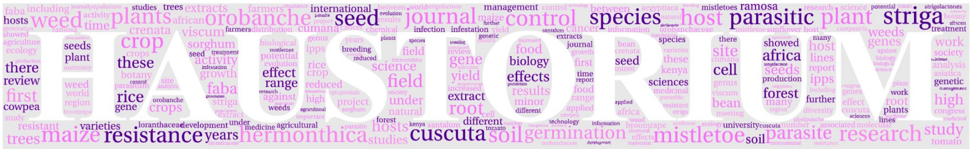
* 

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PRESIDENT'S MESSAGE

Dear IPPS members

I hope you are all OK. We are going through some rough times and it is difficult to meet other people. Fortunately, we have electronic means of communication and the IPPS General Assembly that we held on Zoom on 25 August showed that for meetings like that this is a viable option. And we have our newsletter, Haustorium, to stay in touch. But we have probably also all experienced that the real exchange of ideas and creation of new plans and collaborations very much needs live interaction. Let's hope that we will be able to have our 16th WCPP on location in Nairobi 4-10 July 2021, as planned. We will keep you updated on developments.

This is my first 'Message of the President' in Haustorium. I want to use this opportunity to thank my predecessor, Julie Scholes, for the great job she did over the last 8 years as Vice-President and President of the IPPS. She organized a WCPP in Sheffield and has supervised a number of transitions in the IPPS, such as the creation of a new website, an update of the constitution and the creation of an IPPS bank account, thus preparing the Society for the future. Thanks for all your hard work Julie!
The new website came right in time, helping us, as members of the IPPS, to stay in touch despite the difficult time. In contrast to the old one, the new site is interactive and alive. Through the website you can reach out to other members should you have specific questions or if you are looking for a collaborator. The website is alive because the members can, themselves, post news and vacancies. I invite you to use this opportunity to reach out to other IPPS members and the society at large: login into the member area and post news, for example on your most recent paper or project funding. I am myself also very pleased with the homepage on which we have a feed from Scopus that shows the most recent papers on parasitic plants and is refreshed automatically so always up to date. We are currently facing a change in the policy of Scopus but I hope that by the time you read this message this problem has been overcome and our feed is up and running again. Another highly actual item on our home page is the Twitter feed. Any Tweet using the #parasiticplants hashtag will be displayed there; so if you Tweet use that hashtag. I visit our home page almost daily to stay up to date with interesting papers and news.

In Julie's last message as President she thanked Maurizio Vurro and Airong Li for serving the society as Secretary and Member at Large, respectively. And she welcomed Jonne Rodenburg, as Vice-President, Airong Li, as secretary, and Pradeepa Bandaranayake, as new Member at Large. We are currently having another election, this time for Treasurer, see elsewhere in Haustorium and in our Society news on the IPPS website). The election will be facilitated through a polling tool implemented in the member area of the IPPS website. Here I want to thank Philippe Simier and Philippe Delavault for serving the Society as Treasurer for many years.

With the help of you, our members, the Executive Committee is nominating the IPPS Advisory Board, consisting of Julie Scholes, Neelima Sinha, Koichi Yoneyama and Jim Westwood. The Advisory Board will advise the Society on matters of strategic importance and monitor the Society's finance. We ask the members to give their opinion on this nomination; on the Society's website you will be able to cast your vote, see **IPPS News**
While you are at our website to cast your vote, I would like to encourage you to look at and interact with the website. Please log in to the Member area and update your profile with your picture and that of your institution as well as some personal information. You may want to add some expertise keywords as the member list is searchable, allowing others to find you based on your expertise. And post news on your most recent paper or project funding or your vacancies.

I would like to end with wishing you all Happy holidays and a great, healthy and hopefully interactive 2021.

Harro Bouwmeester
IPPS President

FREE MEMBERSHIP OF THE INTERNATIONAL PARASITIC PLANT SOCIETY UNTIL JULY 2021

Membership of the International Parasitic Plant Society (IPPS) is traditionally associated with participation in the World Congress on Parasitic Plants (WCPP), as the registration for these events includes the IPPS membership fee.

Formally, this implies that only the attendants of the most recent WCPP are members of the IPPS. Taking advantage of recent changes in the IPPS Constitution and Executive Committee, we have decided to establish a more constant form of membership. Membership registration and fee payment will still be coupled to the WCPP, but members who do not attend the WCPP will be enabled to continue their membership by paying a membership fee via the IPPS website. To facilitate this transition, we are offering anyone who is interested in becoming a member of the IPPS free membership until July 2021. In July 2021 we will have the next WCPP, in Nairobi, and you will be able to pay your membership fee either through your attendance at the WCPP or via the IPPS website. If you would like to become a member, please send an email to secretary@parasiticplants.org. You will receive an email inviting you to confirm your membership by logging in on the IPPS website member area. After doing so, we kindly ask you to update your member profile on the website with a short description of your scientific interest and a picture of yourself as well as an image representing your institution. Through the website member area, you can also post news and vacancies, access high-resolution pictures of parasitic plants, and communicate with other members. I hope that many of you use this opportunity to become a member and support our society!

Harro Bouwmeester, president of the IPPS

IPPS NEWS

The International Parasitic Plant Society (IPPS) aims to involve its members in decision-making regarding general society matters. To simplify this process, the Executive Committee has established dedicated web pages at https://www.parasiticplants.org/. In the Members-only area, IPPS members can access general Society Documents like the Constitution of the IPPS and a record of the last General Assembly, including the president's presentation. Members can now vote on Society matters through the IPPS website directly. For example, active IPPS members can decide on the next meeting venue or new Executive Committee officers at https://www.parasiticplants.org/members-only-area/society-documents/polls/. In the future, the Executive Committee will announce elections online and in *Haustorium*.

IPPS Advisory Board

Following the Executive Committee's call for nominations, members named Koichi Yoneyama (Ehime University, Japan), Neelima Sinha (UC Davis, USA), Julie Scholes (The University of Sheffield, UK), and Jim Westwood (Virginia Tech, USA) to form the IPPS Advisory Board. The Executive committee now asks IPPS members to take part in an online vote by January 20, 2021. Specifically, members need to confirm the Advisory Board in its current personnel composition. Comprehensive biographies of each of the Advisory Board members are available on the polling page of the IPPS website (see above).

Election of an IPPS Treasurer

Three experienced IPPS members put themselves up for Treasurer: Rosemary Ahom (Nigeria), Ahmed Uludag (Turkey), and Prof. Renate Wesselingh (Belgium). Therefore, the Executive Committee now asks all members to vote online by January 20, 2021 at the IPPS website. Short profiles of each of the nominees are accessible on the polling page in the Members-only area of the IPPS website, which members can access using their login credentials.

Susann Wicke

PROFILE

***Santalum acuminatum* (Santalaceae) – quandong**

Santalum acuminatum or more commonly known as quandong, is a close relative to sandalwood, and is a hemi-parasitic Australian plant. It belongs to the family Santalaceae, many members of which are also parasites (Der and Nickrent, 2008). Quandong has a widespread distribution across Australia, with a distributional range that extends from the mesic southern temperate to central arid regions of the continent, growing in a wide range of soil types and conditions. The plant's edible fruit (Fig.1) is an important food source for the indigenous people of Australia and has also been utilised for medicinal purposes in some indigenous local communities.

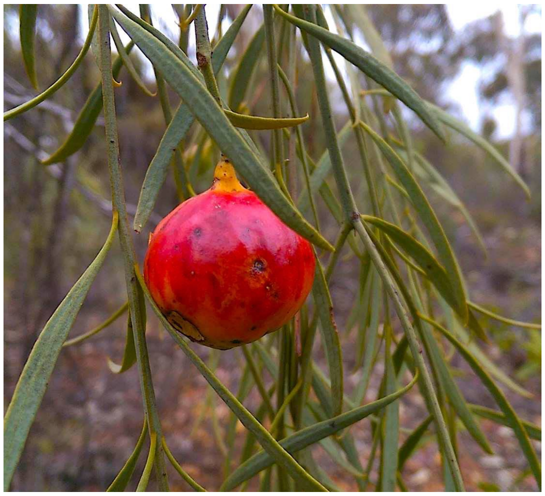


Figure 1. Fruit of quandong – *Santalum acuminatum* (photo Francis Nge)

Most studies on the genus *Santalum* have focused on the sandalwood species and how to increase their yield either through suitable host trials or other environmental field experiments. Though looking at host preferences for *Santalum* in an ecological context has been lacking.

Our recent study looked at the host preferences of quandong by growing it with a range of different potential hosts (native Australian plant species) that are known to co-occur with it in its natural habitat (Nge et al., 2019). Out of the eighteen species that we included in the study, quandong grown with N_2-fixing hosts (Fabaceae) showed the highest growth in biomass, whereas the quandong grown with other species were suppressed, compared to the controls (grown without a host or with another quandong). Preference for N_2-fixing hosts supports findings on other parasitic plants that display higher yields or biomass growth when paired with these hosts due to the higher nitrogen content in their xylem (Fig. 2). Interestingly, the quandong strongly preferred only one of the three N_2-fixing Fabaceae hosts (*Acacia saligna*) in our study; those grown with the other two Fabaceae host pairs had even lower biomass than the controls. These findings indicate that this parasitic plant has a strong host specificity and this may partly explain why it is present in some areas and not in others, in a local scale throughout Australia (Nge et al., 2019).

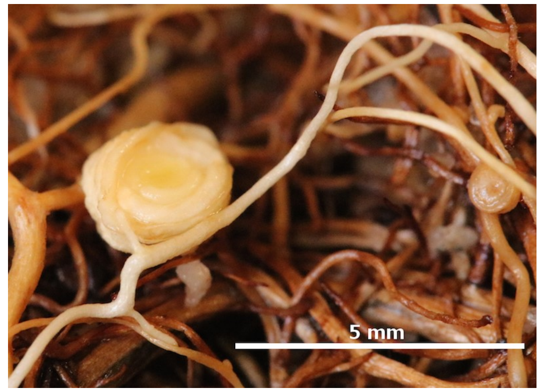


Figure 2. Live haustoria of quandong attached to a host (*Acacia saligna*)(Photo Francis Nge.

Due to a combination of strong host specificity, rare local establishment, and the slow growing nature of this species, there has been no incentive and indeed little purpose for the control of this parasite in terms of its management. This is in stark contrast to other more invasive herbaceous parasites commonly found in the Northern Hemisphere (e.g. *Striga*). The Australian large flightless emu bird is a well known seed dispersal agent of quandong. Getting quandong seeds to germinate is difficult in horticulture, and is said to be significantly aided by feeding them to an emu and collecting the remains of their scat after, with the kernels digested but seed intact. Quandong is slow growing and once established, will persist in the landscape for many years (50–100 years or more), often growing into large shrubs. On some occasions I have seen them as tall trees though this is rare, and these are found in areas that get higher rainfall than in more arid parts of its distribution (Fig. 3).

I have also seen some quandong being parasitised by other parasitic plants or even on themselves (self-parasitism). An unusual example includes a native Australian mistletoe growing on a quandong, an example of hyper-parasitism (Fig. 4).

Figure 3. Quandong trees up to 3 m in height and are still relatively young of age, growing in an open clearing surrounded by Wandoo (*Eucalyptus*) woodland (photo: Francis Nge)

Figure 4. Quandong being parasitised by another plant parasite – an Australian mistletoe species (*Amyema*)(photo Francis Nge)

References:

Der, J.P. and Nickrent, D.L., 2008. A molecular phylogeny of Santalaceae (Santalales). Systematic Botany 33, 107–116.

Nge, F.J., Ranathunge, K., Kotula, L. Cawthray, G.R. and Lambers, H., 2019. Strong host specificity of a root hemi-parasite (*Santalum acuminatum*) limits its local distribution: beggars can be choosers. Plant and Soil 437, 159–177.

Francis J Nge, The University of Adelaide and State Herbarium of South Australia

INTERNATIONAL YEAR OF PLANT HEALTH: PLANT OF THE MONTH - SEPTEMBER – *STRIGA*

Artist Libby Walker is an illustrator and maker based in Glasgow.
https://libbywalker.co.uk/

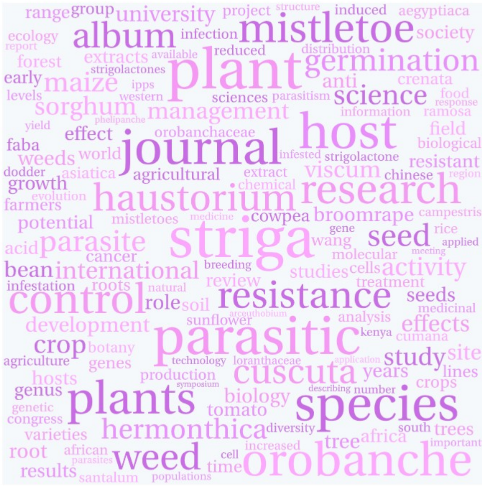
Why did we pick it?

Striga is a devastating parasitic weed that attacks food crops in sub-Saharan Africa such as rice, sorghum and millet. It affects 40% of Africa's arable savanna region, and is a major cause of food insecurity and poverty. Tackling the plant health problems experienced by rural susbistence farmers requires an extra level of local collaboration and ingenuity, to ensure that solutions are locally appropriate and meet the needs of these communities.

1st September, 2020.

*A MILLION WORDS

About a million words have been published in the 78 previous editions of Haustorium. After extracting the text from the original PDF and other files, we can, with the help of the 'tidytext' package of statistics software R, identify the most common words. Disregarding short and common words, the top five emerge: ***Striga*** (over 4,300 mentions)**, plant, parasitic, species** and **host. *Orobanche*** and **mistletoe** are not far behind. This graphic (offered just for decorative purposes) shows the 150 most frequent words with the font sized according to how often they appear. The colours are randomly applied in four shades approximating the *Striga hermonthica* flower.



Ben Parker

LITERATURE HIGHLIGHT

How often and how many?

The review published by Daniel L. Nickrent in Taxon (Parasitic angiosperms: How often and how many? Taxon 69(1): 5-27. 2020) (noted briefly in Haustorium 78) is a helpful summary of the phylogeny of parasitic angiosperms that will be of broad interest to botanists, and of particular regard to those of us working with parasitic angiosperms. Nickrent is one of the leading researchers of parasitic angiosperm phylogeny especially in the Santalales, which includes sandalwood making him ideally suited to prepare this overview.

His definition of parasitic flowering plants is plants that attach to host plants by means of haustoria. They are heterotrophic. Mycoheterotrophs, plants that derive nutrients from other plants via fungal connections to host plants, are also heterotrophic and could be considered parasites in a different way. They are termed ‘ectomycorrhizal epiparasites’. This review covers only angiosperms with haustoria.

He provides careful documentation of evolutionary research, including much of his own, confidently showing that parasitism has evolved twelve times in the angiosperms. He states ‘it is no exaggeration to say that these methods (molecular phylogenetic) have revolutionized our understanding of parasitic plant relationships’.

The review includes discussion of each of the twelve orders that contain parasites. These treatments are helpful summaries of the history of evolutionary studies, representative genera, fossil evidence (there is not a fossil record for many of the orders), unresolved phylogenies, and more. The greatest generic diversity is in the Santalales which the order with the highest number of species is the Orobanchaceae. In fact, five clades of the Orobanchaceae are covered in greater detail, more than any other group. This is because, as the author explains, this family contains the notorious parasites *Striga* and *Orobanche* which have received so much attention because of the devastation they cause to crops.

Based on his extensive research and familiarity with parasites around the world, Nickrent suggests evolutionary trends. For example, there are strong evolutionary forces for a trend to holoparasitism. Once parasitism has evolved in a group, there is no going back to the autotrophic condition.

This is a capstone paper from a researcher who has advanced our understanding of parasites markedly. It is certain to be widely cited.

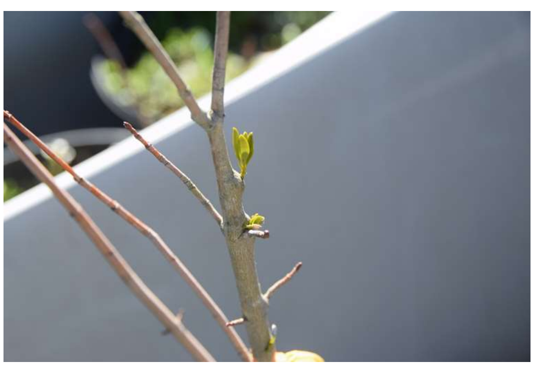
Lytton. J. Musselman

STUDENT PROJECT

Estimating the relative influences of local environmental conditions and disperser behavior on the distribution of the oak mistletoe (*Phoradendron leucarpum*)

The high visibility of oak mistletoe (*Phoradendron leucarpum*) and its dependence on birds for seed dispersal beyond the host tree of origin make it a nice system for investigating general questions about the role of dispersal in determining plant distributions. Such information about the distribution of oak mistletoe in the southeastern United States could also have conservation implications. Mistletoes in general can be considered keystone resources, and in addition to being food resources for fruit-eating birds in forested wetlands and urban areas of the region the species serves as the sole larval host-plant for the great purple hairstreak butterfly (*Atlides halesus*).

We used a seed sowing experiment to quantify the roles of light availability and flood regime in determining the initial survival of oak mistletoe (*Phoradendron leucarpum*). During winters (Jan-Mar) 2016-2018 we planted 1000 oak mistletoe seeds across 50 plots in forested wetlands in southeastern Virginia on a variety of potential host tree species. In winter 2018 we planted 580 oak mistletoe seeds on potted red maple (*Acer rubrum*) saplings under a range of light availability and flood regime treatments using a split plot design. Mistletoe seedling survival and establishment data were analyzed using generalized linear models and the results suggest that light availability has a significant effect on seedling establishment. This information will be coupled with results from a regional co-occurrence study using presence-absence data on both oak mistletoe and avian frugivores to determine the relative influences of environmental conditions and seed disperser behavior on oak mistletoe habitat relationships. Cryptic habitat specificity could exist in the foraging behavior of unmarked avian seed dispersers detected in the region. We are using population genetics analyses and microsatellite marker data from mistletoe samples from across the region to test for the presence of patterns indicative of such disperser.



Established oak mistletoe (*Phoradendron leucarpum*) seedlings as evidenced by the presence of leafy stems.

Nicholas Flanders

PRESS REPORTS

Plants communicate at a molecular level - biologists identify a protein which recognizes *Cuscuta* as a parasite.

Working together with researchers from the University of Tübingen, the University of Tromsø, the UC Davis and the Sainsbury Laboratory in Norwich, biologists from FAU have discovered how tomato plants identify *Cuscuta* as a parasite. The plant has a protein in its cell walls that is identified as 'foreign' by a receptor in the tomato.
Cuscuta spp., also known as dodder, is a parasitic vine which grafts to the host plant using special suckers to obtain water, minerals and carbohydrates. The parasite also attacks and damages crops such as oilseed rape, sweetcorn, soy, flax or clover. Although the infection generally goes undetected by the host, some species of tomato actively defend themselves by forming wooden tissue which prevents the suckers from penetrating the plant. In earlier research, the biologists at FAU discovered that these tomatoes possess a special receptor, the *Cuscuta* receptor 1 (CuRe1), which triggers the defence mechanism. However, until now it was unclear how the receptor recognises the danger posed by the dodder.

The researchers have now succeeded in answering this question: the dodder possesses a specific marker in its cellular wall, a glycine-rich protein (GRP). Using its receptor CuRe1, the tomato is able to recognise the molecular pattern of the GRP and identify the dodder as a pathogen, and triggers the immune reaction as a result. The new findings concerning the molecular dialogue between the *Cuscuta* marker and the tomato receptor may help to increase the resistance of crop plants against parasitic plants.

Journal Reference**:**

Volker Hegenauer *et al.* 2020. The tomato receptor CuRe1 senses a cell wall protein to identify *Cuscuta* as a pathogen**.** Nature Communications 11(1): DOI: 10.1038/s41467-020-19147-4

Science News 20th October, 2020.

Parasitic plants attack crops when defending themselves from microbes.

Researchers at the RIKEN Center for Sustainable Resource Science (CSRS) in Japan have discovered a link between defensive responses in plants and the beautiful but devastating crop parasite witchweed. Published in Nature, the new study shows that both parasitic and non-parasitic plants can detect and react to a class of organic compounds called quinones. While parasitic plants sense quinones in their prey and use it to invade, quinones trigger defensive responses in non-parasitic plants that can protect them from bacteria and other microbes.

All varieties of the witchweed parasite (genus *Striga*) sense the quinone DMBQ in other plants such as maize, sugarcane, and sorghum, and then build appendage-like organs that they use to invade the host. Once they invade, they steal water and nutrients, affecting crop growth and production. Annual worldwide losses to *Striga* parasites are well over a billion USD. Ken Shirasu and his group at CSRS want to find ways to prevent these kinds of losses by developing effective treatments or *Striga*-resistant crops. To do this, they need to understand all the molecular events that happen in the parasitic plants in response to quinones. But first says Shirasu, 'we needed to answer a more basic question: What are quinones doing in non-parasitic plants in the first place?' Surprisingly, no one had ever tested whether non-parasitic plants respond to quinones. The answer is that they do.

The researchers found that the commonly used research plant *Arabidopsis* responded to quinones by producing a calcium signal. They then examined 50,000 mutagenized seedlings and found 11 mutants in which this response was absent. This is a common technique used to find genes responsible for biological chains of events. In this case, all 11 mutants showed mutations in the same gene, which the researchers named CARD1 (**CA**nnot **R**espond to **D**MBQ).

Next, the researchers asked what happens after a non-parasitic plant detects DMBQ. A genetic analysis showed that biological chain of events after quinones activate the CARD1 protein involve responses to wounds and stress. The team then tested the hypothesis that quinone signaling is related to immune responses. They found that compared with wildtype plants, the card1 mutants were more easily infected by the *Pseudomonas syringae* bacteria—a common bacteria that affects *Arabidopsis* and many other plants such as tomatoes. One typical immune response in plants is the closing of pores in the leaves to prevent pathogens from entering. A deeper analysis showed that these stomatal pores failed to close in the mutant plants because the plants could not respond to quinones. This likely led to the increased susceptibility to infection. Another test showed that pre-treating plants with DMBQ increased resistance to bacterial infection via the CARD1 signaling pathway.

Satisfied that the CARD1 protein is essential for immune-related responses to quinones in non-parasitic plants, the team wondered if quinone signaling in parasitic plants was related to a similar gene. They looked for and found CARD1-like proteins in the model parasitic plant *Phtheirospermum japonicum*, which were expressed in the roots and also involved in DMBQ-induced calcium increase.

Understanding plant quinone signaling should provide targets for combatting parasitic plants, as well as rule out other targets. As Shirasu explains, 'our current research shows that if we simply target quinones, it will likely have the unwanted side effect of making crops more susceptible to bacterial infection. Another approach could be to create crops that do not produce quinones, but can still initiate the downstream responses that provide protection from microbial infection, perhaps with treatment.'

One of the next steps is to figure out how exactly quinone production is triggered in non-parasitic plants, and if the chain of events can be initiated downstream when quinones are missing.

Reference

Laohavisit *et al*. (2020) Quinone perception in plants via leucine-rich repeat receptor-like kinases. Nature. DOI: 10.1038/s41586-020-2655-4

New pests: resistant maize to the rescue.

Maize is a staple food crop for many subsistence farmers. Destructive pests have emerged causing crop losses. The cheering news is that scientists have developed disease-resistant varieties of maize. Farmers in Akwa Ibom State are benefiting from it, reports.

New threats are emerging in the production of maize. They are in form of newer pests, some of them voracious crop-destroyers that can reduce farm production and farmers' incomes. Among a flood of new pests that has emerged over a couple of years, is the fall armyworm. The worm has a voracious appetite for crops. According to the Food and Agriculture Organisation (FAO), it has spread to more than 30 countries since being discovered, potentially destroying $5 billion worth of maize, its favourite snack. Another pest is *Striga*. It currently remains the biggest threat to maize production.

With *Striga*-related losses estimated at $1 billion per year, a number of research bodies in Africa, including the International Institute of Tropical Agriculture (IITA), the International Centre for Insect Physiology and Ecology (ICIPE), International Wheat and Maize Improvement Center (CIMMYT) and the African Agriculture Technology Foundation, launched in 2009 a concerted effort to tame the weed.

Nigeria produces over 12 million metric tonnes of maize annually and it is a major source of farm income. Farmers have been applying maize crops resistant to the widespread *Striga* plant parasite. The crops were developed at IITA. According to IITA, the varieties dramatically cut maize losses from the root-infecting *Striga*, or witchweed, during two years of trial cultivation by farmers in Borno State. In support of this, the Institute for Agricultural Research has begun distributing the new parasite-resistant maize seeds.

The varieties, known as Sammaz 15 and 16, contain genes that diminish the growth of parasitic flowering plants such as *Striga*, which attaches to the maize root. Both Sammaz varieties tolerate heavy *Striga* infestations without suffering. Sammaz 16 is a late-maturing variety requiring 110 to 120 days of growth, whereas Sammaz 15 can often be harvested at 100 days and is more suitable for regions with short growing periods or unpredictable water supplies. Other maize varieties that will be able to resist *Striga* and pests and confer resistance are being bred in partnership with IITA.

Bassey Anthony, Agric. Business, Nov 2020.

Secrets of mistletoe to be uncovered by Scottish scientists

It has been a frivolous part of Christmas festivities for centuries, but now scientists sense that untangling mistletoe's complex make-up could lead to lasting benefits. Edinburgh scientists are set to be the first to sequence mistletoe's genome – the sum total of its entire DNA – which is more than 40 times the size of the human genome.

The mistletoe genome will contribute to the Darwin Tree of Life Project, which aims to sequence the genomes of over 60,000 British and Irish species within the next 10 years. The research is pioneering the use of ground-breaking gene sequencing technology, that could also be used to better understand diseases and cancers in humans and animals.

Researchers at the University's Edinburgh Genomics facility will be one of the first in Europe to use the PacBio Sequel IIe System, which is designed to read long fragments of DNA from virtually any species, with extremely high accuracy. The system produces eight-times more data than earlier sequencers, making sequencing complex genomes more affordable. Experts will use the technology to rapidly decode the mistletoe's entire DNA.

Mistletoe is a hemi (partial) parasite which attaches to a tree via suckers roots and absorbs some water and nutrients from its host plant. However, it also produces some of its own food via photosynthesis in its green leaves. It can be found in the UK on a variety of host plants including apple, lime, poplar, sycamore, ash and hawthorn. However it is rarely found on oak.

The results from the study could reveal how mistletoe has evolved to become a parasite in the first instance. Project partners, the Royal Botatanic Garden Edinburgh, will provide the mistletoe sample, collected from near the Scottish Gallery of Modern Art. Dr Javier Santoyo-Lopez, Service Manager at Edinburgh Genomics sequencing facility, said: 'PacBio's Sequel IIe System is a very powerful addition to our battery of sequencers at Edinburgh Genomics, enhancing the sequencing services we provide to researchers at the University at the same time as reducing costs. Its capability to accurately read large fragments of DNA will allow us to fully characterize the genetic information of many organisms, such as the mistletoe, as well as detect complex genomic alterations that could be the cause of rare diseases or cancers.'

Dr Alex Twyford, Lecturer in Botany at the School of Biological Sciences and Darwin Tree of Life University lead, said: 'We're excited to be the first to attempt to sequence the complex genome of the mistletoe, using the new PacBio Sequel IIe System. The results will become part of the Darwin Tree of Life Project, to sequence the genomes of all 60,000 British and Irish species within the next ten years. Jonas Korlach, PhD, Chief Scientific Officer of PacBio, said: 'We are proud to support the Darwin Tree of Life project and excited to see the complexity of a festive holiday plant like mistletoe revealed with HiFi reads. Projects and initiatives such as these are vital to generating complete reference genomes that advance research focused on understanding and preserving Earth's biodiversity.'

This equipment was funded by a grant from the Biotechnology and Biological Sciences Research Council (BBSRC). The Darwin Tree of Life project is funded by Wellcome.

By Iain Pope, The Scotsman
17th December 2020

Unique parasitic plant returns to Wellington for the first time in many years

A weird and wonderful plant is making its return to Wellington today, with seeds harvested by careful hands from Pureora Forest Park, gifted to their new caretakers in a tearful ceremony, and planted in the cool earth at Zealandia.

Dactylanthus taylorii or Pua o te Rēinga, meaning 'flower of the underworld' is New Zealand's only native parasitic plant.
On Friday morning, representatives from six iwi, Wellington City Council, and conservation workers gathered on the lawn outside the Zealandia visitor centre for a short ceremony, before zigzagging through the reserve to the first planting site. It was truly Wellington on a good day. The sun beamed down, Mayor Andy Foster was there, and only one person slipped down a hill. The plant has not grown in the Wellington region for many years, due to predation by introduced mammals, and destruction of their habitat.

ROSA WOODS/Stuff
Wellington Mayor Andy Foster planting some of the seeds deep in the Zealandia bush, which would take a minimum of five years to sprout.

The seeds were collected three days ago from Pureora Forest, washed, and readied for planting at Zealandia, and another batch at Otari-Wilton's Bush.Zealandia director Danielle Shanahan said this was the first time all six iwi had worked togwether. Representatives from each iwi sang a waiata, specially composed to mark the occasion. Then another representative, tears on her cheeks and sobs wracking her body, knelt in the centre, took each seed packet from a woven purse, and placed them gently on the grass. They were collected up again, one by one to be taken to the planting site, a symbolic gesture of the seeds changing hands.

David Mudge, a passionate advocate for pua o te Rēinga, and a member of the group from Pureora Forest Park which launched the endeavour, was fascinated by the plant. 'Each seed is a treasure, more precious than gold, each a small capsule of genetic information.' A parasitic plant is one that gets its nutrients from another plant, instead of from the earth and the sun. Pua o te Rēinga does this by putting roots into another plant, tapping its resource supply and leaving beautiful, flared, rose-shaped scars on the roots, popular with collectors. These never seemed to heal, Mudge said, implying there was some kind of chemical released by the tubers which left permanent damage. The plant, when it grew from the tubers and appeared above ground, had no leaves or stems, didn't photosynthesise to produce energy from sunlight, and survived entirely through the connection to the host plant - hence its status as a parasite.

Zealandia/Supplied
Wood rose, caused by the parasitic plant Pua o te Rēinga, meaning ‘flower of the underworld’.

In nearby locations like Pureora Forest Park, they tended to flower around March. Mudge estimated a group of 30 or so flowers, each with a lifespan of only 7-10 days, would produce collectively 0.5mL of nectar in that time. But flowers were something that wouldn’t be seen for at least five years, as the plant was slow to germinate and start growing – if they grew at all.

The three planting sites were carefully chosen; one at the head of a river, to encourage the spread of seeds downstream; one just off the trail in the cool, moist earth of the bush; and one where there was a small population of mice, to see if their presence affected its growth. The flowers would hopefully provide a rich food source for nectar feeding animals, and it would be interesting to see which animals became the main clientele.

Nga Manu/Supplied
The flower of *Dactylanthus taylorii*.

The plant was unique in another way – it was the only ground flower in the world to be pollinated by bats, in particular the New Zealand short-tailed bat. The introduction to Zealandia, where there were no bats, was an opportunity to explore the relationships between the plant and different hosts and pollinating species. Zealandia staff hoped the hihi, also known as the stitchbird, might step into that role.
The foundations were laid, and only time would tell.
Kate Green , Wellington Reporter

Tenbury mistletoe auction cancelled for first time in more than 150 years.

A famous mistletoe auction has been cancelled this year for the first time in 160 years.

The Tenbury Wells Mistletoe Festival, which celebrates the town's connection to the sale of holly and mistletoe – and goes back more than a hundred years – has also had to be cancelled. A spokesperson for the Tenbury Wells Mistletoe Association said: ‘It is with sadness, however not surprising, we are not holding the Mistletoe Festival this year due to the ongoing Corona Virus Pandemic. ‘We hope to return bigger and better in December 2021. Until then, stay safe. Look out for updates for our return.’

Charlotte Bentley, South ShropshireFarming.
Nov 24, 2020

CHRIS THOROGOOD
IN THE NEWS!

Dr Thorogood, Head of Science and Public Engagement for Oxford Botanic Garden & Arboretum researches the evolutionary genetics of plants, plant taxonomy and biodiversity hotspots. Specifically he is interested in speciation and adaptive radiations in poorly known parasitic and carnivorous plant groups, and also in taxonomic diversity in biodiversity hotspots including the Mediterranean Basin region and Japan. He is based at the University of Oxford Botanic Garden and works in close collaboration with other scientists at University of Oxford Department of Plant Sciences. He is also interested in identifying novel and effective routes to public engagement with research, as Head of Science & Public Engagement at the Botanic Garden.

Expertise

- Botany
- Plant sciences
- Plant evolution
- Rare plants
- Parasitic plants
- Carnivorous plants
- Mediterranean plants

Oxford University

NB. For full item including interview on BBC Breakfast show, see: https://www.ox.ac.uk/news-and-events/find-an-expert/dr-chris-thorogood

See also: https://www.oxfordsparks.ox.ac.uk/content/facebook-live-worlds-largest-flower

Painting by Chris Thorogood of *Cistanche fissa* in Israel.

THESIS

Anna Clarissa Krupp. Strategies and mechanisms of cellular interaction between the parasitic weed *Orobanche cumana* WALLR. and its host *Helianthus annuus* L. University of Hoheheim, 2020. Advisor: Otmar Spring

Abstract

Sunflower broomrape, *Orobanche cumana* WALLR., is a root parasitic plant causing considerable yield losses in sunflower cultivation in Europe, North Africa and Asia. Comprehensive knowledge about early interaction stages between host and parasite is necessary to find new ways of controlling this weed. In this thesis, three aspects regarding the biology of *O. cumana* were studied: 1) the chemotropism of *O. cumana* germtubes which bend towards the host root, 2) the development of *O. cumana* on resistant and susceptible sunflower lines and 3) the development of the phloem connection between the *O. cumana* haustorium and the sunflower host root. Sesquiterpene lactones in sunflower root exudates act as germination stimulants for *O. cumana*. As sesquiterpene lactones are known inhibitors of plant elongation growth and seem to play a role in the phototropic curvature of sunflower hypocotyls, a chemotropism bioassay on water agar was established to test if they also serve as chemotropic signals for the host-finding of *O. cumana* germtubes. When sesquiterpene lactone containing sunflower root exudate, sunflower seed oil extract or the sesquiterpene lactone reference costunolide were applied on filter discs, 70 % of the germtubes showed orientation towards them. The artificial strigolactone GR24, however, did not induce chemotropism. A concentration gradient of sesquiterpene lactones exudated from the host root is likely to be responsible for a stronger inhibition of elongation growth on the host-facing flank of the germtube. This would confer a double role of sesquiterpene lactones from root exudates in the sunflower-broomrape-interaction, namely as germination stimulants and as chemotropic signals. One way of controlling *O. cumana* is the cultivation of resistant sunflower lines. However, this resistance is rapidly overcome by more aggressive pathotypes of the parasite. Therefore, the resistance or tolerance reaction of the sunflower genotype T35001 was investigated in comparison to six other sunflower genotypes with different resistance characteristics. The development of *O. cumana* was monitored in a root chamber system which allowed permanent assessment of germination, attachment and tubercle formation in the different host-parasite-combinations. All seven tested sunflower lines induced germination and attachment of *O. cumana*, independent of the expected resistance or susceptibility of the host.

A difference between compatibility or incompatibility of the interactions was only observed at the tubercle stage. On T35001, tubercles never occurred, neither in root chamber nor in pot experiments. To find out why the development stopped before the tubercle stage, samples of sunflower roots with attached *O. cumana* seedlings were analysed by bright field-, fluorescence- and transmission electron microscopy. Histological studies revealed that *O. cumana* penetrated the host root, but never reached the host's vascular bundle. The root cortex cells surrounding the *Orobanche* haustorium showed no ultrastructural changes such as cell wall thickening. Fluorescence microscopy revealed no callose depositions or signs of phytoalexin release. However, ultrastructural examination of the host-parasite-interface showed degeneration processes in both cortex and haustorial cells. Cortex cells were flooded with bacteria, haustorium cells showed degeneration of cytoplasm and nuclei. The resistance mechanism that prevented further development of the *O. cumana* haustorium did not express itself in a histologically visible way. As holoparasite, *O. cumana* acquires its entire demand for water, minerals and organic nutrients from the host's vascular system. The development of the xylem connection between *O. cumana* and sunflower had previously been reported, but the phloem connection is far more relevant for the parasite in terms of organic nutrients. Accordingly, the ultrastructure of the phloem connection between the haustorium of young *O. cumana* tubercles and the sunflower root was examined. Parasite and host tissues were intermingled at the contact site and difficult to distinguish, but sieve-tube elements of *O. cumana* and sunflower could be differentiated according to their plastid ultrastructure. While sieve-element plastids of *O. cumana* were larger, often irregular in shape and contained few, small starch inclusions, sieve-element plastids of the host were significantly smaller, always round with more and larger starch inclusions. This made it possible to trace the exact contact site of host and parasite sieve elements to show a direct symplastic phloem connection between the two species. The interspecific sieve plate showed more callose on the host side. This allowed detection of newly formed plasmodesmata between host sieve-tube elements and parenchymatic parasite cells, thus showing that undifferentiated cells of the parasite can connect to fully differentiated sieve elements of sunflower.

LITERATURE

We thank CAB Direct for access to their abstract data base.

Abbes, Z., Bouallegue, A., Trabelsi, I., Trabelsi, N., Amani Taamalli. Amri, M., Mhadhbi, H. and Kharrat, M. 2020. Investigation of some biochemical mechanisms involved in the resistance of faba bean (*Vicia faba* L.) varieties to *Orobanche* spp. Plant Protection Science 56(4): 317-328. [Studying the resistance of varieties of faba bean Najeh and Chourouk to *O. foetida* and *O. crenata,* apparently due to more efficient enzymatic antioxidative response and reduced lipid peroxidation that helped the plants to avoid the damaging effects.]

Abdalla, M.M.F., Saleh, H.A.M.A. and Khater, M.A. 2020. Detection of genetic variations in *Orobanche crenata* using inter simple sequence repeat (ISSR) markers. Bulletin of the National Research Centre 44(1): 139. (https://bnrc.springeropen.com/articles/10.1186/s42269-020-00390-0) [Noting the wide genetic variability within populations of *O. crenata.*]

Abdullah, Y., Baloch, M.S., Shah, A.N., Hashim, M.M., Nadim, M.A., Ullah, G. Khan, A.A. and Shahzad, M.F. 2020. Weed management in wheat by cuscuta alone and in combination with commercial weedicides Allymax and Axial. Planta Daninha 38: .e020203106 (http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0100-83582020000100230&tlng=en) [An extract from unspecified *Cuscuta* sp.failed to provide any useful control of weeds. In Pakistan.]

Adomako, M.O., Gao FangLei, Li JunMin, Du DaoLin, Xue Wei and Yu FeiHai. 2020. (Effects of soil nutrient heterogeneity and parasitic plant infection on an experimental grassland community.) (in Chinese) Flora (Jena) 271: 151666. (https://doi.org/10.1016/j.flora.2020.151666) [A review based on 70 references.]

Afolayan, G., Aladele, S.E., Deshpande, S.P., Kolawole, A.O., Nwosu, D.J., Michael, C., Blay, E.T. and Danquah, E.Y. 2020. Genetic variation for *Striga hermonthica* resistance and yield among sorghum accessions in Nigeria. Journal of Agricultural Science (Toronto) 12(7): 192-202. [Among 25 sorghum accessions, SRN39, Danyana, Sepon82, and SAMSORG40 were the most resistant to *S. hermonthica,* suitable as sources of *S. hermonthica* resistant genes for introgression into cultivars adapted to Nigeria.]

Akhter, G. and Tabreiz Ahmad Khan. 2020. First report of weed-disease complex of *Meloidogyne incognita* and *Orobanche cernua* in brinjal. Indian Journal of Nematology 48(2): 240.

Al-Rowaily, S.L., Al-Nomari, G.S.S., Assaeed, A.M., Facelli, J.M., Dar, B.M., El-Bana, M.I. and Abd-Elgawad, A.M. 2020. Infection by *Plicosepalus curviflorus* mistletoe affects the nutritional elements of *Acacia* species and soil nutrient recycling in an arid rangeland. Plant Ecology 221(1): 1017-1028. [Infection of *Acacia* spp.in Saudi Arabia has a dual effect – of potentially killing its host tree due to absorption of host nutrients particularly when the infection is intense, but also a positive effect improving the availability of the micro-habitat of nutrients under the canopy, which in turn may contribute to the maintenance of biodiversity.]

Amico, G.C., Nickrent, D.L. and Vidal-Russell, R. 2019. Macroscale analysis of mistletoe host ranges in the Andean-Patagonian forest. Plant Biology 21(1): 150-156. [12 mistletoe species in three families (Loranthaceae, Misodendraceae and Santalaceae) occur on 43 plant species in 24 families with varying degrees of specificity. *Misodendrum* species and *Desmaria mutabilis* (Loranthaceae) are specialists with *Nothofagus* as their primary hosts. *Tristerix* and *Notanthera* (Loranthaceae) and *Antidaphne* and *Lepidoceras* (Santalaceae) are generalists parasitizing more than six host species. Unexpectedly, generalist mistletoes have smaller geographic ranges than specialists in his region.]

Amico, G.C. and Vidal-Russell, R. 2020. (Host use by the Argentine mistletoe *Ligaria cuneifolia* (Loranthaceae) along its geographical distibution) (in Spanish). Boletin de la Sociedad Argentina de Botanica 54(3): 395. [Recording 35 native hosts and 1 non-native, the most frequent being *Schinus, Prosopis, Geoffroea, Larrea* and *Vachellia.*]

Amri, M., Trabelsi, I., Abbes, Z. and Kharrat, M. 2019. Release of a new faba bean variety "chourouk" resistant to the parasitic plants *Orobanche foetida* and *O. crenata* in Tunisia. International Journal of Agriculture and Biology 21(3): 499-505. [New variety Chourouk yielded 1.71 t/ha grain in the presence of *O. foetida*, representing 4.2 and 6.5 times that of the susceptible checks and 42% more than the resistant check Najeh. Resistance to both *Orobanche* species is associated with low germination stimulation.]

Annor, B., Badu-Apraku, B., Nyadanu, D., Akromah, R. and Fakorede, M.A.B. 2020. Identifying heterotic groups and testers for hybrid development in early maturing yellow maize (*Zea mays*) for sub-saharan Africa. Plant Breeding 139(4): 708-716. [205 hybrids obtained by crossing 41 inbred lines with five standard testers evaluated under drought, low soil nitrogen (N), *Striga*-infested environments in Nigeria. Testers TZEI 17 and TZEI 23 were the most efficient across environments.]

Anselmo-Moreira, F. Teixeira-Costa, L. Ceccantini, G. and Furlan, C.M. 2019. Mistletoe effects on the host tree *Tapirira guianensis*: insights from primary and secondary metabolites. Chemoecology 29(1): 11-24. [A study of the reciprocal effects of *Phoradendron perrottetii* infection and the primary metabolites and phenolic compounds of *T. guianensis*.]

Anteyi, W.O. and Rasche, F. 2020. Population genetic structure and marker-trait associations in East and West African *Striga hermonthica* with varying phenotypic response to *Fusarium oxysporum* f. sp. *strigae* isolates Foxy-2 and FK3. Plant Journal 104(2): 391-402. [Studying the genetic basis for the variable susceptibility of 10 populations of *S. hermonthica* from differing zones of sub-Saharan Africa to *F. oxysporum* f. sp. *strigae* isolates Foxy-2 and FK3, and finding no consistent association of susceptibility with their origin in East or West Africa.]

Alemu Araya, Letemariam Desta and Ibrahim Fitiwy. 2020. Integrated effect of chlorusulfuron, nitrogen fertilizer and varieties on *Striga* management in Sorghum in Western, Tigray, Ethiopia. Asian Plant Research Journal 6(3): 1-9. [Optimum control of *S. hermonthica* obtained with combination of variety Brihan, chlorsulfuron 15-25 g/ha and N 46-69 kg/ha, but no data on crop yield.]

Arana, M.D. and Luna, M. L. 2019. A new subspecies of *Jodina rhombifolia* (Santalales: Cervantesiaceae), with taxonomical considerations. Phytotaxa 425(4): 208-218. [Suggesting the existence of two forms of *J. rhombifolia*, a small hemiparasitic tree about 4-8 m high from S. America.]

Arti Garg and Singh, R.K. 2020. Typification of fifty one names in *Pedicularis* (Orobanchaceae). Phytotaxa 430(2): 61-94. [45 lectotypes, 4 second-step lectotypes and 2 neotypes are designated for 51 names in *Pedicularis* to fix the identity and to avoid the misapplication of names. Images of the selected lectotypes and neotypes at the Central National Herbarium, Calcutta, are provided.]

Audley, J.P. and 10 others. 2020. Impacts of mountain pine beetle outbreaks on lodgepole pine forests in the Intermountain West, U.S., 2004-2019. Forest Ecology and Management 475: 118403. (https://doi.org/10.1016/j.foreco.2020.118403) [*Arceuthobium americanum* of much less importance than pine beetle, *Dendroctonus ponderosae*, in terms of damage to *Pinus contorta* in this region.]

Badu-Apraku, B., Adewale, S.., Paterne, A., Gedil, M. and Asiedu, R. 2020. Identification of QTLs controlling resistance/tolerance to *Striga hermonthica* in an extra-early maturing yellow maize population. Agronomy 10(8): 1168. (https://doi.org/10.3390/agronomy10081168) [194 $F_{2:3}$ families of TZEEI 79 × TZdEEI 11 were screened and 12 minor and major QTLs were identified for *Striga* resistance/tolerance adaptive traits.]

Badu-Apraku, B., Adu, G.B., Yacoubou, A.M., Toyinbo, J. and Adewale, S. 2020. Gains in genetic enhancement of early maturing maize hybrids developed during three breeding periods under *Striga*-infested and *Striga*-free environments. Agronomy 10(8): 1188. (https://doi.org/10.3390/agronomy10081188) [54 early maturing maize hybrids were evaluated and TZdEI 352 × TZEI 355, TZdEI 378 × TZdEI 173, and TZdEI 173 × TZdEI 352 were outstanding in grain yield and stability in *Striga*-infested environments.]

Badu-Apraku, B., Fakorede, M.A.B., Talabi, A.O., Oyekunle, M. Aderounmu, M., Lum, A.F., Ribeiro, P.F., Adu, G.B. and Toyinbo, J.O. 2020. Genetic studies of extra-early provitamin-A maize inbred lines and their hybrids in multiple environments. Crop Science 60(3): 1325-1345. [Hybrids TZEEIOR 202 and TZEEIOR 205 found to combine combination of high provitamin-A with satisfactory performance under low-N, *Striga hermonthica*-infested conditions.]

Bai JinRui and 17 others. 2020. Exploration of resistance to *Phelipanche aegyptiaca* in tomato. Pest Management Science 76(11): 3806-3821. [*Solanum pennellii* LA0716 was the best of 50 wild tomato accessions for tolerance to *P. aegyptiaca.* IL6-2 is identified as a prospective line possessing the major QTLs.]

Bandeira, Á.N.T., Bautista, H.P., Buril, M.T. and Melo, J.I.M.de. 2019. (Convolvulaceae from Engenheiro Ávidos Ecological Park, High Sertão from Paraiba, Brazilian Northeastern.) (in Portuguese) Rodriguésia 70: (http://dx.doi.org/10.1590/2175-7860201970026) [Recording the occurrence of *Cuscuta racemosa*.]

Bay, C. 2020. Four decades of new vascular plant records for Greenland. PhytoKeys 145: 63-92. [Adding *Pedicularis sudetica* ssp. *albolabiata.*]

Bilgen, B.B., Barut, A.K. and Demirbaş, S. 2019. Genetic characterization of *Orobanche cumana* populations from the Thrace region of Turkey using microsatellite markers. Turkish Journal of Botany 43(1): 38-47. [66% of the genetic variation was within-population and 34% due to among-population variations. Analysis showed 1 cluster had 3 groups containing 4 populations from the Kırklareli and Edirne regions. Two populations from Tekirdağ were in cluster II.]

Billard, E., Goyet, V., Delavault, P., Simier, P. and Montiel, G. 2020. Cytokinin treated microcalli of *Phelipanche ramosa*: an efficient model for studying haustorium formation in holoparasitic plants. Plant Cell, Tissue and Organ Culture 141(3): 543-553. [A study aimed at improving the ability of *P. ramosa* calli to attach to a host plant and develop to maturity, which can be useful as an efficient genetic transformation system for future studies].

Borzooie, S., Sharifi, R and Moarrefzadeh, N. 2020. Induction of systemic resistance in tomato against broomrape. Journal of Phytopathology 167(10): 1-9. [10 of 15 plant growth-promoting rhizobacteria reduced growth of *Phelipanche aegyptiaca*. *Lysinibacillus boronitolerans* B124 reduced the dry weight by 80%; *Bacillus pumilus* INR7 reduced the number of tubercles by 90%, and number of emerged parasites by 87%, while the lowest dry weight of the parasite was observed with methyl jasmonate treatment.]

Bran, A., Ion, V., Joița-Păcureanu, M., Prodan, T., Rîşnoveanu, L., Dan, M. and Sava, E. 2020. Sunflower hybrids with high genetic potential for the seed yield, in different environmental conditions. Romanian Agricultural Research 37: 81-88. [18 varieties tested at four locations over 2 years including one with serious *Orobanche cumana* infestations where two varieties showed zero infection. Very varied results.]

Brown, S.D.J. 2019. A new species of *Proterhinus* Sharp, 1878 (Coleoptera: Curculionoidea: Belidae) from Miti'aro, Cook Islands, South Pacific. Zootaxa 4664(4): 481-496. [Describing *Proterhinus tauai* Brown, apparently associated with *Cassytha filiformis*.]

Chikoye, D., Lum, A.F. and Menkir, A. 2020. Witchweed [*Striga hermonthica* (Del.) Benth] control using imazapyr seed coating in maize hybrids in the Nigerian savannah. Canadian Journal of Plant Science 100(4):.392-400. [Reporting trials from 2007-2008. Imidazolinone-resistant, *Striga* tolerant maize hybrids, seed-treated with herbicide yielded 60% more than those not treated wioth herbicide.]

Clark, N.F., McComb, J.A. and Taylor-Robinson, A.W. 2020. Host species of mistletoes (Loranthaceae and Viscaceae) in Australia. Australian Journal of Botany 68(1): 1-13. file:///C:/Users/chris/AppData/Local/Temp/BT19137_Clark_et_al_2020.pdf) **[An extremely comprehensive documentation of the hosts of Australia's 90 mistletoe species, adding 317 species to those 338 previously known. 36 species are recorded as hyper-parasites on 37 different host mistletoes. 63% of all Australian mistletoes parasitise either *Eucalyptus* or *Acacia* species, or both these genera.]**

Cocoletzi, E., Angeles, G,; Briones, O., Ceccantini, G. and Ornelas, J.F. 2020. The ecophysiology of a neotropical mistletoe depends on the leaf phenology of its tree hosts. American Journal of Botany 107(9): 1225-1237. [Showing that *Psittacanthus schiedeanus* growing on *Liquidambar styraciflua* (deciduous) and *Quercus germana* (evergreen) host trees in eastern Mexico takes up water and xylem nutrients from both deciduous and evergreen host trees, suggesting the ability to modify its physiology according to the availability of host resources, benefiting the early growth of the parasite.]

Coutinho, A.P., Silveira, P.C.da, Portugal, A., Albuquerque, J.I. and Pujadas-Salvà, A.J. 2019. Contribution to the knowledge of the pollen morphology in the tribe Orobancheae Lam. & DC. (Orobanchaceae). Grana 58(1): 14-44. [A very detailed study of 53 species of *Orobanche, Phelipanche* and *Cistanche*. 6 pollen groups are described. Light microscopy is apparently more useful than SEM, although information from SEM is clearly relevant as a complement.]

Cvejić, S., Radanović, A., Dedić, B., Jocković, M., Jocić, S. and Miladinović, D. 2020. Genetic and genomic tools in sunflower breeding for broomrape resistance. Genes 11(2): 152. (https://doi.org/10.3390/genes11020152) [Reviewing recent advances in sunflower genomics aimed at improving resistance to *Orobanche cumana,* and describing the structure and distribution of new, virulent physiological broomrape races, sources of resistance genes ,and pyramiding and marker assisted selection (MAS) strategies applied in the process of increasing sunflower resistance.]

Dawood, E.M., Zein, A.A., Soliman, I.E., Hamza, A.M. and Sharshar, A.A.H. 2019. Irrigation periods, broomrape control treatments and the growth performance of pea (*Pisum sativum*). Indian Journal of Agricultural Sciences 89(11): 1948-1952. [In soil heavily infested by *Orobanche crenata* best results were obtained from irrigation at 14 days interval and glyphosate sprayed twice at 6.5 g/ha. This increased pea seed yield without any residues in pea seeds at harvest.]

De Campos, B.H., Dalbeto, A C, Francisco, B.dosS., Romanelli, J.P., Munis, R.A., Engel, V.L. and Durigan, G. 2020. Root parasitism by *Scybalium fungiforme* Schott & Endl. is not random among host species in seasonal tropical forest. Acta Botanica Brasilica 34(1): 149-154. [Among the hosts of *S. fungiforme* (Balanophoraceae), *Croton floribundus* was apparently preferred (68% of parasitized plants), while four liana species were complementary hosts (32%).]

Deepak Kumar Gond and Co. Samuel. 2020. Occurrence of *Dendrophthoe falcata* (L. F.) Etting. on *Rosa indica* L. in India. Indian Forester 146(4): .367-367. [Title only available for free.]

Delchev, G. 2019. Efficacy of herbicides and their tank mixtures at sunflower (*Helianthus annuus* L.). Scientific Papers - Series A, Agronomy 62(2): 59-67. [Recording successful control of *Orobanche cumana* in 'Clearfield' sunflowers (resistant to imidazolinone herbicides) by herbicide mixtures containing fluroxypyr or imazamox.]

Ding HongBo, Yang Bin, Zhou ShiShun, Maw MyaBhone, Maung KyawWin and Tan YunHong. 2019. New contributions to the flora of Myanmar I. Plant Diversity 41(3): 135-152. [*Christisonia siamensis* recorded for the first time.]

Dipankar Borah, Neelam Gap and Singh, R.K. 2020. *Pedicularis khoiyangii* (Orobanchaceae), a new species from the Eastern Himalaya, India. Phytotaxa 430(4): 287-293. [*P. khoiyangii* D. Borah & R.Kr. Singh belongs to *Pedicularis* series *Rudes* Prain and is closely related to *P. prainiana*, but differs in many morphological details including size – it is the tallest species of *Pedicularis* recorded so far from India.]

Domina, G., Fabrizio Bartolucci, Patrik Mráz, Lorenzo Peruzzi, Fabio Conti, Otakar Šída and Gabriele Galasso. 2020. Typification and taxonomic remarks on five species names in *Cytisus* (Fabaceae). PhytoKeys 155: 1-14. [A critical discussion of the typification of the names *C. affinis, C. candidus, C. spinescens* and *C. villosus,* concluding that '*C. affinis'* = *C. villosus* (widespread in the Mediterranean) and

'*C. candidus'* = *C. spinescens* (along the NE Adriatic, but not in Sicily.]

Duca, M., Joița-Păcureanu, M., Port, A., Martea, R., Boicu, A., Rîşnoveanu, L. and Clapco, S. 2020. Genetic diversity analysis of sunflower broomrape populations from Republic of Moldova using ISSR markers. Romanian Agricultural Research 37: 89-97. [Confirming that ISSR marker system could be used for estimating genetic diversity in *O. cumana*. The results of genetic polymorphism showed that the application of 14 ISSR markers made it possible to group the studied 39 broomrape populations into different clusters. An association with geographic origin was established.]

Emran, S., Nawade, B., Yahyaa, M., Nassar, J.A., Tholl, D., Eizenberg, H. and Ibdah, M. 2020. Broomrape infestation in carrot (*Daucus carota*): changes in carotenoid gene expression and carotenoid accumulation in the parasitic weed *Phelipanche aegyptiaca* and its host. Scientific Reports 10(1): 324. (https://www.nature.com/articles/s41598-019-57298-7) [Infestation by *P. aegyptiaca* causes variations on the transcript levels of genes involved in carotenoid and strigolactone apocarotenoid biosynthesis of carrot roots].

Faradonbeh, N.H., Darbandi, E.I., Karimmojeni, H. and Nezami, A. 2020. Physiological and growth responses of cucumber (*Cucumis sativus* L.) genotypes to Egyptian broomrape (*Phelipanche aegyptiaca* (Pers.) Pomel) parasitism. Acta Physiologiae Plantarum 42(8): 140. (https://doi.org/10.1007/s11738-020-03127-8) [Parasitism by *P. aegyptiaca* caused variable increases in hydrogen peroxide, malondialdehyde, protein and phenolic compound content across 35 cucumber genotypes. The increases were highest in variety Khassib, which also proved the most resistant.]

Farfán, J., Lamas, G. and Cerdeña, J. 2020. A new species of *Mathania* Oberthür, 1890 from Peru (Lepidoptera, Pieridae). Zootaxa 4758(3): 589-595. [Describing *M. hughesi* Lamas, Farfán & Cerdeña, sp. n. from the southwestern slopes of the Andes of Peru, on *Ligaria cuneifolia* (Loranthaceae).]

Fernández-Aparicio, M., Delavault, P. and Timko, M.P. 2020. Management of infection by parasitic weeds: a Review. Plants 9(9): 1184. (https://doi.org/10.3390/plants9091184) ['New understanding of the physiological and molecular mechanisms behind the processes of germination and haustorium development, and behind the crop resistant response, in addition to the discovery of new targets for herbicides and bioherbicides will guide researchers on the design of modern agricultural strategies for more effective, durable, and health-compatible parasitic weed control.' We hope!]

Ghaznavi, M., Kazemeini, S.A. and Naderi, R. 2019. Effects of N fertilizer and a bioherbicide on Egyptian broomrape (*Orobanche aegyptiaca*) in a tomato field. Iran Agricultural Research 38(1): 9-13. [200 kg ha^{-1} ammonium nitrate reduced *O. aegyptiaca* height and biomass up to 18.7 and 33.7 %, respectively and increased tomato yield up to 27%.]

Golubinova, I. and Marinov-Serafimov, P. 2019. Allelopathic effect of dodder (*Cuscuta epithymum* L.) on different genotypes bird's-foot trefoil (*Lotus corniculatus* L.). Bulgarian Journal of Agricultural Science 25(6): 1198-1204. [Recording some variability in the response of different varieties of *L. corniculatus* to aqueous extracts of *C. epithymum*.]

González-Torralva, F.L., López-López, M.Á., Jiménez-Casas, M. and Alvarado-Rosales, D. 2020. Nutritional status of *Juniperus flaccida* Schltdl. and *Phoradendron juniperinum* Engelm. in response to soil chemical fertilization. Revista Cubana de Ciencias Forestales 8(2): 296-315. [Reporting the response of *P. juniperinum* and host *J. flaccida* to N, P and K fertilizers in Mexico.]

Gonzalez-Verdejo, C.A., Fernández- Aparicio , M., Córdoba, E.M. and Nadal, S. 2020. Identification of *Vicia ervilia* germplasm resistant to *Orobanche crenata.* Plants *9*(11): 1568. (https://doi.org/10.3390/plants9111568) [Screening102 bitter vetch accessions for resistance to *O. crenata* revealed 16 accessions with low levels of *O. crenata* infection. Resistance in Ve.055 and Ve.155 was associated with low stimulant, while others had two forms of post-germination resistance.]

Grímsson, F., Bouchal, J.M., Xafis, A. and Zetter, R. 2020. Combined LM and SEM study of the middle Miocene (Sarmatian) palynoflora from the Lavanttal Basin, Austria: part V. Magnoliophyta 3-Myrtales to Ericales. Grana 59(2/3): 127-193. [*Arceuthobium* spp. among 46 taxa identified.]

Guojing Shen, Jingxiong Zhang, Baldwin, T. and Jianqiang Wu. 2020. *Cuscuta australis* (dodder) parasite eavesdrops on the host plants' FT signals to flower. PNAS 117(37): 23125-23130. (https://www.pnas.org/content/117/37/23125) [Showing that FLOWERING LOCUS T (FT) protein is synthesized in the leaves of the host,

tomato, and is transferred to the parasite, *C. australis* resulting in synchronous flowering.]

Habonimana, B., Nzigidahera, B., Hakizimana, P., Ndayisaba, G. and Masharabu, T. 2019. (The Loranthaceae and Viscaceae parasites of Burundi's forests and agro-ecosystems: diversity and extent of infestation.) (in French) Journal of Applied Biosciences 140: 14235-14244. (https://www.ajol.info/index.php/jab/article/view/191429) [11 Loranthaceae and 4 Viscaceae recorded, the most abundant being *Phragmanthera usuiensis*, *P. capitata* and *Agelanthus flammeus*.]

Haruna, P., Asare, A.T., and Kusi, F. 2020. Assessment of *Striga gesnerioides* (Willd.) resistance and genetic characterization of forty-six cowpea (*Vigna unguiculata* (L.) Walp.) genotypes in Ghana. International Journal of Agronomy 2020: 3635157. (https://www.hindawi.com/journals/ija/2020/3635157/) [Among 46 cowpea genotypes, screened in pots for their reaction to *S. gesnerioides,* 65% were immune. 16 polymorphic SSR primers distinguished all 46 cowpea genotypes into three clusters, allowing cowpeas with *Striga* resistance to be evaluated and released as varieties for farmers to cultivate.]

Hayat, S., Wang Kai, Liu Bo, Wang Yue, Chen FangJie, Li PuFang, Hayat, K. and Ma YongQing. 2020. A two-year simulated crop rotation confirmed the differential infestation of broomrape species in China is associated with crop-based biostimulants. Agronomy 10(1): 18 (https://doi.org/10.3390/agronomy10010018) [Pot experiments confirmed some useful reduction in the seed bank of *Orobanche cumana* following growth of wheat, pepper and sugar beet as potential trap crops.]

Hegenauer, V. and 19 others. 2020. The tomato receptor CuRe1 senses a cell wall protein to identify *Cuscuta* as a pathogen. Nature Communications 11(1): (https://www.nature.com/articles/s41467-020-19147-4) [See Press Report above.]

Hosni, T., Abbes, Z., Abaza,L., Medimagh, S., Salah, H.B. and Kharrat, M. 2020. Effect of broomrape (*Orobanche cumana* Wallr.) on some agro-morphological and biochemical traits of Tunisian and some reference sunflower (*Helianthus annuus* L.) accessions. Journal of Plant Diseases and Protection 127: 831–841. (https://doi.org/10.1007/s41348-020-00362-6) [11 lines of sunflower assessed and 3 of those - TL12, TL15 and TL16 found to be free of infection.]

Huet, S., Pouvreau, J-B., Delage, E., Delgrange, S., Marais, C., Bahut, M., Delavault, P, Simier, P. and Poulin, L. 2020. Populations of the parasitic plant *Phelipanche ramosa* influence their seed microbiota. Frontiers in Plant Science 17 July 2020. (https://doi.org/10.3389/fpls.2020.01075). [*P. ramosa* from oilseed rape, tobacco, and hemp each had different sensitivity to strigolactone and isothiocyanate stimulants. Seeds from tobacco hosts were 100x more sensitive to (-)-2'-*epi*-GR24 than to (+)-GR24, contrary to seeds from oilseed rape and hemp, while seeds from rape were 10x to 100x times more sensitive to (±)-GR24 and to different conformations of GR24 than seeds from hemp plots. The complex results from study of microbiota are also presented.]

Huish, R., Faivre, A.E. Manow, M. and McMullen, C.K. 2019. Investigations into the reproductive biology of the Southern Appalachian endemic piratebush (*Buckleya distichophylla*): pollination biology, fruit development, and seed germination. Castanea 84(1): 70-80. [A detailed study of the pollination and germination of *B.distichophylla* (Santalaceae) establishing that seed set occurs but paucity of establishment from seed is likely due to heavy seed predation.]

Ishikawa, H., Drabo, I., Boukar, O., Fatokun, C. and Muranaka Satoru. 2019. Comparative analysis of farmers' selection criteria for cowpea (*Vigna unguiculata)* varieties in Niger and Burkina Faso. JARQ, Japan Agricultural Research Quarterly 53(3): 159-167. [Resistance to *Striga gesnerioides* among important criteria in farmers' selection of cowpea varieties.]

Iyawe, E.O., Aigbokhan, E.I. Ohanmu, E.O. 2020. First evaluation study on *Striga hermonthica* infestation in soils from southern part of Nigeria. International Journal of Conservation Science 112: 565-570. [Claiming to find that a rainforest soil has the potential for *S. hermonthica* emergence, growth and infestation but methods not adequately described to support this finding.]

Jacquemyn, H. and Merckx, V.S.F.T. 2019. Mycorrhizal symbioses and the evolution of trophic modes in plants. Journal of Ecology (Oxford) 107(4): 1567-1581. [A detailed review of mycoheterotrophy and its evolutionary origins.]

Kamara A.Y. and 10 others. 2020. Mitigating *Striga hermonthica* parasitism and damage in maize using soybean rotation, nitrogen application, and *Striga* -resistant varieties in the Nigerian savannas. Experimental Agriculture 56(4): 1-13. [Concluding that *Striga* -resistant maize varieties in combination with the application of N fertilizer and rotation with soybean could increase the productivity of maize in *Striga* - infested fields in the Nigerian savannas.]

Kamara, A.Y., Ajeigbe, H.A., Ndaghu, N., Kamsang, L., Ademulegun, T. and Solomon, R. 2019. Using a participatory approach and legume integration to increase the productivity of early maturing maize in the Nigerian Sudan savannas. International Journal of Agronomy 2019: No.5154943. (https://www.hindawi.com/journals/ija/2019/5154943/) [*Striga hermonthica*-tolerant and early-maturing maize varieties with legume rotation reduced *Striga* infestation by 46-100% when cowpea was rotated with maize, 80-97% with groundnut 59-94% with soybean. 99EVDT-W-STR C0 was the most popular maize because it is early maturing, *Striga*-resistant, and drought-tolerant.]

Kitiş, Y.E., Grenz, J.H. and Sauerborn, J. 2019. Effects of some cereal root exudates on germination of broomrapes (*Orobanche* spp. and *Phelipanche* spp.). Mediterranean Agricultural Sciences 32(2): 145-150. [Recording good germination of *Phelipanche ramosa* and *P. aegyptiaca* by maize root exudates.]

Konarska, A. and Chmielewski, P. 2019. Taxonomic traits in the microstructure of flowers of parasitic *Orobanche picridis* with particular emphasis on secretory structures. Protoplasma 257(1): .299-317. [The micromorphology of sepals, petals, stamens, and pistils of *O. picridis* are described in great detail. Also the ultrastructure of nectaries and glandular trichomes.]

Krupp, A., Heller, A. and Spring, O. 2019. Development of phloem connection between the parasitic plant *Orobanche cumana* and its host sunflower. Protoplasma 256(5): 1385-1397. [Describing detection of newly formed plasmodesmata between host sieve-tube elements and parenchymatic parasite cells, showing that undifferentiated cells of the parasite could connect to fully differentiated sieve elements of sunflower. More detail of the phloem development in the *O. cumana* tubercle are also described.]

Kvaček, Z., Teodoridis, V. and Denk, T. 2019. The Pliocene flora of Frankfurt am Main, Germany: taxonomy, palaeoenvironments and biogeographic affinities. Palaeobiodiversity and Palaeoenvironments 100(3): 647-703. [*Viscum* among the 15 genera of angiosperm species recorded.]

Laohavisit, A., Wakatake, T., Ishihama, N. Mulvaney, H., Tazikawa, K., Suzuki, T and Shirasu, K. 20230. Quinone perception in plants via leucine-rich-repeat receptor-like kinases. Nature 587: 92–97. (https://doi.org/10.1038/s41586-020-2655-4) [See Press Reports.]

León-Bañuelos, L.A., Endara-Agramont, A.R., Gómez-Demetrio, W., Martínez-García, C.G. and Nava-Bernal, E.G. 2019. Identification of *Arceuthobium globosum* using unmanned aerial vehicle images in a high mountain forest of central Mexico. Journal of Forestry Research 31(5): 1759-1771. [Using RGB values (Red, Green and Blue) through the colorimetric ranges for use in identification of *Arceuthobium globosum* in aerial images. And further to distinguish its phenological stage, young, adult and senescent under sunny and cloudy conditions.]

Li AiRong, Mao Ping asnd Li YunJu. 2019. Root hemiparasitism in *Malania oleifera* (Olacaceae), a neglected aspect in research of the highly valued tree species. Plant Diversity 41(5): 347-351. [Confirming the presence of parasitic haustoria of *M. oleifera* (Olacaceae), attached to a wide range of host species, including trees and grasses; also self-parasitism. In Yunnan, China.]

Li JunMin, Oduor, A.M.O., Yu FeiHai and Dong Ming. 2019. A native parasitic plant and soil microorganisms facilitate a native plant co-occurrence with an invasive plant. Ecology and Evolution 9(15): 8652-8663. [Results suggest that parasitism by *Cuscuta campestris* on the invasive *Mikania* diminishes the competitive ability of invasive plants and facilitates the native *Coix lacryma-jobi*. Effects of the parasite are enhanced as a result of suppression of favourable fungi in faviour of pathogenic bacteria.]

Ma Rui, Miao Ning, Zhang HuaXia, Tao WenJing, Mao KangShan, Moermond, T.C. 2020. Generalist mistletoes and their hosts and potential hosts in an urban area in southwest China. Urban Forestry & Urban Greening 53: 126717. (https://doi.org/10.1016/j.ufug.2020.126717 [Hosts of *Taxillus nigrans* and *Scurrula parasitica* included 41 species, 54% of infections occurring on 4 species - *Platanus acerifolia* (85%), *Robinia pseudoacacia* (65%), *Metasequoia glyptostroboides* (45%), and *Broussonetia papyrifera* (42%).]

Ma Yan, Lu NingNa, Lu GuangMei and Chen XueLin. 2020. Phenotypic selection for floral traits of two sympatric *Pedicularis* species. Acta Prataculturae Sinica 29(2) 186-192. [Studying and comparing a range of floral traits in *P. kansuensis* and *P. semitorta* on the Tibetan Plateau.]

Madany, M.M.Y., Saleh, A.M., Habeeb, T.H., Hozzein, W.N. and Abdelgawad, H. 2020. Silicon dioxide nanoparticles alleviate the threats of broomrape infection in tomato by inducing cell wall fortification and modulating ROS homeostasis. Environmental Science: Nano 7(5): 1415-1430. [The nano particles (how applied?) caused a modest reduction in *O. ramosa* infections and some increase in tolerance, but abstract not convincing.]

Madany, M.M.Y., Zinta, G., Abuelsoud, W., Hozzein, W.N., Selim, S., Asard, H. and Elgawad, H.A. 2020. Hormonal seed-priming improves tomato resistance against broomrape infection. Journal of Plant Physiology 250: 153184. (https://doi.org/10.1016/j.jplph.2020.153184) [Results suggest some protection of tomato by soaking seeds in 1mM IAA and salicylic acid against damage from *Phelipanche ramosa*.]

Marin, M., Laverack, G., Matthews, S. and Powell, A.A. 2019. Germination characteristics of *Rhinanthus minor* influence field emergence, competitiveness and potential use in restoration projects. Plant Biology 21(3): 470-479. [Seed quality of *R. minor* is discussed as a key factor to consider when predicting the impact of the hemi-parasite on community productivity and diversity.]

Martín-Sanz, A., Pérez-Vich, B., Rueda, S., Fernández-Martínez, J.M. and Velasco, L.. 2020. Characterization of post-haustorial resistance to sunflower broomrape. Crop Science 60(3): 1188-1198. [Resistance to *Orobanche cumana* in sunflower inbred line PHSC1102, which was consistently resistant against races F and G, was observed at a late stage (i.e., after tubercle development) and was associated with the production of phenolic compounds, which were hypothesized to restrict the parasite's growth.]

Masteling, R., Lombard, L., Boer, W. de, Raaijmakers, J.M., Dini-Andreote, F. 2019. Harnessing the microbiome to control plant parasitic weeds. Current Opinion in Microbiology 49: 26-33. [A detailed review and discussion of the potential for root-associated microorganisms to interfere with the chemical signaling cascade between the host plant and the root parasites, *Striga, Orobanche* and *Phelipanche*.]

Masteling, R., Voorhoeve, L., Ijsselmuiden, J., Dini-Andreote, F., de and Raaijmakers, J.M. 202. DiSCount: computer vision for automated quantification of *Striga* seed germination. Plant Methods 16(60): (01 May 2020). [DiSCount is accurate and efficient in quantifying total and germinated *Striga* seeds in a standardized germination assay, some 100 to 3000-fold faster than manual counting. The complete software and manual are hosted at https://gitlab.com/lodewijk-track32/discount_paper.]

Mellado, A. and Zamora, R. 2020. Ecological consequences of parasite host shifts under changing environments: more than a change of partner. Journal of Ecology (Oxford) 108(2): 788-796. [Discussing the apparent shift in host attack by *Viscum album* from *Pinus nigra* to *P. sylvestris* ssp. *nevadensis*, the contrasting effects on the two hosts – mainly a reduction in growth in *P. nigra* as opposed to a reduction in reproductive capacity in *P. sylvestris* and the importance of considering the specific effects of newly established interactions when predicting future species assemblages.]

Menkir, A. and Meseka, S. 2019. Genetic improvement in resistance to *Striga* in tropical maize hybrids. Crop Science 59(6): 2484-2497. [Studying genetic gain in grain yield and other traits in 32 maize hybrids developed over three breeding periods under artificial *Striga hermonthica*-infested and non-infested conditions for 4 years and finding a yield gain of 3.2% with a mean increase of 94 kg ha^{-1} yr^{-1} under *Striga* infestation, associated with 5.5% yr^{-1} reduction in the number of emerged parasites at 10 wk after planting.]

Miyakawa, T., Xu, Y. and Tanokura, M. 2020. Molecular basis of strigolactone perception in root-parasitic plants: aiming to control its germination with strigolactone agonists/antagonists. Cellular and Molecular Life Sciences 77(6): 1103-1113. [A review outlining recent findings on the strigolactone perception mechanism in *Striga hermonthica*, including the finding that HTL/KAI2 homologs have been identified as strigolactone receptors in the process of *Striga* seed germination.]

Moeini, A., Masi, M., Zonno, M.C., Boari, A., Cimmino, A., Tarallo, O., Vurro, M. and Evidente, A. 2019. Encapsulation of inuloxin A, a plant germacrane sesquiterpene with potential herbicidal activity, in β-cyclodextrins. Organic & Biomolecular Chemistry 17(9): 2508-2515. [Inuloxin A, complexed with β-cyclodextrins almost completely inhibited *Phelipanche ramosa* seed germination.]

Muhammad Ali, Hidayatullah, Zahid Mustafa,Tabeel Tariq Bashir and Farooq Shehzad. 2020. *Orobanche* species identification through DNA barcoding in tomato crop in uplands of Balochistan. Indian Journal of

Science and Technology 13(27): 2747-2754. [Using PCR amplification to distinguish *Phelipanche ramosa* from *P. purpurea*.]

Mursidawati, S., Wicaksono, A. and da Silva, J.A.T. 2019. Development of the endophytic parasite, *Rafflesia patma* Blume, among host plant (*Tetrastigma leucostaphylum* (Dennst.) Alston) vascular cambium tissue. South African Journal of Botany 123: 382-386. [A detailed description of the development of *R. patma* rows from a simple clump of cells or protocorm inside the cambium tissue of *T. leucostaphylum,* expanding in about 2 months into a flower bud.]

Mwakha, F.A., Budambula, N.L.M., Neondo, J.O., Gichimu, B.M., Odari, E.O., Kamau, P.K., Odero, C., Kibet, W. and Runo, S. 2020. Witchweed's suicidal germination: can Slenderleaf help? Agronomy 10(6): 873. (https://doi.org/10.3390/agronomy10060873) [26 *Crotalaria* landraces showed 15-54% germination of *Striga hermonthica.* They allowed attachment but there was no penetration beyond the pericycle, making them suitable trapcrops.]

Ndayisaba, P.C., Kuyah, S., Midega, C.A.O., Mwangi, P.N. and Khan, Z.R. 2020. Push-pull technology improves maize grain yield and total aboveground biomass in maize-based systems in western Kenya. Field Crops Research 256: 107911. (https://doi.org/10.1016/j.fcr.2020.107911) [Finding that push-pull is similar or superior to other maize farming systems in terms of maize grain and biomass production; and that while its performance is influenced by agro-ecological conditions, its efficacy in controlling *Striga hermonthica* increases over time, and its productivity is not compromised over time on the same farm.]

Nosratti, I., Sabeti, P., Chaghamirzaee, G. and Heidari, H. 2020. Weed problems, challenges, and opportunities in Iran. Crop Protection 134: 04371. (https://doi.org/10.1016/j.cropro.2017.10.007) [*Cuscuta campestris* among the most important weed species that compete with major crops in Iran.]

Olszewski, M., Dilliott, M., Ruiz, I.G., Bendarvandi, B. and Costea, M. 2020. *Cuscuta* seeds: diversity and evolution, value for systematics/identification and exploration of allometric relationships. PLoS ONE 15(6): e0234627. (https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0234627) [A detailed study of the seed morphology of 101 *Cuscuta* spp. which permit the separation of subgenera, but not of sections. Identification of individual species using seed characteristics is difficult but not impossible if their geographical origin is known. Subg. *Monogynella* species exhibits the likely ancestral epidermis. Diversity and evolution of seed traits discussed in relationship with their putative roles in dormancy, germination and dispersal.]

Orchard, A., Vuuren, S.F van and Viljoen, A.M. 2019. Commercial essential oil combinations against topical fungal pathogens. Natural Product Communications 14(1): 151-158. [Of 128 combinations, those containing *Santalum austrocaledonicum* displayed the strongest anti-fungal activity with MIC values as low as 0.06 mg/mL.]

Oyetunde, O.A., Badu-Apraku, B., Ariyo, O.J. and Alake, C.O. 2020. Efficiencies of heterotic grouping methods for classifying early maturing maize inbred lines. Agronomy 10(8): 1198. (https://doi.org/10.3390/agronomy10081198) [256 maize hybrids, were grown under *Striga hermonthica* infestation, drought, and optimal conditions to determine the combining abilities of the parental inbreds. HSGCA and SCA methods were the most efficient for grouping in all test conditions. For practical breeding purposes, the HGCAMT (general combining ability effects of multiple traits) method was recommended for *Striga* infestation.]

Özkil, M., Torun, H., Eymirli, S., Üremiş, I. and Tursun, N. 2019. (Determination of weed frequencies and densities in sunflower (*Helianthus annuus* L.) fields in Adana province.) (in Turkish) Mustafa Kemal Üniversitesi Tarım Bilimleri Dergisi 24(2): 87-96. [*Cuscuta campestris* recorded as serious locally.]

Padiglia, A., Zucca, P., Cannea, F.B., Diana, A., Maxia, C., Murtas, D. and Rescigno, A. 2020. Absence of polyphenol oxidase in *Cynomorium coccineum*, a widespread holoparasitic plant. Plants 9(8): 96. (https://doi.org/10.3390/plants9080964) [Confirming the absence of polyphenol oxidase in *C. coccineum* and discussing its significance.].

Piwowarczyk, R., Mielczarek, Ł., Panek-Wójcicka, M. and Ruraż, K. 2020. First report of *Melanagromyza cuscutae* (Diptera: Agromyzidae) from Poland. Florida Entomologist.103(1): 124-126. [30-60% of *Cuscuta lupuliformis* plants were found to be infested by *M. cuscutae*, causing reduced vigour and seed production.]

Piwowarczyk, R., Ruraż, K., Krasylenko, Y., Kasińska, J. and Pedraja, Ó.S. 2020. Seed micromorphology of representatives of holoparasitic Orobanchaceae genera from the Caucasus region and its taxonomic significance. Phytotaxa 432(3): 233-251. [Seeds of 43 holoparasitic species from the *Cistanche*, *Diphelypaea*, *Orobanche* and *Phelipanche* were subjected to micromorphological analysis. Three types of periclinal wall ornamentation were: (1) clearly pitted sculpturing in all *Cistanche*, *Diphelypaea*, and most *Orobanche* seeds; (2) fibrillar and veined sculpturing in *Phelipanche* seeds; and (3) smooth, granular or rugged (very rarely visibly pitted) outer periclinal wall in *O. coerulescens* and *O. colorata.*]

Porkabiri, Z., Sabaghnia, N., Ranjbar, R. and Maleki, H.H. 2019. Morphological traits and resistance to Egyptian broomrape weed (*Orobanche aegyptiaca* pers.) in tobacco under greenhouse condition. Australian Journal of Crop Science 13(2): 287-293. [Comparing 26 genotypes of tobacco and finding G14 was the best genotype against *O. aegyptiaca*. (In Iran)]

Punia, S.S., Vinod Maun, Yadav, D.B., Manjeet and Todarmal Punia. 2020. Effectiveness of different methods for controlling *Orobanche* in mustard. Indian Journal of Weed Science 52(1): 43-46. [Applications of neem cake or soil drenching of metalaxyl were ineffective. Post emergence glyphosate at 25 or 50 g/ha plus ammonium sulphate gave up to 90% control of unspecified *Orobanche*. No reference to yields/crop damage in abstract.]

Qasem, J.R. 2020. Osyris (*Osyris alba* L.) updates, the illustrated threatening parasite to fruit and forestry trees in Jordan. Pakistan Journal of Botany 52(1): 251-256. [*O. alba* recorded on olive, grape, almond, figs, plum, cypress, orange wattle, Aleppo pine, Palestine buckthorn and wild pistachio; also on wild thorny burnet and spiny broom. Olive, almond and grapes were the most severely affected.]

Rodenburg, J., Randrianjafizanaka, M.T., Büchi, L., Dieng, I., Andrianaivo, A.P., Ravaomanarivo, L.H.R. and Autfray, P. 2020. Mixed outcomes from conservation practices on soils and *Striga*-affected yields of a low-input, rice-maize system in Madagascar. Agronomy for Sustainable Development 40(1): 8. (https://doi.org/10.1007/s13593-020-0612-0) [A continuous rice/maize rotation suffering infestation by *S. asiatica* was compared with 3 alternative rotations involving legumes and Conservation Agriculture practices. Rice yields benefited but maize yields did not.]

Rohani, S., Ai Lim Teh and Salam, M.R. 2019. Parasitic plants at the coastal of Setiu, Terengganu: distribution and its association with host trees. In: Mohd Tajuddin Abdullah *et al.*(eds) Greater Kenyir Landscapes. Springer. Pp. 91-100. [7 parasitic species recorded in this region of Malaysia including *Cassytha filiformis* (most frequent at both coastal and inland sites), *Dendrotrophe varians, D. pentandra*, *Scurrula* , *Viscum articulatum*, *Macrosolen cochinchinensis* and *M. retusus. Syzygium zeylanicum* the host tree most highly parasitized.]

Roulet, M.E., Garcia, L.E., Gandini, C., Sato, H., Ponce, G. and Sanchez-Puerta, M.V. 2020. Multichromosomal structure and foreign tracts in the *Ombrophytum subterraneum* (Balanophoraceae) mitochondrial genome. Plant Molecular Biology 103(65): 623-638. [Analysis of horizontal gene transfer from Asteraceae host to *O. subterraneum* compared to other cases of gene transfer among Balanophoraceae species, leading to an evolutionary hypothesis involving ancient transfers from legume hosts to ancestral parasite species].

Rubiales, D. 2020. Broomrape threat to agriculture. Outlooks on Pest Management 31(3): 141-145. [A general review, emphasising that in spite of a wide range of control efforts, the threat from *Orobanche* and *Phelipanche* species is increasing, not only extending to new suitable areas but also adapting genetically to infect new crops and to develop increased virulence.]

Rubiales, D. and Emeran, A.A. 2020. Adaptation of grass pea (*Lathyrus sativus*) to Mediterranean renvironments. Agronomy 10(9): 1295. (https://doi.org/10.3390/agronomy10091295) [*Orobanche crenata* noted to be the major limiting factor in both Spain and Egypt, favoured by moderate temperatures at crop flowering and rain and humidity after flowering. The most interesting accessions of 16 breeding lines studied, those with high yield and low broomrape infection, were lines Ls10, Ls11 and Ls18.]

Samuel, A.T., Abolade, O.A. and Evelyn, O.O. 2020. Status of pests and diseases of sorghum and their management practices by "Fadama" III participating farmers in Abuja, Nigeria. Journal of Agricultural Extension and Rural Development 12(2):36-47. [A survey showed 20% of sorghum fields infested by *Striga hermonthica*.]

Saric-Krsmanovic, M. Bozic, D,; Radivojevic, L., Umiljendic, J.G. and Vrbnicanin, S. 2019. Response of alfalfa and sugar beet to field dodder (*Cuscuta campestris* Yunck.) parasitism: a physiological and anatomical approach. Canadian Journal of Plant Science 99(2): 199-209. [*Cuscuta campestris* caused a reduction in pigment content in alfalfa (15%-68%) and sugar beet (1%-54%). It had a strong effect on stem and leaf of alfalfa and leaf and petiole of sugar beet. It also increased the contents of N, P_2O_5, K_2O, and organic nutrients in alfalfa while infested sugar beet had higher contents of N and organic nutrients.]

Sawadogo, P., Batieno, T.B.J., Dieni, Z., Sawadogo, N., Ouedraogo, T.J. and Sawadogo, M. 2020. Geographical distribution and alternate hosts of *Striga gesnerioides* (Willd.) Vatke in Burkina Faso. Journal of Applied Biosciences 145: 14955-14964. (https://m.elewa.org/Journals/wp-content/uploads/2020/01/10.Sawadogo-1.pdf) [Alternative hosts of *S. gesnerioides* were *Cassia mimosoides, Alysicarpus ovalifolius, Ipomea eriocarpa, Ipomea* sp, and *Tephrosia pedicellata*. In addition, 4 morphotypes of *S. gesnerioides* were all found to be parasitizing both wild plants and cowpea.]

Sáenz-Romero, C. and 11 others. 2020. Recent evidence of Mexican temperate forest decline and the need for ex situ conservation, assisted migration, and translocation of species ensembles as adaptive management to face projected climatic change impacts in a megadiverse country. Canadian Journal of Forest Research 50(9): 843-854. [Recording massive infestation of *Pinus hartwegii* by *Arceuthobium globosum* and *A. vaginatum* and other problems apparently due to climate change. Discussing possible options for management.]

St. Clair, A.B., Dunwiddie, P.W., Fant, J.B., Kaye, T.N. and Kramer, A.T. 2020. Mixing source populations increases genetic diversity of restored rare plant populations. Restoration Ecology 28(3): 583-593. [Discussing the results of a study on *Castilleja levisecta*.]

Saucier, J.R., Milensky, C.M., Caraballo-Ortiz, M.A., Ragai, R., Dahlan, N.F. and Edwards, D.P. 2019. A distinctive new species of flowerpecker (Passeriformes: Dicaeidae) from Borneo. Zootaxa 4686 (4): 451-464. [Reporting the capture of a 'Spectacled Flowerpecker' thought to be a new species of *Dicaeum,* typically feeding on fruits of Loranthaceae.]

Seiler, G.J. 2019. Genetic resources of the sunflower crop wild relatives for resistance. Helia 42(71): 127-143. [The USDA-ARS, National Plant Germplasm collection of wild, relatives of sunflower containing 2,519 accessions of 53 species with 14 annual species (1641 accessions) and 39 perennial species (878 accessions) is found to have a number with resistance to *Orobanche cumana* races F, G, and H,. in 7 annual and 32 perennial species.]

Shayanowako, A.I.T., Shimelis, H., Laing, M.D. and Mwadzingeni, L. 2020. Striga resistance and compatibility of maize genotypes to a biocontrol agent, *Fusarium oxysporum* f. sp. *strigea*. Journal of Crop Improvement 34(4): 437-454. [Treatment with *F. oxysporum* f.sp. *strigae* gave moderate improvement in maize yields in the presence of *Striga asiatica*. Genotypes ZM1523, ZM 1423, ZM 1421, NC QPM and Colorado showed resistance to *S. asiatica* and compatibility to the fungus.]

Shi RuYu, Zhang ChunHong, Gong Xue, Yang Min, Ji MingYue, Jiang LinLin, Leonti Marco, Yao RuYu and Li MinHui. 2020. The genus *Orobanche* as food and medicine: an ethnopharmacological review. Journal of Ethnopharmacology 263: 113154. (https://doi.org/10.1016/j.jep.2020.113154) [A substantial review based on 74 references. *Orobanche* spp. (*s.l.*) are much used in China as health foods and food supplements, with potential to be developed into herbal medicines for tonifying the kidney, against impotence and spermatorrhea, dermatological problems and wounds, as well as infantile diarrhea. However, the basis for their activity is not yet explained.]

Singh, S.P., Yadav, R.S., Godara, A.S. and Bairwa, R.C. 2020. Screening of herbicides for broomrape (*Orobanche*) control in mustard. Indian Journal of Weed Science 52(1): 99-101. [Glyphosate at 25 g/ha + 50 g/ha at 25 and 55 DAS controlled unspecified *Phelipanche* sp. effectively with nil phytotoxicity and produced significantly the highest seed yield in mustard during both the years over other herbicidal treatments.]

Sofi Mursidawati, Adhityo Wicaksono and da Siva, J.A.T. 2020. *Rafflesia patma* Blume flower organs: histology of the epidermis and vascular structures, and a search for stomata. Planta 251(6): 112. (https://doi.org/10.1007/s00425-020-03402-5) [Studying vascular and epidermal tissue of *R. patma* flowers during anthesis. The adaxial epidermis had papillate cells, perhaps assisting the emission of odor through chemical evaporation. The abaxial epidermis had flattened cells providing a stiffer outer protective barrier for the flower. No stomata were found in this tissue.]

Sokat, Y. and Çatikkaş, U. 2019. (Weed species in almond areas in Akhisar-Kula (Manisa) and Datça (Muğla).) (in Turkish) Turkish Journal of Weed Science 22(1): 121-126. [*Viscum album* recorded as a minor weed of almond.]

Strelnikov, E., Antonova, T., Gorlova, L. and Trubina, V. 2020. The environmentally safe method of control of broomrape (*Orobanche cumana* Wallr.) parasitizing on sunflower. Conference paper : BIO Web of Conferences 21. XI International Scientific and Practical Conference Biological Plant Protection is the Basis of Agroecosystems Stabilization: 00039. (https://doi.org/10.1051/bioconf/20202100039) [In a pot experiment incorporation of a green manure of white mustard (variety Ruslana) showed 45% decrease in the infection of sunflower by *Orobanche cumana.* Common mustard (Yunona) and black mustard (Niagara) reduced the infection by 26% and 27%, respectively, andrapeseed (Tavrion) by 24%. In Russia.]

Suárez-Islas, A., Capulín-Grande, J. and Mateo-Sánchez, J.J. 2020. Performance of *Dalbergia Palo-escrito* Rzed. & Guridi-Gómez, a valuable timber tree, in a coffee plantation in hidalgo, Mexico. Bois et Forêts des Tropiques 344: 47-57. [Recording damaging effects of unspecified *Struthanthus* and benefits from its removal by pruning.]

Sui XiaoLin, Zhang Ting, Tian YuQing, Xue RuiJuan and Li AiRong. 2019. A neglected alliance in battles against parasitic plants: arbuscular mycorrhizal and rhizobial symbioses alleviate damage to a legume host by root hemiparasitic *Pedicularis* species. New Phytologist 221(1): 470-481. [Demonstrating a substantial contribution of *Glomus mosseae* and *Rhizobium leguminosarum* to alleviating damage to *Trifolium repens* from P-demanding *P. tricolor* and N-demanding *Pedicularis rex* respectively.]

Sun Xiao, Li Lin, Liu Chang and Huang LinFang. 2020. Metabolome and transcriptome profiling reveals quality variation and underlying regulation of three ecotypes for *Cistanche deserticola*. Plant Molecular Biology 102(3): 253-269. [The expression of *PAL*, *ALDH* and *GOT* genes were significantly up-regulated in *C. deserticola* growing on saline-alkali land compared to grassland or sandy land, apparently due to up-regulation of phenylethanoid glycoside biosynthetic genes in response to the saline-alkali conditions.]

Tak JunHyung, Coquerel, Q.R.R., Tsikolia, M., Bernier, U.R., Linthicum, K. and Bloomquist, J.R. 2020. Screening for enhancement of permethrin toxicity by plant essential oils against adult females of the yellow fever mosquito (Diptera: Culicidae). Journal of Medical Entomology 57(4): 1149-1156. [Sandalwood (*Santalum album*) oil displayed consistently high mortality against the resistant Puerto Rico strain of *Aedes aegypti*.]

Tan, A.S. and Kaya, Y. 2019. Sunflower (*Helianthus annuus* L.) genetic resources, production and researches in Turkey. OCL - Oilseeds and Fats, Crops and Lipids 26: 21. (https://www.ocl-journal.org/articles/ocl/full_html/2019/01/ocl190004s/ocl190004s.html) [932 oilseed and confectionary sunflower accessions in the National Seed Gene Bank of Turkey are being explored towards the development of improved sunflower hybrids with desired characters including resistance to *Orobanche cumana*.]

Tang GuangDa, Liu JunFang, Huang Lin, Zhu ChuMeng, Liu LiHua, Randle, C.P. and Yu WenBin. 2019. Molecular and morphological analyses support the transfer of *Gleadovia kwangtungensis* to *Christisonia* (Orobanchaceae). Systematic Botany 44(1): 4-82. [Supporting the creation of *Christisonia kwangtungensis*, differing from *C. sinensis* and *C. siamensis* in the length and colour of the corolla.]

Tippe, D.E., Bastiaans, L., van Ast, A., Dieng, I., Cissoko, M., Kayeke, J., Makokha, D.W. and Rodenburg, J. 2020. Fertilisers differentially affect facultative and obligate parasitic weeds of rice and only occasionally improve yields in infested fields. Field Crops Research 254:10785. (https://doi.org/10.1016/j.fcr.2020.107845) [Rice husks alone and rice husks or manure combined with DAP and urea increased yields and soil fertility most. *Striga asiatica* in upland rice in Tanzania was moderately reduced, however infestation of *Ramphicarpa fistulosa* in lowland rice was increased.]

Tkaczyk, M. and Sikora, K. 2020. First report about occurrence of *Sphaeropsis visci* on mistletoe (*Viscum album* L.) in Poland. Baltic Forestry 26(1): (https://doi.org/10.46490/BF461) [Reporting the occurrence of *S. visci* on *V. album* ssp. *austriacum* on Scots pine.]

Tounkara, A., Clermont-Dauphin, C., Affholder, F., Ndiaye, S., Masse, D. and Cournac, L. 2020. Inorganic fertilizer use efficiency of millet crop increased with organic fertilizer application in rainfed agriculture on smallholdings in central Senegal. Agriculture, Ecosystems & Environment 294(1): 106878.

(https://doi.org/10.1016/j.agee.2020.106878***)*** ***[***A study involving rotations and fertilizer applications on 'home fields' and 'outfields'. Regular use of organic manure on the former resulted in much higher yields of pearl millet than the use of inorganic fertilizer on the outfields. Rotation involving peanuts reduced *Striga hermonthica* and increased yields of millet.]

Üder, F. and Demirbaş, S. 2019. (Determination of some effects of broomrapes (*Orobanche Cumana* Wallr.) in Thrace region on the development of sunflower.) (in Turkish) Mediterranean Agricultural Sciences 32(2): 211-217. [Comparing different samples of *O. cumana* for their germination and damaging effects on sunflower. Samples from 2006 were still viable.]

Üstüner, T. 2019. The effects of mistletoe (*Viscum album* L.) on the physiological properties of some drupe trees in Turkey. Turkish Journal of Agriculture and Forestry 43: 485-491. [Discussing in detail the physiological effects of *V. album* on apricot, almond and plum and how the branches 'drift backwards' from the tip of their shoots due to the competition for waster and nutritional elements.]

Vélez-Gavilán, J. 2020. *Aeginetia indica* (forest ghost flower). Compendium Datasheet **:** Invasive Species Compendium 2020: 40110039. [Possible distribution models for *A. indica* show that the species has a broad invasive potential in tropical and subtropical areas of all continents where potential host crops are grown.]

Vera, A., Maldonado, R., Socorro, Y. and Martínez, M. 2020. (Interaction pattern of *Struthanthus dichotrianthus* in the xerophytic scrubland, wildlife reserve Cienaga de La Palmita and Isla de Pajaros, Zulia state.) (in Spanish) Revista de la Facultad de Agronomía, Universidad del Zulia 37(Suppl.1) 52-58. [*S. dichotrianthus* has a wide range of hosts in this region of Venezuela, with some degree of preference for *Pithecellobium dulce*. Other common hosts include *Quadrella odoratissima* and *Ruprechtia ramiflora.*]

Wahid Hussain, Lal Badshah, Farrukh Hussain and Asghar Ali. 2020. Floristic configuration and ecological characteristics of plants of Koh-*e*-Safaid range, northern Pakistani-Afghan borders. Acta Ecologica Sinica - International Journal. 40(3): 221-236. [Noting the presence of *Cuscuta reflexa*, *Viscum album* and *V. articulatum* in this region.]

Wakatake, T., Ogawa, S., Yoshida, S. and Shirasu, K. 2020. An auxin transport network underlies xylem bridge formation between the hemi-parasitic plant *Phtheirospermum japonicum* and host *Arabidopsis*. Development (Cambridge) 147(14): 187781. (https://pubmed.ncbi.nlm.nih.gov/32586973/) [Concluding that the cooperative action of auxin transporters is responsible for controlling xylem vessel connections between parasite and host.]

Wang JianYou and14 others. 2020. Efficient mimics for elucidating zaxinone biology and promoting agricultural applications. Molecular Plant 13(11): 1654-1661. [Describing the development of easy-to-synthesize and highly efficient mimics of zaxinone easy-to-synthesize and highly efficient mimics of zaxinone. MiZax3 and MiZax5 exert zaxinone activity in reducing strigolactone content and are at least as efficient as zaxinone in alleviating *Striga hermonthica* infestation under greenhouse conditions without negatively impact mycorrhization.]

Wang Kai Li PuFang, Yu Rui, Wang Yue and Ma YongQing. 2029. (Control effect of crop rotation regime on *Orobanche* spp. in Yanqi agricultural areas of Xinjiang Uygur Autonomous Region of China.) (in Chinese) Chinese Journal of Biological Control 35(2): 272-281. [Exudates from roots of sugar beet, pepper and wheat caused only low germination of *Phelipanche aegyptiaca* but caused over 50% germination of *Orobanche cumana.*]

Xiaoxin Ye, Meng Zhang, Manyun Zhang and Yongqing Ma. 2020. Assessing the performance of maize (*Zea mays* L.) as trap crops for the management of sunflower broomrape (*Orobanche cumana* Wallr.). Agronomy 10(1): 100. (https://doi.org/10.3390/agronomy10010100) [Confirming maize, specially var N214, to be a useful trap crop for reduction of *O. cumana* sunflower in China.]

Yanev, M., Mikov, A., Neshez, N. and Tonev, T. 2020. Broomrape (*Phelipanche ramosa* (L.) Pomel) control in winter oilseed rape with imazamox-containing herbicide products. International Journal of Innovative Approaches in Agricultural Research 4(2): 251-258. [Best herbicide treatments on imidazolinone-resistant rape were 25 g/ha imazamox and metazachlor 750 g + imazamox 35 g/ha, both providing over 90% control.]

Yang Chong, Fu Fei, Zhang Na, Wang JianSu, Hu LuYang, Islam, F., Bai QuanJiang, Yun XiaoPeng and Zhou WeiJun. 2020. Transcriptional profiling of underground interaction of two contrasting sunflower cultivars with the root parasitic weed *Orobanche cumana*.

Plant and Soil 450 (1/2): 303-321. [Infection of *O. cumana* triggered insufficient defense responses in a susceptible cultivar compared to a resistant one, presumably due to a failure to fully recognize parasite effectors. Secretome prediction enabled identification of 180 proteins associated with *O. cumana* penetration and infection. They were associated with cell wall degradation, nutrient acquisition and pathogenesis.]

Yang DeJun, Qiu Qiong, Xu LinHong, Xu YuMei and Wang Yi. 2020. The complete chloroplast genome sequence of *Santalum album*. Mitochondrial DNA Part B.5(1): 406-407. [A phylogenomic analysis also showed that *S. album* and *Osyris alba* clustered in a clade in the Santalales order.]

Yolcu, S., Ozberk, I. and Ozberk, F. 2020. Orobanche (*Orobanche* spp.) in lentil (*Lens culinaris* Medic.): how huge are the losses of yield, quality, marketing prices and profitability? Journal of Agricultural Sciences, Belgrade 65(2): 151-161. [Infestation by 0 to 15 m^{-2} broomrape (mainly *Phelipanche aegyptiaca* and *P. ramosa*) reduced the grain yield by 59%. Variety Firat-87 was found to be higher yielding than Yerli Kırmızı.]

Yoneyama, K., Xie XiaoNan, Nomura, T. and Yoneyama, K. 2020. Do phosphate and cytokinin interact to regulate strigolactone biosynthesis or act independently? Frontiers in Plant Science 11: 438. (https://doi.org/10.3389/fpls.2020.00438) [Cytokinins applied to hydroponic culture media significantly suppressed the strigolactone levels in both the root exudates and the root tissues of rice plants grown under P deficiency. In a split-root system, cytokinin suppressed strigolactone production locally, while P affected it systemically, suggesting that they act on its production independently.]

Zamora, R. and Mellado, A. 2019. Identifying the abiotic and biotic drivers behind the elevational distribution shift of a parasitic plant. Plant Biology 21(2): 307-317. [Discussing the population dynamics of *Viscum album* subsp. *austriacum,* occurring on *Pinus halepensis*, *P. nigra* and *P. sylvestris* var. *nevadensis* in a Spanish mountain region. With warming temperatures, the mistletoe currently has a window of opportunity to expand its distribution to higher elevations.]

Zhigila, D.A., Verboom, G.A., Stirton, C.H.and Muasya, A.M. 2019. A taxonomic revision of *Thesium* section *Hagnothesium* (Santalaceae) and description of a new species, *T. quartzicolum*. South African Journal of Botany124: 280-303. [Describing 8 species, - *T. fragile*, *T. fruticulosum*, *T. hirtum* (Sond.) Zhigila, Verboom & Muasya comb. nov., *T. leptostachyum*, *T. longicaule* Zhigila, Verboom & Muasya nom. nov., *T. microcarpum,*, *T. minus* and *T. quartzicolum* Zhigila, Verboom & Muasya sp. nov.]

Zhili Pang, Xu Zhang, Fulei Ma, Junliang Liu, Hang Zhang, Jing Wang, Xin Wen and Zhen Xi. 2020. Comparative studies of potential binding pocket residues reveal the molecular basis of ShHTL receptors in the perception of GR24 in *Striga.* Journal of Agricultural and Food Chemistry 2020(68): 12729-12737. (https://pubs.acs.org/doi/10.1021/acs.jafc.0c04947) [*Striga* HTL7 mutants were constructed and the equilibrium dissociation constants of a strigolactone analog was measured, providing expanded understanding for hormone-receptor binding].

Zorrillaorcid, J.G., Calaorcid, A., Rialorcid, C., Mejíasorcid, F.J.R., Molinilloorcid, J.M.G., Varelaorcid, R.M. and MacÍas, F.A. 2020. Synthesis of active strigolactone analogues based on eudesmane- and guaiane-type sesquiterpene lactones. Journal of Agricultural and Food Chemistry 68(36): 9636-9645. [Describing the synthesis of 9 'eudesmanestrigolactones' with high activity in germination of *Phelipanche ramosa*, *Orobanche cumana*, and *O. crenata* seeds, even at nanogram doses (100 nM). 'They provide a set of readily obtained allelochemicals with potential applications as preventive herbicides.']

HAUSTORIUM 79

has been edited by Chris Parker, 5 Royal York Crescent, Bristol BS8 4JZ, UK (Email chrisparker5@compuserve.com), Lytton Musselman, Parasitic Plant Laboratory, Department of Biological Sciences, Old Dominion University, Norfolk Virginia 23529-0266, USA (fax 757 683 5283; Email lmusselm@odu.edu) and Luiza Teixeira-Costa, Department of Organismic & Evolutionary Biology, Harvard University Herbaria, USA. (luiza.teixeirac@gmail.com). It has been produced and distributed by Chris Parker and published by Old Dominion University (ISSN 1944-6969).

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