal profile with information on their work, contact details and relevant internet links. It enables members to inform other members on their expertise and interests which in turn helps to link up with relevant new partners.

In summary, Weedsbook is easy to use, and it enables you to:

- Enhance your network of peers
- Share, communicate and learn
- Get assistance or provide assistance on weed related queries
- Be alerted on new weed science products, or announce your own products
- Be informed (or inform your peers) on new funding opportunities, conferences and other relevant events

Membership is open and free. To join:

Go to www.afroweeds.org/network - click on ‘Register’ - complete the form - click on ‘Register’ - confirm the Weedsbook e-mail sent to your e-mail address

At first use: enter your user name and password and click on ‘Login’

For help or other queries, please contact Dr Jonne Rodenburg (AfricaRice): j.rodenburg@cgiar.org

THESSES

Nitrogen role in the plant - parasitic plant interaction: Brassica napus L. - Phelipanche ramosa (L.) Pomel.


The broomrape Phelipanche ramosa L. Pomel is a parasitic weed widespread in Mediterranean Europe whose control is extremely difficult in agroecosystems. One of the biological features of this parasitic plant is that it germinates only in response to germination stimulants exuded by the roots of surrounding host plants. After attachment to the host root and connection to their vascular tissues, broomrape uptakes water and nutrients needed for their development. In France, the adaptation of this broomrape to tobacco, hemp and especially to winter oilseed rape (WOSR; Brassica napus L.) crops has become a major agricultural problem in the most infested areas. Considering the current recommendations of significant inputs reduction in sustainable agriculture (pesticides and fertilizers) and the importance of nitrogen nutrition for WOSR productivity, there was a need to investigate the impact of new crop management practices such as lower nitrogen inputs on the WOSR - broomrape interaction. Therefore, the aim of this thesis was to elucidate the role of nitrogen in this interaction. To achieve this, the work was organized around two distinct roles of this nutrient.

First, we evaluated the effect of contrasting N fertilization regimes (and two associated minerals, sulfur and phosphorus) on the sensitivity of WOSR facing broomrape by analyzing the ability of WOSR roots to exude germination stimulants and to be parasitized by broomrape. In the second part of the study, through an approach of 15N isotope tracing coupled to a primary metabolite profiling, a thorough analysis of the global N fluxes in the interaction was conducted. This led to the identification of the transferred compounds (amino acids, carbohydrates, organic acids and glucosinolates) from WOSR to broomrape and to the characterization of the metabolic pathways of these compounds used within the parasite. Therefore, this work required methodological developments allowing the rapid assessment of germination rate of broomrape seeds through a high-throughput process and the analysis of 15N amino acids by UPLC-PDA-ESI-MS.

Thus, the beneficial effect of sulfur fertilization on the production or exudation in the rhizosphere of the main stimulant of broomrape seed germination, the 2-phenylethyl isothiocyanate (2-PEITC), has been demonstrated. Likewise, the decrease of WOSR susceptibility to broomrape, evaluated by the number and the total biomass of attached broomrapes, during a nitrogen deficiency, was also evidenced. Analysis of the overall N fluxes (15N isotope tracing and amino acids profiling) highlighted the early role of supernumerary sinks represented by broomrapes for reduced nitrogen assimilated by the host WOSR. Indeed, the parasitic sink proved to be dominant at the end of the vernalization compare to the own
sinks of WOSR (in a susceptible WOSR genotype - broomrape interaction) particularly for foliar N newly assimilated during this period. Thus, this competition strongly inhibited the post-vernalization development of WOSR. Analysis of compounds transferred from the host and accumulated into the parasite highlighted the importance of glutamine as a long-distance nitrogen carrier, but also the role of WOSR specific compounds such S-methylcysteine sulfoxide (SMCSO) and glucosinolates in the interaction, and asparagine in N remobilization into the parasite.

These results open up interesting perspectives in terms of control methods compatible with existing agro-environmental directives, including the selection of more nitrogen efficient WOSR genotypes and an increased monitoring of sulfur fertilization in early culture (period of high WOSR susceptibility to broomrape). This work has also highlighted the influence of WOSR genetics on N source-sink control within the interaction (comparative study of susceptible and resistant WOSR genotypes). The study of WOSR mechanisms involved in the control of parasitic sink appears as one of the major perspectives because breeding for tolerance to face broomrape is becoming an increasingly important issue.

FORTHCOMING MEETINGS

The 1st International Congress on Strigolactones. 1-6 March, 2015. Wageningen, the Netherlands. 1st International Congress on Strigolactones we bring together scientists from these different disciplines to exchange ideas and knowledge on Strigolactones and to increase the solidarity and collaboration within the strigolactone community. For further information go to: http://www.strigolactones.org/

5th International Conference on Alternative Methods of Crop Protection. Lille, France, 11-13 March, 2015. Sessions will include one on resistance and varietal selection. For information contact AFPP, 42 rue Raymond Jaclard, F-94140 Alfortville. Email afpp@afpp.net. Website www.afpp.net.

The 13th World Congress on Parasitic Plants. 5-10 July, 2015. Kunming, Yunnan Province, Southwest China. Further details can be found at the conference website http://wcpp13.csp.escience.cn/dct/page/65540.

GENERAL WEB SITES

For individual web-site papers and reports see LITERATURE

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

For the 13th IPPS Congress see http://wcpp13.csp.escience.cn/dct/page/1

For past and current issues of Haustorium see also: http://www.odu.edu/~lmusselm/haustorium/index.shtml

For the ODU parasitic plant site see: http://www.odu.edu/~lmusselm/plant/parasitic/index.php

For the Strigolactone Congress see: www.strigolactones.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.huck.psu.edu/

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

For information on the COST/STREAM conference see: http://streamisrael2013.wix.com/stream-israel-2013

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

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

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

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

For information on future Mistel in 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 (Search Santalum)

For ‘Weedsbook’ online African Weed Science Network, see: www.afroweeds.org/network

And for entertainment as well as instruction watch a video of the germination of Cuscuta campestris and attachment on chickpea, see http://youtu.be/uIFulwqC9ko (with thanks to Yaakov Goldwasser).
LITERATURE

*indicates web-site reference only

Entries in bold are the editors’ (but mainly one editor’s) personal selection of the top ten items.

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Ajani, E.O., Ogunlabi, O.O., Akinwande, O. and Adegbesan, B.O. 2014. Loranthus micranthus leaves extract attenuates risk factors of cardiovascular disease in fructose fed rats. European Journal of Medicinal Plants 4(12): 1489-1500. [Confirming that males are more prone to metabolic dysfunction of fructose than females and that L. micranthus (?Loranthus micrantheras = Englerina gabonensis) is efficacious in preventing this defect in both males and females.]


Among 51 species Hydnora africana one of the two mentioned most frequently by users. Modes of use are described.]

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and polyphenol oxidase in roots of tomato assumed to be responsible for increasing resistance to *O. ramosa*. But no data on the levels of infection with and without the treatments.]

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Alemede, I.C., Fasanya, O.O.A. and Oke, A.O. 2013. Growth and reproductive performance of rabbits fed mistletoe leaves (*Phragmanthera nigritana*). Journal of Agriculture, Forestry and Social Sciences 11(1): 249-255. [Concluding that *P. nigritana* can be used to feed rabbit does without any deleterious effect on performance.]


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Baheti, D.G. and Kadam, S.S. 2014. Antiurolithiatic activity of different plants extracts on zinc disc implantation induced urolithiasis. Der Pharmacia Lettre 6(4): 201-207. [An extract of *Dendrophthoe elasti* showed significant improvement in urinary parameters along with prevention
of stone formation suggesting significant antiurolithic activity.

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abstract how significant the differences were, nor where the work was conducted.] Dossou-Aminon, I., Loko, L.Y., Adjatin, A., Dansi, A., Elangovan, M., Chaudhary, P., Vodouhè, R. and Sanni, A. 2014. Diversity, genetic erosion and farmer's preference of sorghum varieties [Sorghum bicolor (L.) Moench] in North-eastern Benin. International Journal of Current Microbiology and Applied Sciences 3(10): 531-552. [Recording a wide variety of sorghum lines used by farmers, but also a worrying rate of loss of older varieties and the need for their conservation if problems of drought and Striga are to be adequately addressed in future.]

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Fikadu Erenso, Melesse Maryo and Wendawek Abebe.

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Fikadu Erenso, Melesse Maryo and Wendawek Abebe.


434. [Describing *S. himalayana* (Rafflesiaceae) a total root parasite of *Cissus elongata* and other species of family Vitaceae threatened with extinction; sighted only a few times since its first discovery. It is proposed for conservation as a flagship species in the Namdapha biosphere reserve.]

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Hu GaoSheng, Jia JingMing and Kim DohHoon. 2014. Effects of feeding tyrosine and phenylalanine on the parasitic plant *Cistanche deserticola* was found in 80% of the 33 lowland rice crops visited in Togo. Farmers use weeding and chemical fertilizers but always at lower input rates than national standards.]


Idris, K.I., Khan, Z.R. and Babiker, A.G.E. 2013. Influence of *Desmodium* species root exudates on *Striga hermonthica* (Del.) Benth and *Orobanchus ramosa* L. germination. Persian Gulf Crop Protection 2(4): 7-14. [Reporting negligible germination of *S. hermonthica* from unindulated exudates of *D. uncinatum*, *D. intortum*, *D. tortuosum*, or *D. dichotomum*, while there was significant germination from *D. distortum* (in figure labelled *D. tortuosum*). No germination of *O. ramosa* by any *Desmodium* sp. Results included very variable results with GR24.]

Ifeanyi, F.O., Richard, C.E. and Effiong, U.E. 2014. Assessment of some toxic metal concentrations in selected ready-to-use medicinal plant roots and stem barks in Ibadan, Nigeria. Journal of Scientific Research and Reports 3(3): 427-436. [Confirming that the levels of toxic metals were acceptable in a range of medicinal products studied including *Olax subschorpidea.*]

Ijoyah, M.O. 2014 Maize-soybean intercropping system: effects on *striga* control, grain yields and economic productivity at Tarka, Benue State, Nigeria. International Letters of Natural Sciences 14: 69-75. [Intercropping maize with soybean reduced *Striga hermonthica* numbers by over 50% and increased maize and total crop yield.]


Jun RuiHong, Chen GuiLin, Li MeiJia and Li Wei 2014. *Desmodium* species root exudates on *Striga hermonthica* (Del.) Benth and *Orobanchus ramosa* L. germination. Journal of Agriculture and Biology 16(5): 935-940. [Confirming that increasing doses of di-ammonium phosphate decreased stimulant exudation and, in pot experiments, greatly reduced infestation by *S. hermonthica* in millet.]


signals in symbiotic and parasitic plant interactions is discussed in view of the existence of other plant-derived substances that are able to promote these plant interactions. Also, possible strigolactone use in agriculture practices is suggested.

Kuijt, J. 2014. Five new species, one new name, and transfers in Neotropical mistletoes (Loranthaceae), miscellaneous notes, 61-68. Novon 23(2): 176-186. [Proposing new combinations for Maracanthus costaricensis (=Oryctina costaricensis) and Passovia pedunculata (=Loranthus pedunculatus), and describing 5 new species of Loranthaceae, Psittacanthus longiflorus, Struthanthus cajamarcanus, S. ophiostylus and Tristerix divaricatus all from Peru and S. truncatus from Colombia. The name Passovia pedunculata is neotypified.]


Li MaoXing, He XiRui, Tao Rui and Cao XinYuan. 2014. Phytochemistry and pharmacology of the genus Pedicularis used in traditional Chinese medicine. American Journal of Chinese Medicine 42(5):1071-1098. [Reviewing the use of Pedicularis spp. in Chinese medicine, their chemical components and their uses including antitumor, hepatoprotective, anti-oxidative, antithaemolysis, antibacterial activity, fatigue relief of skeletal muscle, nontropic effect and other activities.]

Li XiuHui, Gou ChunYan, Yang HuSheng, Qiu JinPeng, Gu Tao and Wen Tao. 2014. Echinacoside ameliorates D-galactosamine plus lipopolysaccharide-induced acute liver injury in mice via inhibition of apoptosis and inflammation. Scandinavian Journal of Gastroenterology 49(8): 993-1000. [Echinacoside, the active component of extracts from Cistanche salsa can provide a pronounced protection against acute liver injury in mice.]

Lira-Noriega, A. and Peterson, A.T. 2014. Range-wide ecological niche comparisons of parasite, hosts and dispersers in a vector-borne plant parasite system. Journal of Biogeography 41(9): 1664-1673. [Studying whether the distribution of Phoradendron californicum is mediated by host distributions (host niche hypothesis, HNH), the mistletoe’s autecology (parasite niche hypothesis, PNH) or that of its vectors (vector niche hypothesis, VNH), and concluding that results match PNH. The parasite has a strictly circumscribed ecological niche, and host species become infected with mistletoe only where they overlap its suitable areas.]

Lu, J.K., Xu, D.P., Kang, L.H. and He, X.H. 2014. Host-species-dependent physiological characteristics of hemiparasite Santalum album in association with N2-fixing and non-N2-fixing hosts native to southern China. Tree Physiology 34(9): 1006-1017. [Comparing the growth, in pots, of S. album on Bischofia polycarpa and Dracontiomelon duperrenanum and N2-fixing hosts Acacia confusa and Dalbergia odorifera. Perhaps showing that growth of S. album was best on D. odorifera, but abstract not clear.]


African Journal of Microbiology Research 8(27): 2624-2630. [Noting that R. leguminosarum induces resistance to O. crenata in peas, and showing that the heat-stable bacterial surface carbohydrates lipopolysaccharides reduced O. crenata infection significantly at concentrations as low as 1 and 0.5 mg/ml.]


Mellado, A. and Zamora, R. 2014. Generalist birds govern the seed dispersal of a parasitic plant with strong recruitment constraints. Oecologia 176(1): 139-147. [Although specialist mistletoe feeders are assumed to be most important in ensuring dispersal, a study on Viscum album ssp. austriacum recorded 11 bird species involved, including some very effective non-specialised feeders.]

Mesfin Abrate, Firew Mekbib, Temam Hussien, Wondimdu Bayu and Fasil Reda. 2014. Assessment of genetic diversity in sorghum (Sorghum bicolor (L.) Moench) for reactions to Striga hermonthica (Del.) Benth. Australian Journal of Crop Science 8(8): 1248-1256. [Identifying a number of landraces that combined high grain yield with low or moderate Striga emergence, of potential for further breeding and selection.]


Miladinovic’, D., Imerovski, I., Dimitrijevic’, A., Jocić’, S., Cvejić’, S., Đedicion of new lines at sites in Serbia, Romania and Turkey. A number were found resistant to the most virulent race E biotypes of O. cumana and some of these also showed superior agronomic characteristics.]


Breeding 3(3): [In an ICRISAT study, 5 QTLs with linked markers associated with Striga resistance were mapped in sorghum variety N13 and used in conjunction with others to select within progeny from crosses with 3 preferred farmer varieties in Sudan, leading to the development of 4 lines with good Striga-resistance and high yield.]


Moran-Palacio, E.F., Zamora-Álvarez, L.A., Stephens-Camacho, N.A., Yáñez-Farías, G.A., Virgen-Ortiz, A., Martínez-Cruz, O. and Rosas-Rodríguez, J.A., 2014. Antioxidant capacity, radical scavenging kinetics and phenolic profile of methanol extracts of wild plants of Southern Sonora, Mexico. Tropical Journal of Pharmaceutical Research 13(9): 1487-1493. [Krameria erecta possesses five times the antioxidant activity of ascorbic acid and also demonstrates high phenolic content, which supports the beneficial properties attributed to these plants in traditional medicine.]


Moupela, C., Vermeulen, C.; Doucet, J.L., Dainou, K. and Lebally, P. 2014. Importance of Cosula edulis Baill. for the people of South-East Gabon: harvest levels and economic potential. Tropicicultura 32(1): 37-45. [Suggesting that the economical potential of the edible fruits of C. edulis (Olacaceae) could be improved if a sustainable production strategy through domestication processes and agroforestry practices was developed.]

Musselman, L.J. 2014. The well-travelled tallow wood, Ximenia americana. Chinquapin. The Newsletter of the Southern Appalachian Botanical Society 22(3): 1. [A general description of X. americana, occurring locally in USA, parasitic on a wide range of woody hosts, but also widespread in Africa, where the plum-like fruits are consumed fresh and also used as a source of oil. There was an article on it by Lytton in Haustorium 61.]


Naumann, J., Salomo, K., Der, J.P., Wafula, E.K., Bolin, J.F., Maass, E., Frenzke, L., Samain, M.-S., Neinhuis, C., dePamphilis, C.W. and Wanke, S. 2013. Single-copy nuclear genes place haustorial Hydnoraceae within Piperales and reveal a Cretaceous origin of multiple parasitic angiosperm lineages. PLoS ONE 8:e79204. [Molecular dating showed that Hydnoraceae evolved ca. 91 mya. After examining other parasite groups, the ‘temporal specialization hypothesis’ was proposed where older lineages tend to be more specialized.]

Nazaruddin, D.A., Fadilah, N.S.M., Zulkarnain, Z., Omar, S.A.S. and Ibrahim, M.K.M. 2014. Geological studies to support the tourism site: a case study in the Rafflesia trail, near Kampung Jedip, Lojing Highlands, Kelantan, Malaysia. International Journal of Geosciences 5(8): 835-851. [The area is famous for its Rafflesia and has become one of the tourism attractions in Kelantan. Studies conclude that this area should be supported as a sustainable tourism site.]

infestation in rainfed lowland rice in Benin. Agricultural Systems 130: 105-115 [A survey of 231 fields showed that 72% were infested by Rhamphicarpa fistulosa with average density of 109 plants m$^{-2}$. Occurrence was most likely on infertile soils in valley bottoms. Helpful control practices included late sowing, timely application of post-emergence herbicide, three hoe or hand weeding operations, medium-rate fertilizer application and prolonged fallow.]


Neetu Bais and Arun Kakkar. 2014. Bioassay-guided phytochemical analysis of active fraction of Cuscuta reflexa grown on Cassia fistula by LC-MS. International Journal of Pharma and Bio Sciences 5(3): P-585-P-592. [Concluding that the antibacterial activity of fraction-8 was due to the presence of derivatives of quinoxalin, quercetin, and chromenones.]


Nikolov, L.A., Tomlinson, P.B., Manickam, S., Endress, P.K., Kramer, E.M. and Davis, C.C. 2014. Holoparasitic Rafflesiaceae possess the most reduced endophytes and yet give rise to the world’s largest flowers. Annals of Botany 114(2): 233-242. [This paper confirms the mycelium-like endophyte, the body of the parasite within its host (always a member of the grape family, Vitaceae) and shows for the first time the unique development of the protocorm. Despite the microscopic nature of the endophyte, discussed in detail, the largest known flower is produced from these strands of cells.]

Nittayajaiprom, W., Sangthong, P., Chancharunee, S., Wipatpanawin, A., Wanasawas, P. and Chulasiri, M. 2014. Mutagenicity, antimutagenicity and tyrosinase inhibition activity of hydroglycol extracts from Terminalia chebula Retzias, Terminalia bell erica Roxb and Rafflesia kerrii Mejier. International Journal of Phytomedicine 6(1): 93-102. [Results suggest that extracts of these three plants may be used as potential candidates for skin-care cosmeceutical ingredients.]


Olorunfemi, O.D., Ogunlade, I., Fakayoode, S.B. and Adekunle, O.A. 2014. Ensuring improved livelihood opportunities for resource-poor maize farmers through the dissemination of Striga control methods in Kwara State, Nigeria. Albanian Journal of Agricultural Sciences 13(2): 80-88. [Emphasising the need to support the 4 main sources for diffusing Striga control methods in the area, namely neighbours and friends, government agencies, agricultural extension agents and farmers groups.]

Orhan, N., Hoşbaş, S., Orhan, D.D., Aslan, M. and Ergun, F. 2014. Enzyme inhibitory and radical scavenging effects of some antidiabetic plants of Turkey. Iranian Journal of Basic Medical Sciences 17(6): 426-432. [Noting that Viscum album ssp. album, and ssp. austriacum are used traditionally for treatment of diabetes in Anatolia, but no results with these are mentioned in the abstract.]


Parvender Sheoran, Punia, S.S., Samunder Singh and Dhiraj Singh. 2014. Orobanche weed management in mustard:
opportunities, possibilities and limitations. Journal of Oilseed Brassica 5(2): 96-101. [O. aegyptiaca is a major problem in mustard (Brassica juncea) in Haryana, Punjab, northern Rajasthan, western UP and NE Madhya Pradesh. Field trials and larger-scale multi-location testing over 4 seasons confirmed that a split application of glyphosate 25 g/ha at 30 days after sowing followed by 50 g/ha at 55 days provided 70-80% reduction in Orobanche and 15-20% yield increase with negligible signs of damage.]


Piwowarczyk, R., Halamski, A.T. and Durska, E. 2014. Arabinogalactan protein-rich cell walls, paramural deposits and ergastic globules define the hyaline bodies of rhinanthoid Orobancheaeaeaustoria. Annals of Botany 114(6): 1359-1373. [The distinctive anatomy and cell wall architecture indicate hyaline body specialization in Rhinanthus minor, Odontites vernus and Melampyrum pratense. Altered proportions of AGPs and pectins may affect the mechanical properties of hyaline body cell walls and AGPs might therefore be implicated in nutrient transfer and metabolism in haustoria.]


Piwowarczyk, R., Halamski, A.T. and Durska, E. 2014. Seed and pollen morphology in the Orobanche alsatica complex (Orobancheaeae) from central Europe and its taxonomic significance. Australian Systematic Botany 27(2): 145-157. [Differences in hosts and ecological preferences confirm the separation of the three examined taxa, O. alsatica, O. bartlingii and O. mayeri, but seed and pollen morphology are too variable to be reliable taxonomic characters.]


Poonam Agrawal, Kirti Laddha and Ashok Tiwari. 2014. Isolation and HPLC method development of azafrin from Alceta parasitica var. chitrakusens. Natural Product Research 28(13): 940-944. [Presumably the rhizomes of A. parasitica are a source of saffron (azafran in Spanish).]


Reger, B., Mellert, K.H. and Ewald, J. 2014. (Indicator species of nutrient-poor sites in mountain forests of the Bavarian Alps.) (in German) Tuexenia 34: 39-51. [Melampyrum sylvaticum noted as closely connected to nutrient-poor calcareous sites on limestone and dolomite.]


Ridenour, W.M., Callaway, R.M. and Cavieres, L.A. 2014. Parasitism by Cuscuta chinensis and gender affect how the nurse cushion Larrea acuavis increases diversity in Andean alpine communities. Journal of Vegetation Science 25(6): 1474-1483. [Infection of L. acuavis (Apiaceae) by C. chinensis was greater on female host plants than on male, and increased a number of the beneficial insects associated with the host plant.]

Rowntree, J.K., Barham, D.F., Stewart, A.J.A. and Hartley, S.E. 2014. The effect of multiple host species on a keystone parasitic plant and its aphid herbivores. Functional Ecology 28(4): 829-836. [Noting that the activity of Aphis gossypii on Rhinanthus minor was reduced when it parasitised Lotus corniculatus, Other results suggested that host mixtures generally benefitted aphids and that the specificity of host attachment alters the impact of this keystone parasitic plant on its own herbivores and, potentially, on the wider plant and herbivore community.]


Ruszkiewicz-Michalska, M. and Polec’, E. 2014. Additions to Ramularia species (hymenomycetes) in Poland. Mycotaxon 127: 63-72. [As R. melampyri (a leaf-spot fungus) new for Poland infects Melampyrum spp., currently classified in Orobanchaceae, the implications of the new systematics of Scrophulariaceae s.l. for the taxonomy of Ramularia and related Mycosphaerella species are discussed briefly.]


Shamrov, I.I. 2014. (The gynoeocium formation in Buddleja davidii (Buddlejaceae).) (in Russian) Botanicheskii Zhurnal 99(7): 729-748. [Including comparisons with Scrophulariaceae and referring to the complex bundle formed in the center of the ovary due to fusion of four ventral bundles as in Striga gesnerioides and possibly S. elegans.]


Phytotherapy Research 28(6): 925-932. [Results help to explain the anti-inflammatory properties of S. album.]

Shui XiaoRong, Tang ShaoHu and Lei Wei 2014. Bioinformatic analysis of transcription factor MYB 1 and its targeted-regulatory microRNAs. Research on Crops 15(3): 687-696. [In this study, MYB1 from four plant species including Morella rubra, Orobancha ramosa, Leucaena leucocephala and Epimedium sagittatum, was investigated using bioinformatic tools and methods. MYB1 transcription factors have a significant role in regulating plant secondary metabolisms and microRNAs negatively regulate gene expression by inhibiting translation of the target mRNA. MYB1 genes ORF and protein structure were elucidated from these plant species and 3-D models were constructed. Also, possible regulatory miRNAs were predicted.]


Sipes, S., Huff Hartz, K., Amin, H., Anterola, A. and Nickrent, D. 2014. Floral scent and pollinators of the holoparasite Pilostyles thurberi (Apodanthaceae). Journal of Pollination Ecology 12: 31-39. [The pollinators of Pilostyles thurberi were identified as the bee Augochloropsis metallica (Halictidae) and eumenee potter wasps (Vespidae). GC/MS analysis of the floral scent was shown to contain an unusually simple bouquet of raspberry ketone and several eugenols.]

Smith, D.R. and Asmail, S.R. 2014. Next-generation sequencing data suggest that certain nonphotosynthetic green plants have lost their plastid genomes. New Phytologist 204(1): 36-49. [Findings on the preservation of plastid DNA and their loss is discussed based on next-generation organelle-genome sequencing in different plants including a Rafflesia sp. that have lost photosynthetic capabilities]

Smith, L., Hofstetter, R. and Mathiasen, R. 2013. Insect communities associated with Douglas-fir dwarf mistletoe witches' brooms in northern Arizona. Southwestern Naturalist 58(4): 395-402. [Somewhat more Chrysomelidae, Phalchorhiriidae, Pteromalidae, Miridae, Berytidae, and Braconidae were found on branches infested by Arceuthobium douglasii than on uninfested branches.]

Sokho Kim, Dongho Lee, Jae-Kyung Kim, Jae-Hun Kim, Jong-Heum Park, Ju-Woon Lee and Jungkee Kwon. 2014. Viscothionin isolated from Korean Mistletoe improves nonalcoholic fatty liver disease via the activation of adenosine monophosphate-activated protein kinase. Journal of Agricultural and Food Chemistry 62(49): 11876-11883. [Viscothionin, extracted from Viscum album coloratum, given orally to high fat diet-induced obese mice was shown to reduce non-alcoholic fatty liver disease via the adenosine monophosphate-activated protein kinase signaling pathway, suggesting possible usefulness in treatment of obesity.]


Takem, L.P., Udia, P.M. and Poh, C.F. 2014. Anti-secretory, gastroprotective and anti-ulcer activities of aqueous extract of Phragmanthera capitata S. Balle in rats. International Journal of Pharmaceutical Sciences and Research (IJPSR) 5(8): 3560-3565. [Extracts of P. capitata, parasitic on e.g. avocado are used traditionally in Cameroon, and this study showed it to have significant anti-secretory, gastroprotective and anti-ulcer activities.]

Talve, T., Mürk, M., Lindell, T. and Oja, T. 2014. Rhinanthes plants found in calcareous fens on Gotland (Sweden): are they related to Rhinanthes osiliensis from Saaremaa (Estonia)? Biochemical Systematics and Ecology 54: 113-122. [Bayesian clustering analysis and the principle coordinate analysis showed that R. osiliensis and Rhinanthes sp. from Gotland are genetically differentiated and could not be the same species. Further research needed.]

Tashev, A., Koev, K., Tashev, N. and Georgiev, S. 2013. Anti-apoptotic effect of R. osiliensis from southern Patagonian forests. New Phytologist 204(1): 36-49. [Findings on the preservation of plastid DNA and their loss is discussed based on next-generation organelle-genome sequencing in different plants including a Rafflesia sp. that have lost photosynthetic capabilities]


Tőșitél, J., Tőșitélová, T., Fisher, J.P., Lepš, J. and Cameron, D.D. 2015. Integrating ecology and physiology of root-hemiparasitic interaction: interactive effects of abiotic resources shape the interplay between parasitism and autotomy. New Phytologist 205(1): 350-60. [Describing a glasshouse experiment with Rhinanthes electrorophus. Manipulating mineral nutrients and water, had profound interactive effects on the performance of both the parasite and its hosts, as well as the balance of above-ground biomass between them.]


Toh, S., Holbrook-Smith, D., Stokes, M.E., Tsuchiya, Y. and McCourt, P. 2014. Detection of parasitic plant suicide germination compounds using a high-throughput Arabidopsis HTL/KA12 strigolactone perception system. Chemistry & Biology 21(8): 988-998. [Showing that strigolactones and corylumides promote an interaction between HTL/KA12 and the F-box protein MAX2 in yeast, and that this effect can be used as a screening method. Some compounds identified in this way were shown to stimulate Striga hermonthica germination.]


Virtue, J., Prider, J. and Williams, A. 2014. Host range of branched broomrape (Orobanche ramosa subsp. mutellii) in South Australia. Plant Protection Quarterly 29(2): 46-54. [Among crop species, cultivars in the Brassicaceae were classified as high risk hosts Common vetch was the most susceptible legume host, while medics and clovers were less susceptible, and field peas were not hosts. Crops in Solanaceae and Cucurbitaceae were not as susceptible as reported elsewhere. Non-crop hosts were mostly in the Asteraceae and Brassicaceae.]


Wagner, S.T., Hesse, L., Isnard, S., Samain, M.S., Bolin, J., Maass, E., Neinhuis, C., Rowe, N.P. and Wanke, S. 2014. Major trends in stem anatomy and growth forms in the perianth-bearing Piperales, with special focus on Aristolochia. Annals of Botany 113(7): 1139-1154. [Anatomical studies of stem anatomy in representatives of Piperales with perianths, including Hydnora, were conducted. The hypothesis that the vegetative organs of Hydnora is a rhizomes is confirmed.]

Wang Qing, Huang HengZhi, Wang Jun, Pan Yao, Song Ping and Shen LiXin. 2014. (The species association of parasitic/epiphytic plants of ancient cultivated tea plantation in Jingmai-Mangjing.) (in Chinese) Journal of West China Forestry Science 43(3): 45-50. [Documents the presence of Balanophora as part of the ancient tea forests in this province of China which includes the greatest diversity of tea.]

Weigend, M., Luebert, F., Gottschling, M., Couvreur, T.L.P., Hilger, H.H. and Miller, J.S. 2014. From capsules to nutlets - phylogenetic relationships in the Boraginales. Cladistics 30(5): 508-518. [Four chloroplast genes for 89 ingroup taxa were used to generate a well-supported phylogeny of Boraginales. Lennoaceae was sister to Ehretiaceae in the woody Boraginales II clade and considered by the authors part of this family.]

Wong HoiShan, Chen Na, Leong PouKuan and Ko KamMing. 2014. β-sitosterol enhances cellular
glutathione redox cycling by reactive oxygen species generated from mitochondrial respiration: protection against oxidant injury in H9c2 cells and rat hearts. Phytotherapy Research 28(7): 999-1006. [Assessing the role of β-sitosterol in the 'Yang-invigorating' action of Cistanche tubulosa and observing that its protective effect against myocardial ischemia/reperfusion injury was seen in female but not male rats ex vivo.]

Wong HoiShan, Chen JiJiang, Leong PouKuan, Leung HoiYan, Chan WingMan and Ko KamMing. 2014. Cistanches herba reduces the weight gain in high fat diet-induced obese mice possibly through mitochondrial uncoupling. Journal of Functional Foods 10: 292-304. [Results suggest that extracts of Cistanche deserticola or C. tubulosa prevent obesity and the associated health consequences such as diabetes, cardiovascular diseases and metabolic syndrome.]


Wu ChiRei, Lin HangChing and Su MuhHwan. 2014. Reversal by aqueous extracts of Cistanche tubulosa from behavioral deficits in Alzheimer’s disease-like rat model: relevance for amyloid deposition and central neurotransmitter function. BMC Complementary and Alternative Medicine 14:; 202. [Daily administration of C. tubulosa extract ameliorated the cognitive deficits, decreased amyloid deposition and reversed cholinergic and hippocampal dopaminergic dysfunction caused by Aβ 1-42 in rats.]

Xiong XianHua, Ding BingYang, Zhang Hao, Hu RenYong and Chen XianXing. 2014. (Two genera and five species newly recorded in Zhejiang Province, China.) (in Chinese) Journal of Zhejiang University (Science Edition) 41(4): 432-434, 439. [Cuscuta campestris newly reported from Zhejiang Province.]

Wu XiaoJu. 2014. (Development of a healthy wine from cistanche black rice.) (in Chinese) Food Research and Development 35(9): 73-75. [English abstract no more intelligible!]

Yamato, M., Ogura-Tsujita, Y., Takahashi, H. and Yukawa, T. 2014. Significant difference in mycorrhizal specificity between an autotrophic and its sister mycoheterotrophic plant species of Petrosaviaceae. Journal of Plant Research 127(6): 685-693. [Twenty two fungal partners were detected in the autotrophic Japonolirion osense while the mycoheterotrophic Petrosavia sakurai had only one, suggesting that fungal partners are not necessarily shifted, but rather selected for in the course of the evolution of mycoheterotrophy.]


Yang XiaoJing and 10 others. 2014. Comparative pharmacokinetics with single substances and Semen cuscutae extract after oral administration and intravenous administration Semen cuscutae extract and single hypersoside and astragalin to rats. Analytical Methods 6(18): 7250-7259. [Involving seeds of Cuscuta chinensis.]

Yonli, D., Raore, H., Sawadogo, B., Bonzi-Coulibaly, Y., Tapsoba, I., Bellvert, F., Comtes, G., Sereme, P., Sankara, P. and Bally, R. 2013. (Exploitation of allelopathic properties of local plants against Striga hermonthica in Burkina Faso.) (in French) In: Journées Internationales sur la Lutte contre les Mauvaises Herbes, 22e Conférence du COLUMA, Dijon, France, 10-12 Décembre 2013: Dijon, France, 10-12 décembre 2013: 837-844. [Water extracts of Ceiba pentandra, Eucalyptus camendulensis and Faidherbia albida caused some inhibition of S. hermonthica germination, but concentrations used were hardly practical?]
Bouwmeester, H.J. 2014. Rice cytochrome p450 MaX1 homologs catalyze distinct steps in strigolactone biosynthesis. Nature Chemical Biology, 10: 1028–1033. [Reporting that two members of CYP711 enzymes can catalyze two distinct steps in strigolactone biosynthesis, identifying the first enzymes involved in B-C ring closure and a subsequent structural diversification step of strigolactones.]


Zhou JunFang, da Silva, J.A.T. and Ma GuoHua. 2014. Effects of smoke water and karrikin on seed germination of 13 species growing in China. Central European Journal of Biology 9(11): 1108-1116. [Germination of Santalaum album was stimulated by gibberellic acid but not by karrikin, suggesting functions and/or metabolic pathways are different.]

Zhou ShengLiang, Yan ShuZhen, Wu ZhenYing and Chen ShuangLin. 2014. Endophytic fungi associated with Macrosolen tricolor and its host Camellia oleifera. World Journal of Microbiology & Biotecnoogy 30(6): 1775-1784. [Identifying a wide range of endophytic fungi in both M. tricolor and its host C. oleifera, broadly similar in each but differing significantly in detail.]


Zippel, E. 2014. (From Achillea millefolium to Viscum album - the German genebank network for crop wild relatives (CWR).) (in German) Zeitschrift für Arznei- & Gewürzpflanzen 19(2): 81-87. [No abstract available.]

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