SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 542 May 2018

FUNGI PLAY KEY ROLE IN BEE METAMORPHOSIS

Karina Toledo

https://www.technologynetworks.com/, April 16, 2018

The cultivation of fungi in the nest for food or defense seems to be a widespread practice among social insects. According to an article by Brazilian researchers published in 2015 in the journal *Current Biology*, the newborn larvae of *Scaptotrigona depilis*, a species of stingless bee native to Brazil, feed on filaments of a fungus cultivated in the brood cells. Without this food, few larvae survive to become adults.

This symbiosis was recently studied in greater depth by researchers working on the Ribeirão Preto campus of the University of São Paulo in Brazil as part of the Thematic Project supported by the Ribeirão Preto School of Pharmaceutical Sciences (FCFRP-USP) and the US National Institutes of Health. The results were published in *Scientific Reports* in January 2018.

"We know insects can't synthesize hormones, so they must obtain precursor substances from their food," said Mônica Tallarico Pupo, a professor in the FCFRP-USP and the principal investigator for the project. "Our hypothesis was that the fungus supplied a precursor for the molting and pupating hormone required for larvae to complete the metamorphosis into adult bees."

The first step of the investigation consisted of isolating the fungus from brood cells and characterizing it in the laboratory. The group found it to be a fungus belonging to the genus *Zygosaccharomyces*.

"We aren't sure how this fungus gets into brood cells. The bees lay eggs and then fill the cells with a liquid called larval food. Some three days later, the fungus begins to grow inside the cells," Pupo said.

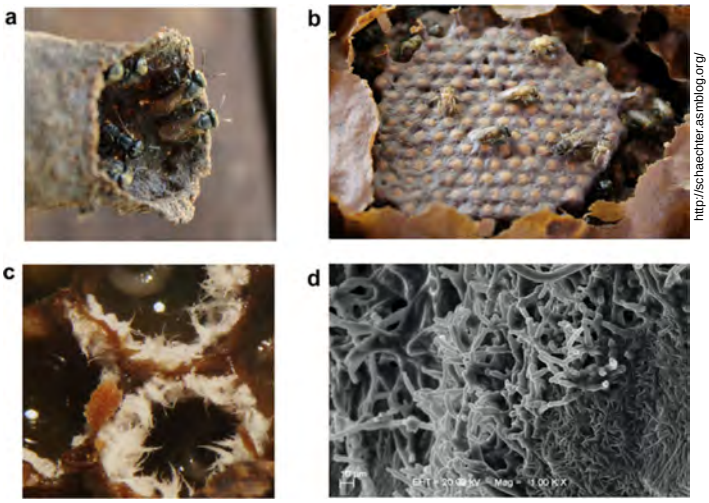
Using fluorescence microscopy, the researchers found an accumulation of lipids in the fungal cytoplasm from samples grown in vitro as well as samples extracted directly from bee colonies.

"Steroids, the precursors of molting hormones, are lipids. Using GC-MS, we found that the predominant compound among the lipids in this fungus was ergosterol," Pupo said.

Via *in vitro* experiments, the researchers proved that most larvae completed pupal morphogenesis when the larval food was inoculated with the fungus and when only ergosterol was added.

"The results were statistically equivalent for these two situations," Pupo explained. "When the larvae received only larval food without the fungus, they failed to reach the adult stage. We therefore concluded that ergosterol was in fact being used by the larvae to produce molting hormone, which reinforces the dependency between these bees and the fungus."

The group now plan to investigate whether similar phenomena occur in other species of stingless and stinging bees.



http://schaechter.asmblog.org/

Characteristics of Scaptotrigona depilis and its food fungus. (a) S. depilis in the entrance of the colony. (b) Brood cells with newly emerged bees. (c) Zygosacharmomyces pseudomycelium inside S. depilis brood cells. (d) Scanning electronic microscopy of S. depilis brood cell fungus.

NEW VEGAN FUNGUS SNEAKER

https://www.designboom.com/, April 16, 2018

A German-based engineering firm has designed a high-end sneaker using "leather" made from a tree fungus in combination with innovative materials such as eco-cotton terrycloth, microfiber suede made from recycled PET bottles, real cork insoles, and real rubber outsoles.

The elementary material for the vegan fungi sneaker was developed by designer Nina Fabert of ZYNDER from the trama of the Tinder Sponge, *Fomes fomentarius*, a parasite growing on dead or weak birches and beeches.

The resulting "mushroom leather" has a unique vintage look and is unbelievably soft. By using the material from both sides, interesting contrasts and combinations become possible. The material is organic and chemical-free, and the fungus is antiseptic and anti-bacterial.

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CALENDAR

May 8	Membership meeting, 7:30 pm, CUH
May 14	Board meeting, 7:30 pm, CUH board room
May 18–20	Field trip (see PSMS website)
May 19	Cultivation workshop
May 20	Mushroom Maynia, CUH
May 22	*Spore Prints* deadline
May 25–27	Field trip (private property, preregistration only)
June 1–3	Field trip (see PSMS website)
June 9	Field trip (see PSMS website)

BOARD NEWS

Luise Asif

The board is working to implement suggestions from the Retreat and ideas sent in to Derek from the membership. A small group, including board and nonboard members, met on April 17 under the leadership of new board member Chiara DeNeve to discuss improving communications for the club, with meetings continuing in the following weeks. Derek Hevel is gathering a group of enthusiasts to begin work on a PSMS cookbook. He has planned an exiting year of culinary experiments and fun. Danny Miller is having a cultivation workshop on May 19. Daniel Winkler continues leading the Bridle Trails Study. Groups go out every 2 weeks on alternating Sundays and Mondays. If you are interested in joining the group, contact Luise Asif at fasif@hotmail.com. Plans are moving forward thanks to Jeremy Collison and Chi Tran for Mushroom Maynia on May 20. Thank you to the 17 people who signed up at the April meeting to help. If you have not yet volunteered, please do so by contacting Luise Asif. March was the spring deadline for Ben Woo Scholarship applications, and of the nine received four were awarded: Emily Wolfe for her study on ecosystem effects of fungal endophytes at Mt. St. Helens; Chance Noffsinger for his Alpine Russula study in Montana; Edward Barge for his study of foliar endophytes associated with black cottonwood in the Pacific Northwest; and Shannon Adams for her study of Cortinarius in the Pacific Northwest. Marian Maxwell and Erin O'Dell are working together on a project for school outreach. Marian continues to offer lectures at regional libraries.

MEMBERSHIP MEETING

Tuesday, May 8, 2018, at 7:30 pm at the Center for Urban Horticulture, 3501 NE 41st street, Seattle

Korena Mafune

Our speaker for May is Korena Mafune, who will talk on "Old-growth temperate rainforest in Western Washington: Exploring fungal mutualism in canopy soil."

The temperate rainforests of Western Washington are known for their temporally stable old-growth forests. In Olympic National Park, many old-growth trees have developed thick layers of organic canopy soils on tree branches. *Acer macrophyllum* (big leaf maple) has adapted to canopy soils by growing extensive adventitious roots that are forming unique fungal relationships. Mafune's research focuses on determining if the community diversity of mutualistic fungi in canopy soils enhances the resilience of *Acer macrophyllum* to seasonal extremes. She will briefly introduce the complexity of the parallel evolution between plants and fungi, and will turn to focus on preliminary evidence that suggests that adventitious canopy roots may be associating with different fungal species than forest floor roots.

Korena Mafune is a Washington native, and has always had a passion for being outdoors. Her interest in plant-fungal associations started to grow during her undergrad years, and she started working with canopy soils in the temperate rainforests. She continued into the Master's program in the School of Environmental and Forest Sciences at UW, receiving her Master's in 2015 and continuing with Ph.D. research. Korena received a Ben Woo Scholarship from PSMS in 2016. This helpful contribution allowed her to collect preliminary data on fungi in canopy soils, which resulted in pulling in more funding for her current, much larger research project. Even after the Ph.D., she hopes to continue elucidating the role of fungal interactions in the Pacific Northwest's rainforests. On her free time, she enjoys foraging, cooking, spending time with family and pets, and training martial arts.

AMBROSIA BEETLES NURTURE THEIR GARDENS OF FUNGI WITH ALCOHOL **Katie Langin**

http://www.sciencemag.org/, April 9, 2018

No one likes a moldy peach, so some farmers stop fungus from growing by dipping their produce in alcohol. But that trick doesn't work on ambrosia fungus, which fungus-eating beetles raise in "gardens" that have a ready supply of ethanol. A new study suggests the alcohol not only helps the fungus grow, but it also inhibits microbial "weeds" that would otherwise crowd it out.

Ambrosia beetles survive by boring into trees and growing fungi inside. They prefer stressed or dying trees, which have more ethanol—an alcohol that's produced naturally by the plant—flowing through their tissues. To find out why, researchers took a closer to look at the black stem borer, an ambrosia beetle native to Asia that has become a tree-boring pest in North America.

The researchers collected fungus from black stem borers in an Ohio woodland. Then they grew the fungus, a species called *Ambrosiella grosmanniae*, on laboratory plates that contained food with different concentrations of ethanol. They found that the fungus grew best when there was some ethanol—about 1% or 2%—but did worse when there were higher or lower concentrations, the team reports today in the *Proceedings of the National Academy of Sciences*. What's more, even small amounts of ethanol stalled the growth of microbial "weeds" like the fungus *Penicillium* that crowd out the beetles' food source.

So for ambrosia beetles, the smell of ethanol isn't just a sign that a tree is stressed or dying. It's a sign that the conditions are ripe for the perfect garden.

thinglink

Ambrosia beetles and fungi.

TIME FOR "SHAJKAAN," THE SPRINGTIME WILD MUSHROOMS IN NORTH INDIA **Zubair Lone**

https://freepresskashmir.com/, April 17, 2018

With advent of spring every year, women vendors from Uri and other far-flung areas walk down to Baramulla town with a basket full of a seasonal crop called Shajkaans. But the much-sought after delicacy is now facing an existential threat from the free run of smugglers and sizable presence of military in northern Kashmir jungles.

She sits on a sidewalk and tracks pedestrian footfall like the watchful vendor she is. Her lifting, spanning, and zooming gaze constantly gauges the market mood. Her spring arrival in bustling Baramulla bazaar is known to townspeople who eagerly crowd around her basket full of the springtime crop.

Attired in colorful casual wear, Tasleema is one of the seasonal women vendors who show up in town every spring with a kind of mushroom called Shajkaan, aka Kanpapar.

Shajkaan is a wild variety of edible fungus, botanically known as *Geopora arenicola*. They are found mostly in southern Europe and northwest Himalaya in Jammu and Kashmir.

Shajkaan form a round fruiting body underground on sandy loam soils. After remaining under soil for most of the year, the edible body breaks the surface with the onset of spring to form a cup. They've a very short season of only 40–50 days, beginning from ending February to starting April.

Z. Lone

Shajkaan (Geopora arenicola) in situ.

Tasleema comes from the deep pockets of northern Kashmir touching the Line of Control. Since ages, her tribe has been foraying into the jungles with the advent of spring to collect Shajkaan. Although the gathering process remains tedious, she calls it a labor of love.

"This variety takes form in early spring," says Tasleema, whose vendor tribe comes all the way from Chahal Uri, Yenkuur Hajibal, and other far flung areas of Baramulla district.

"We collect these from the nearby jungles. It's very hard and tedious process to search. But it's worth it, given its ancestral and living value for all of us."

Z. Lone

A pile of cleaned Shajkaan.

While sprinkling water over her crop, Tasleema says that sometimes it takes her tribe many days to collect even a few kilograms.

"We've to travel many miles, as they can never be found in guilds but distributed over large areas," she says, carefully gauging the market mood. Many customers come by, and walk past to other vendors. She patiently waits.

Most of these vendors eagerly wait for spring to come, as the sprouting of Shajkaan brings in chances for short-term earnings.

After gathering soiled Shajkaan, Tasleema and others sit to clean the crop. The whole family, she says, is employed in this work. After washing, the womenfolk begin their trade trip to Baramulla.

"I've been selling them for over 20 years now," says Naseema, a vendor from Katiyawali Baramulla. "It's very hard to make them available. It's like selling our toil and sweat."

Near her stock on a crowded sidewalk, Naseema keeps selling the spring crop at around Rs250 (US$3.78)/kg. "But it's still not comparable to what hardships we face in collecting them."

cont. on page 4

Time for Shajkaan, *cont. from page 3*

Around many of these vendors, the customers—both men and women—compete with each other to take home a bagful of fresh Shajkaans. The crop rots in very short time.

Apart from being tasty and nutritious, they are equally sought for their medicinal value. One can fry them; cook them with onions or tomatoes. Some even prepare them with milk.

"My Delhi friends think that we are lucky to live in area where such a variety is found," says Parveez Ahmad, one of the customers.

With time, however, Shajkaan production has seen a drastic decline. Last year was in fact the worst, when most of these women vendors didn't show up in the bazaar. "We went penniless, as there was no production," says Mehmooda, a vendor accompanied by her mother. "That happened because of the adverse weather conditions."

But the crop's drastic decrease has more to it than simply uncertain weather condition. Most of these vendors blame massive axing of trees in the belt. Over the years, their eco-friendly belts have become a safe-haven for smugglers. Some even blame the heightened military footfall in jungles across the North. Owing to these conditions, these vendors say, an edible jungle variety called Modaanmoger has already been lost.

"We now fear that Shajkaan might meet the same fate," Mehmooda says. "In that case, we'll lose our precious part of living practice."

Z. Lone

Women selling Sajkaan in Baramulla.

TWO NEW DISCOVERIES IN FUNGAL DNA PROCESSING

https://phys.org/, April 12, 2018

Fungi, such as mushrooms, play an important role in our ecosystem. In nature, they recycle dead plants and animals. As humans, we not only eat fungi, but also use them in making food, such as bread and beer, and as bioreactors in the manufacture of drugs and other substances. They also play a direct role in human health since they can cause infections. In order to take full advantage of mushrooms (and fungi as a whole) and prevent their undesirable effects, a better understanding of fungi is essential. However, mushrooms are highly complex organisms, as are their genetic processes.

As part of his Ph.D. research, doctoral candidate Thies Gehrmann TU Delft, developed and applied methods of bioinformatic analysis in order to understand variations within and between mushroom-forming fungi. The research results, published in the journal *PNAS* on April 11, 2018, revealed two new discoveries.

"Paternal" And "Maternal" DNA are Active At Different Times

Many types of mushroom have two different nuclei in their cells, one from the "father" and another from the "mother." Researchers at the universities of Delft, Utrecht and Wageningen have discovered that the genes from the parental DNAs are expressed at different times in mushroom development.

"This means that when genes involved in mushroom formation are identified, we first need to find out whether the paternal or maternal nucleus is active," says Gehrmann.

Some Variation is Caused by Alternative Splicing

In addition, Gehrmann demonstrate that another process, known as alternative splicing, causes some of the variations. "This phenomenon is difficult to study in fungi, and so it was generally believed that no splicing took place."

Alternative splicing is a process in cells that enables a single gene to produce different proteins, each with its own function. Abnormal alternative splicing and mutations in the products of alternative splicing have been linked to cancer, autism, and serious development disorders, both in mice and in humans.

Despite these serious consequences for mammals, there has been very little research into alternative splicing in fungi. Gehrmann has now demonstrated that thousands of cases of alternative splicing occur in the fungus *S. commune*.

INDIAN WOMAN CHANGING PEOPLE'S LIVES THROUGH INNOVATIVE MUSHROOM FARMING

http://www.business-standard.com/, April 15, 2018

DEHRADUN (Uttarakhand), India - A mushroom cultivator from Uttarakhand's Dehradun has devised ingenious and innovative methods of growing edible macro-fungi, making their farming a lot more cost effective.

26-year-old Divya Rawat, who is the founder of Soumya Foods, has also promoted her methods, thus providing a means of livelihood for many Uttarakhand residents.

"People in Uttarakhand were leaving their villages to seek jobs in cities due to no fixed source of income, as the traditional farming of paddy and vegetables was not lucrative enough to promise a bright future," said Rawat.

"Looking for a solution I visited Dehradun wholesale markets and found mushrooms to be priced higher than all other vegetables. They were being sold at Rs 200 (US$3.00) per kilogram, and yearly price variations were told to be between Rs 200 and Rs 400. I hit the jackpot and started working on the same. Furthermore, as mushrooms are grown indoors, it prevents crop loss from natural calamities and wild animals," she added.

Rawat then underwent training on mushroom farming from the Indian Council of Agricultural Research-Directorate of Mushroom Research, Solan, and started her own mushroom cultivation unit.

When asked about the prerequisite capital investment she responded by saying, "The cost for the whole up is quite steep. So I made a few changes, making the entire process cost effective. I replaced the aluminum/steel racks with bamboo racks for vertical mushroom cultivation and nylon ropes for growing mushroom via the hanging method. It brought down the capital investment cost to Rs 40–50 thousand which earlier was more than Rs two lakhs."

Another change she implemented was growing three different mushroom varieties following the seasons and natural climatic conditions of Uttarakhand. "It was done so as to take advantage of the varying temperatures. It eliminated the need for air conditioners, humidifiers, or other temperature controllers.

"We grow milky mushrooms in summer as they require 30–40°C; in post-summer when the temperatures are more moderate, we grow oyster mushroom, and in winter button mushrooms," she elaborated.

Reflecting on how the recent boom in mushroom farming has impacted people's lives, she said, "It has brought about an enormous change in my village and it is spreading to other parts of the state as well. Reverse migration is happening, but it will take some time to be visible largely. At the moment, I am focused on providing the right technical and implementation guidance to the farmers who are associated with us. We are progressing rapidly every day, but it is a long way to reach our ultimate destination to have a Directorate of Mushroom [Research] here and make Uttarakhand the mushroom capital of India.

FIRST NATION BAND BANS MUSHROOM HARVEST IN WEST FRASER, B.C., COMPLEX FIRE AREA

https://www.bclocalnews.com/news/, April 12, 2018

The ?Esdilagh First Nation (Alexandria) is banning mushroom picking from certain parts of their traditional territory impacted by wildfire this summer.

Citing concerns over the sensitivity of the area, and past experiences with mushroom pickers, the nation is instituting a "No Go Zone" in the region affected by the West Fraser Complex wildfire area, near the West Fraser Road. The area is slightly to the southwest of the band, and includes the Castle Rock/Twan Lake South Wildfire, near Tingley Lake, Twan Lake, and Mcqoi Lake.

While the band is banning mushroom pickers from the West Fraser Complex, they are offering permits for harvesting and camping for both mushroom pickers and buyers operating in ?Esdilagh territory, provided they are operating in areas burned by other fires, like the Plateau Fire, which burned an estimated 521,012 hectares in the Chilcotin over the summer.

?Esdilagh band manager and mushroom committee member Chad Stump said the plan is to enforce the ban through an agreement they have with the RCMP and conservation officers, and that ?Esdilagh is also reaching out to the Ministry of Transportation and Infrastructure. Chief Victor Stump is calling on the government to use the ban as an opportunity to move forward with reconciliation and to work together with the public and governments.

The band is also in the planning stages of training community members as land officers, in back roads safety, first aid, approaches to dealing with certain situations, and how to guide and monitor potential pickers to areas where they will be allowed to harvest.

"What it really boils down to is that this specific area is all we have left in regards to our traditional area," says Daryl Johnny, who is managing the mushroom committee.

"Industry has wiped out the rest of our area, with harvesting the pine bug, and now that the fir bug is coming, the declining of the moose population, we are losing our fish habitat—we are losing every single thing our resources relied on, what we've lived on all our lives. This is our last time to step up."

THE TICK PROJECT: FIRST-OF-ITS-KIND EXPERIMENT AIMS TO REDUCE TICK POPULATION

CBS New York, April 13, 2018

MILLBROOK, N.Y. - Warmer temperatures wake up ticks, which go dormant in the winter. But now, a first-of-its-kind experiment is aimed at reducing tick populations in their active seasons.

Researchers want to know if treating entire neighborhoods will mean fewer cases of Lyme disease and other tick-related illnesses.

Carlisle Stockton doesn't want her dogs Gypsie and Jasper catching a tick-borne illness.

"It's definitely a concern. My one dog has gotten Lyme disease, erlichiosis, antiplasm, all those in the past, so it's a concern every single day," Stockton told CBS2's Tony Aiello.

During tick season, the dogs get a daily dose of tick repellent.

But in Dutchess County, where tick-borne illness rates for dogs and humans are among the highest in New York state, work is under way to see if tick reduction can be effectively accomplished on a large scale in entire neighborhoods.

Bard College biologist Dr. Felicia Keesing is co-director of "The Tick Project." Their goal? "Reduce ticks in such numbers, to such low numbers, that we can actually prevent people from getting sick, prevent cases of illness," said Keesing.

Researchers recruited more than 1,000 homeowners in 24 Dutchess neighborhoods. They've placed baited rodent boxes in those areas, so whenever a critter enters one of the boxes, it gets a dose of a tick-killing chemical.

Another method being tested is spraying a biopesticide called "Met 52" containing the spores of a commercial strain of *Metarhizium anisopliae*, a tick-killing fungus that occurs naturally in forest soils in eastern North America.

The Tick Project is a blind study, so homeowners don't know if the rodent boxes have the tick-killing chemical or if Met 52 is being sprayed in their area—or just water.

Researchers will monitor tick populations and the number of tick-borne illnesses being diagnosed. They'll also look to see "fewer cases of illness in the properties that are getting tick reduction treatments," Keesing said.

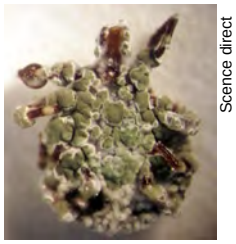
Researchers want to know if the methods work, alone or in tandem. If they do, wide-scale use could be coming to a tick-infested neighborhood near you.

It's the first time the tick-control products have been tested on a large scale.

The N.Y. state Health Department and the U.S. Centers for Disease Control and Prevention are supporting the study.

.greenleafpestcontrol.com

Brown dog tick.



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Tick killed by Metarhizium aniopliae.

TWO NEW FUNGI ID'D AS CAUSE FOR RAPID OHIA DEATH

Tom Callis

Hawaii Tribune-Herald, April 17, 2018

Ohia lelua (Metrosideros polymorpha), iconic flower of the Hawaiian hula.

Scientists have identified and named the two fungal pathogens responsible for Hawaii's rapid ohia death. The disease was first observed in Puna in 2010 and has since been found in 135,000 acres of native forests on Hawaii Island.

Researchers found that the pathogenic fungi responsible for the disease, tentatively identified as *Ceratocystis fimbriata*, are actually two new strains never seen before. They attack only ohia and were either imported or evolved by interacting with other fungi strains.

While they both have a preference for ohia, they are not closely related. According to a news release from the state Department of Land and Natural Resources and University of Hawaii, one has DNA similar to *Ceratocystis* species in Asia, while the other has roots in Latin America,

The new strains were named *Ceratocystis huliohia*, meaning changes the natural state of ohia, and *Certocystis lukuohia*, meaning destroyer of ohia. The agencies said this is the first time Hawaiian names have been given to plant pathogens.

Ceratocystis lukuohia is the more deadly variety, from which rapid ohia death gets its name, while damage from *C. huliohia* might be limited to a branch or two. But both can kill the trees.

The research was done by the U.S. Department of Agriculture's agricultural research service at the University of Hawaii (UH), the University of Pretoria in South Africa, and Iowa State University.

J.B. Friday, a UH extension forester who is researching ways to stop the spread of the fungi, said both strains are being labeled as rapid ohia death, also known as ohia wilt, for management purposes.

He said understanding where the disease comes from will help limit its damage to Hawaii Island's forests. Knowing there are two strains helps explain what's being seen in the forests and why not all trees are killed quickly.

"The good news is, first of all, we know what's going on," Friday said.

His office is researching resistant ohia types, one of which was identified last December. He said having two different strains can complicate those efforts but, fortunately, the tree that was found to have resistance was protected from *C. lukuohia*, the more deadly variety.

"That was with a few dozen trees," Friday said. "We are starting to look at more."

RICE BLAST FUNGUS DISCOVERY

https://geneticliteracyproject.org/, April 16, 2018

UNIVERSITY OF EXETER (UK) - Scientists have found a way to stop the spread of rice blast, a fungus that destroys up to 30% of the world's rice crop each year.

An international team led by the University of Exeter showed that chemical genetic inhibition of a single protein in the fungus stops it spreading inside a rice leaf—leaving it trapped within a single plant cell.

The finding is a breakthrough in terms of understanding rice blast, a disease that is hugely important in terms of global food security.

However, the scientists caution that this is a "fundamental" discovery—not a cure that can yet be applied outside the laboratory.

The research revealed how the fungus can manipulate and then squeeze through natural channels (called plasmodesmata) that exist between plant cells.

Rice blast threatens global food security, destroying enough rice each year to feed 60 million people.

It spreads within rice plants by invasive hyphae (branching filaments) which break through from cell to cell.

In their bid to understand this process, the researchers used chemical genetics to mutate a signaling protein to make it susceptible to a specific drug. The protein, PMK1, is responsible for suppressing the rice's immunity and allowing the fungus to squeeze through pit fields. By inhibiting it, the researchers were able to trap the fungus within a cell.

Symptoms of rice blast fungus.

NEW FUNGAL WEED-CONTROL AGENT BEING RELEASED

https://sunlive.co.nz/, April 15, 2018

NEW ZEALAND - Dogs in the Bay of Plenty area could see their dermatitis clear up thanks to the world's first field release of a Brazilian fungal biocontrol agent aimed at combating an invasive weed in the genus *Tradescantia*. The release of the yellow leaf spot fungus *Septoria lycopersic* was made at Rotorua by Bay of Plenty Regional Council and Manaaki Whenua Landcare Research.

Tradescantia fluminensis (Wandering Jew or Wandering Willie).

Tradescantia, also known as Wandering Jew and Wandering Willie, is an insidious weed that quickly takes over gardens as well as local reserves and is known to give dogs dermatitis. It is hard to get rid of, as any scrap left behind can re-sprout, and is a common skin hindrance to dogs in Tauranga and further afield.

Manaaki Whenua technician Chantal Probst says the yellow leaf spot fungus has been extensively tested and is host specific, so is highly unlikely to attack any other New Zealand plant life.

The fungus, which works by infecting the weed and damaging the epidermis, causing the leaves to shrivel and die, will be released by planting lab-infected plants among healthy Tradescantia plants.

Probst says it's hard to determine how long it will take for the fungus to become properly established.

The EPA gave permission to release the fungus in 2013, but it was not imported and released immediately to allow three species of beetles, all in the genus *Neolema*, that feed on Tradescantia leaves to establish and determine whether the fungal agent would be required.

The beetles, released in 2011, 2012, and 2013, have established well and are showing great promise. However, some release sites have flooded and, since Tradescantia often occurs in riparian areas, flooding will likely be a regular occurrence in some infested areas.

As the beetles could struggle in areas that are subject to regular flooding, the fungus will likely be better suited to these areas.

While the fungus will initially be released into areas without any beetles, in the future this agent and the beetles are expected to complement each other, and a monitoring project has been set up to measure their effectiveness.

A LICHEN THAT CHANGES ITS REPRODUCTIVE STRATEGY ACCORDING TO THE CLIMATE

https://www.sciencedaily.com/, Nov. 29, 2017

Symbiosis between fungi and microalgae gives rise to lichen. Some lichens, however, such as *Lobaria scrobiculata*, have a unique feature: the fungus establishes a symbiosis with a cyanobacterium, thus requiring water in liquid form to activate photosynthesis. According to a new study, this forces the lichen to concentrate its resources on reproduction in places where water is scarce. For the first time, this study demonstrates the theory of life strategies in fungi.

The *Lobaria scrobiculata* lichen is unique. Unlike the majority of lichen with green microalgae, which use environmental humidity to activate their photosynthesis, this species requires liquid water in symbiosis to activate the cyanobacteria living in it. This makes it special, although it is not its only unique property.

A study, published in the journal *Annals of Botany*, reveals how this organism changes its reproductive strategy depending on whether or not there is rainfall. Thus, in dry places, this tree-dwelling lichen starts to reproduce in smaller volumes with greater intensity.

"We believe this is a response strategy to water scarcity," said Sonia Merinero, a researcher from the Rey Juan Carlos University (Madrid) and the University of Stockholm (Sweden) and the main author of the study.

In adverse environments with less rainfall, the lichen could be ensuring the persistence of its populations by means of early and intense production of reproductive structures which free small fragments of fungus and cyanobacteria which are dispersed together (soredia). "On the other hand, in rainy places favorable to the species, the lichen can thrive without reproducing as early, nor very intensely," the scientist affirmed.

In total, researchers analyzed 9,665 lichens in 18 populations of *Lobaria scrobiculata* across 800 km, spanning the Iberian Peninsula. "We measured the size of each lichen in all populations and estimated its reproductive effort. By doing so, we calculated the reproductive threshold in each population, the minimum size required for a lichen to start reproducing with 50% probability," Merinero stated.

The Sexual Life of Fungi

The results also proved the theory of life strategies devised for sexually producing plants and animals for the first time. "This predicts how, in adverse environments, plants and animals with undetermined growth, such as fish and insects, for example, start reproducing in smaller volumes with a greater reproductive effort, guaranteeing their offspring in those adverse environments," the researcher commented.

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MAY IS MOREL MONTH!

So just to whet your appetites, here's a sample of what you may find as you look this spring.

Spring Morels — Dick Morrison

MushRumors, NW Mush. Assn., Feb.–Mar. 2016


Dick Morrison

Morchella snyderi, is a choice woodland black morel that fruits under conifers and mixed woods in mountainous areas in the latter part of spring. With their subdued coloration it can take a sharp eye to spot them in a dimly lit forest setting. All morels and their near relatives should be assumed to contain small amounts of heat-volatile toxins like gyromitrin, so they must be cooked thoroughly.


Dick Morrison

Morchella rufobrunnea, the Landscape Morel, fruits in urban and rural landscapes in late spring. Look for it in gardens and areas recently spread with wood mulch. You might even spot it while taking a neighborhood walk.


Dick Morrison

Morchella anthracophila is one of at least four "burn site" morels that fruit in abundance the first spring or two after a forest fire in mountainous regions. These species are a prime target of commercial pickers and amateur mushroomers alike. Mushroom hunting permits may be required on some public forest lands, so it's wise to check on the regulations before setting out.


Dick Morrison

Morchella tridentata, the Western Blonde morel, fruits in conifer and mixed forests in spring and early summer. As tasty as it is attractive.

Lichen Reproductive Strategy, *cont. from page 7*


Wikipedia

Lobaria scrobiculata.

Until now, this theory has never been proved in the fungi kingdom, and lichen are organisms which arise from a symbiosis between a fungus (mycobiont) and one or several green algae or cyanobacteria (photobionts). "What is curious about this and many other species of lichen is that it also reproduces asexually, indicating that the theory is versatile enough to also explain asexual reproductive strategies," Merinero pointed out.

The group of researchers highlight how, just like sexual reproduction in plants, this type of asexual reproduction is based on the production and dispersion of individual propagules (part of an organism which is produced sexually or asexually) which behave like seeds, and which does not share any similarities with clonal reproduction in plants, such as reproduction using stolons.

These conclusions broaden our knowledge on reproductive strategies in lichen, "organisms whose biology and ecology we still know little about, although they are found in all land ecosystems and carry out important ecological functions," the scientist concluded.

BACON WRAPPED CHEVRE STUFFED MORELS

Morgan Evans

Mycena News, San Fran. Myco. Soc., April 2018

Ingredients

20 large morels, cleaned
One 8 oz. log of chevre, room temperature
2 cloves garlic, finely minced
Small handful of herbs such as chives, tarragon, and chervil finely chopped
Salt and pepper to taste
4 TBs extra virgin olive oil
10 slices thin bacon cut in half lengthwise
Fleur de sel

Procedure

To make the stuffing, stir the garlic and herbs into the room-temperature chevre. Add salt and pepper and taste for proper seasoning. Place stuffing in a ziplock bag. Zip the bag shut making sure to get most of the air out. Cut a small hole in one corner of the bag. Pipe a small amount of filling into each cap without overfilling. Wrap each mushroom with a slice of bacon, pressing to seal the ends. Heat olive oil in a cast iron skillet and cook the mushrooms 2–3 minutes per side, making sure the bacon is fully cooked. Do the mushrooms in batches to avoid overcrowding the pan. Drain on paper towels and sprinkle with fleur de sel right before serving.

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