# SPORE PRINTS

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## PSMS HOLIDAY EXTRAVAGANZA 2016

# Spore Prints

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## CALENDAR

Jan. 10 Membership meeting, 7:30 pm, CUH
Jan. 16 Board meeting, 7:30 pm, CUH Board Room
Jan. 24 *Spore Print* deadline

## A GREAT TIME WAS HAD BY ALL — Milton Tam

On the evening of Dec. 13, the main hall at CUH filled to capacity with jolly PSMS members and families. The occasion was our annual "Cookie Bash," a holiday event hosted by your Board of Trustees. It started out as a mere cookie exchange, but evolved into a grand potluck buffet with a catered main course. Members came through with an amazing array of appetizers, casseroles, salads, baked goods, and desserts, including cookies! With such a variety of dishes, no one could possibly have gone home hungry! Tables were festively decorated with pine boughs, holly, ornaments, and tinsel. Four members released their inner Myco-angelos and provided entries for the edible art contest, with the winners selected by popular acclaim. Congratulations to our member with the top entry, a yule log sporting remarkably life-like marzipan chanterelles (my apologies to our unnamed winner; I wasn't taking notes when the prizes were handed out). Then there were many door prizes, and several members, including James Nowak, Daniel Winkler, Dick Sieger, Paul Hill, and Anne Tarver, shared photos of their mushroom exploits and/or travels in 2016. Special kudos go to our Board members, your hosts, who worked to plan and set up, decorate the room, and tidy up at the end of the evening.

## MEMBERSHIP MEETING

Tuesday, January 10, 2016, at 7:30 pm at the Center for Urban Horticulture 3501 NE 41st Street, Seattle

Our January meeting is dedicated to mushroom cooking. We will have Bonny Giardina from the Hipcooks Seattle Studio do a cooking demonstration with tasting.

*Bonny Giardina*

Bonny's earliest memories are of food and family kitchens, so it was no surprise to anyone but her when she decided to make food for a living. Cooking with and for friends is her favorite leisure activity and she loves to teach. She believes that anyone who wants to can be a great cook! Trained as a pastry chef and running the Hipcooks Seattle studio, you'll often find her playing with chocolate, but her sweet side only makes her more passionate about the savory bites of life. Wild mushrooms are a favorite food, ever since her dad harvested a batch from their front yard and turned them into dinner. That amazement stayed with her, and she jumps at chances to forage, cook, and eat these found treasures and share that joy with everyone she can!

## 12,000 IN WALES TO BE TRAINED AS "FUNGI APPRENTICES" TO COUNTER SHORTAGE OF MUSHROOM EXPERTS

*The Spore Print*, L.A. Myco. Soc., Dec. 2016

Plantlife Cymru is launching a three-year skilling project as a national dearth of mycologists threatens conservation efforts in Wales.

Stumbling across a Pink Ballerina or a crop of Violet Coral can bring a tear to the eyes of even the most experienced fungi expert.

Often described as the orchids of the fungi world, thanks their bright colors, these are members of the stunning waxcap family, adding pockets of vivid hues to the landscape in Wales.

Modern agriculture has been blamed for steady declines of waxcaps, but these grassland jewels now face an even greater threat: a lack of fungi experts.

Despite enormous interest in edible wild fungi, numbers of expert mycologists have hit an all-time low in the UK.

The past two decades has seen a 70 percent decline in fungi professionals—less than a dozen now remain in employed roles.

As a result Plantlife Cymru is launching a new project which aims to create a new generation of fungi experts. Anita Daimond, the charity's waxcap officer, said: "Welsh grasslands are home to some extraordinarily beautiful fungi—remarkable things like Parrot Waxcap and Scarlet Waxcap.

"These wild and wonderful waxcaps are highly sensitive to ploughing and fertilizers, so they need urgent care and protection.

"The current shortage of fungi experts meant their future looked bleak, but we are confident that this new project will help by finding and training the next generation of fungi fanatics."

## PSILOCYBIN REDUCES LIFE-THREATENING ANXIETY AND DEPRESSION IN CANCER PATIENTS

**Hariana Chilstrom**

synopsized from *The New York Times*

Clinical research on the benefits of psychoactive substances received a hefty boost with two recent studies published in the *Journal of Psychopharmacology* and reported in the 12/16/16 *The New York Times**. The *Times* article describes the 2013 clinical trials of psilocybin** at Johns Hopkins and at New York State University. The studies, involving a total of 80 patients, were designed to test the effects of a single dose of synthetic psilocybin on cancer-related depression and anxiety. The results were significant because they were both immediate and long lasting, with minimal side effects. About 80 percent of the cancer patients in these study groups "showed clinically significant reductions in both psychological disorders." These improvements were maintained seven months after the conclusion of the 2013 studies. Interestingly, depression and anxiety decreased in direct proportion to the intensity of mystical experiences reported by the study patients.

Before the 1970 federal restrictions that essentially criminalized psilocybin, hundreds of trials (mainly in the 1940s and 1950s) studied the effects of several psychoactive substances. Research virtually stopped after 1970, but began again in 2000; most of this was privately funded. A 2011 UCLA psilocybin pilot project involving 12 cancer patients was the clinical basis for the two 2013 studies. Each clinical study provided significant psychological support for the patients before, during, and after the double-blinded studies. All patients had been diagnosed with cancer-related anxiety and/or depression. None knew if they had initially ingested the synthetic psilocybin or a placebo, but all members of the 2013 cohort received the other sample within seven weeks.

Featured in the article are quotes from two cancer patients who experienced dramatic improvements in mood during and after the psilocybin trials. They had been suffering significant distress from anxiety and depression that had not been relieved by conventional therapy. Therapy-resistant depression and anxiety afflicts up to 40 percent of cancer patients, who are often desperate because they believe they have exhausted all options for relief. The lead investigator, Dr. Stephen Ross, initiated his study because he wanted to see if psilocybin could give faster results than antidepressants (which can take weeks to demonstrate any benefits). "Cancer patients with anxiety and depression need help immediately," he said, "especially if you consider that they are at elevated risk for completed suicide."

The first client featured in the *Times* article was a cancer patient with severe anxiety after treatment for Stage 3 Hodgkin's lymphoma. His doctor was alarmed at the client's emotional state and recommended the study. After taking one capsule of psilocybin, the client reported the following: "I had an epiphany: Why are you letting yourself be terrorized by cancer coming back? This is dumb. It's in your power to get rid of the fear," he told himself. "That's when I saw black smoke rising from my body. And it felt great." Three years after the study he reported: "I'm not anxious about cancer anymore. I'm not anxious about dying. The session has made my life richer."

The second patient, in remission for leukemia, had a bone marrow transplant that resulted in graft-versus-host disease, leaving him with chronic pain and fatigue. After suffering for about four years, he participated in the 2013 Johns Hopkins trial of psilocybin. It didn't restore him to his pre-cancer state, he said, "but I have a greater sense of peace of what might come. I'm very grateful, beyond words, for this trial. But you have to approach the session with the right intentions of why you're doing it. Because you're going to meet yourself. "

Some medical professionals have expressed skepticism, questioning the reliability and rationale for the trials. Dr. William Breitbart, chair of the psychiatry department at Memorial Sloan-Kettering Cancer Center, stated that he was concerned that studies like this would encourage the usage of psilocybin beyond medical purposes. He suggested it could lead to the same acceptance that marijuana now has. There appears, however, to be more support for further psilocybin studies like these, especially from leading psychiatrists working in the addiction and palliative care fields. Dr. Jeffrey Lieberman, a past president of the American Psychiatric Association, and Dr. Daniel Shalev of the New York State Psychiatric Institute describe this research as "a model for revisiting criminalized compounds of interest in a safe, ethical way…there is much potential for new scientific insights and clinical applications."

These experts emphasize that the results of these trials do not support the use of hallucinogenic mushrooms for self-treatment. In these trials "Patients received extensive support, which may have deepened and secured their life-affirming transformations," said Dr. Griffiths. Recreational use at raves and other celebrations, he says, results in very transient effects that "evaporate like water running through (user's) hands."

Despite the dramatic clinical results of these trials, cancer patients are not expected to have medical access to synthetic psilocybin anytime soon. The value of these studies is in their support for larger studies involving hundreds of patients, which could expand current trials now focused on treatment for alcoholism, tobacco addiction, and treatment-resistant depression. And commercializing psilocybin (if it becomes legal) is not a viable possibility, according to Dr. George Greer, a cofounder of one of the agencies funding the 2013 studies. He believes that specialized clinics may eventually provide single therapeutic doses to patients. But since it only takes one dose, repeat customers are unlikely.

*Hariana Chilstrom is a writer, artist, and naturalist enthralled by most invertebrates; this excludes fungus gnats and mosquitoes. She has studied pollinator conservation for a recent zoology masters, and written about marine science, entomology, and permaculture. An educational website is being developed; current contact is* Hariana@rocketmail.com.

*Clothes I wear for mushroom hunting are rarely sent to the cleaner. They constitute a collection of odors I produce and gather while rambling in the woods. I notice not only dogs (cats, too) are delighted (they love to smell me)."*

*— John Cage, M: Writings '67–x72*

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*A dose of a hallucinogen from a "magic mushroom," and then lasting peace, Jan Hoffman. *The New York Times*, Dec. 1, 2016. http://www.nytimes.com/2016/12/01/health/hallucinogenic-mushrooms-psilocybin-cancer-anxiety-depression.html?_R=1

**Psilocybin is a chemical found in more than 100 known mushroom species. It is thought to act on serotonin receptors in the human brain and gut. Serotonin helps regulate information between different areas of the brain and affects mood, sleep, sex, appetite, memory, and important systems including cardiovascular, smooth muscle, and endocrine. Serotonin imbalance has been implicated in depression, anxiety, and other disorders.

## RESUPINATE FUNGUS OF THE MONTH: *Paullicorticium allantosporum* ©Brian S. Luther

This is another installment reporting on my ongoing work documenting some of the many resupinate fungi I've collected from Cypress Island, Washington, in the San Juan Island Archipelago. I've been sampling resupinate fungi on the island since 2011 in coordination with the Washington State Department of Natural Resources. (Cypress Island is mostly publicly owned and is under their jurisdiction.)

**Description of Collection**

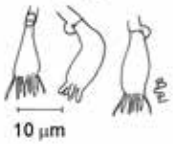
*Paullicorticium allantosporum* J. Eriks.
BSL coll. #2016-121-4.
On the underside of an old fallen, decaying Madrone (*Arbutus menziesii*) trunk on the trail from Eagle Harbor to Reed Lake, Cypress Island, Skagit Co., WA. December 1, 2016.

Brian S. Luther

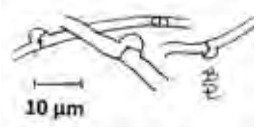
*Paullicorticium allantosporum. BSL coll. #2016-121-4.*

**Basidiocarp**: Resupinate, extremely thin and barely visible when wet, grayish-white when dry, forming only a slight diffuse granular coating on the substrate as viewed under a dissecting microscope, loosely attached when fresh; margin abrupt or finely farinose under magnification.

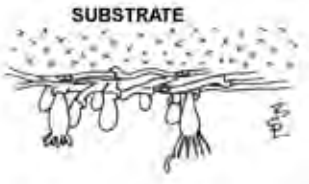

*P. allantosporum, basidiospores.*




*P. allantosporum, basidia.*

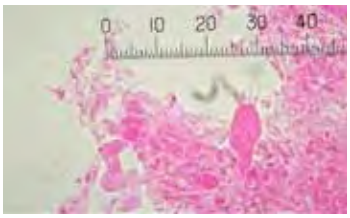



*P. allantosporum, hyphae.*



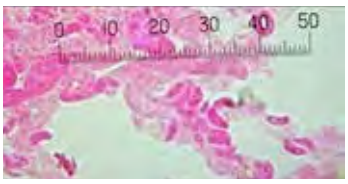

*P. allantosporum, habit.*

Brian S. Luther




*Paullicorticium allantosporum basidium at 1000× with 5 or 6 sterigmata (visible in optical section), in 3% ammonium hydroxide and Phloxine.*

Brian S. Luther




*Paullicorticium allantosporum allantoid basidiospores at 1000×, in 3% ammonium hydroxide and Phloxine.*

**Microstructures:** *Hyphal system* monomitic; hyphae 2–3.5 µm wide, hyaline, thin walled, frequently branching and with abundant large clamp connections. *Cystidia* none. *Basidia* 13–20 × 5–6 µm, clavate to obpyriform, thin walled, with a basal clamp connection; sterigmata 4 to 6 or more (or rarely 1 or 2), which are often at least 5 µm long when mature but start out short, thick, and stub-like until maturing and thinning out to a fine point as the spores are forming. *Basidiospores* 5–6.5 × 1.5–2 µm, allantoid (sausage shaped), thin walled, smooth, inamyloid, and with small oil drop like guttules seen when mounted in 3% $NH_4OH$.

**Discussion**

The genus *Paullicorticium* and the species featured here were originally described by John Eriksson (1958) from Sweden, who provided line-drawing illustrations. He also transferred another species into this new genus, so at that time there were two species known. Then Liberta (1962) monographed the genus, providing descriptions, some basic illustrations, and a key to the known species; he described two new species as well. *Paullicorticium allantosporum* was not known outside of Sweden and Norway at the time. Subsequent to this, Oberwinkler (1965) and Hjortstam (2007) described two new species of *Paullicorticium*. A detailed description as well as excellent line-drawing illustrations of *Paullicorticium allantosporum* are provided by Eriksson et al. (1978). Hansen & Knudsen (1997) provide a synoptic key with only brief species details. Bernicchia & Gorjón (2010) include it in their key also, but only give a few very brief additional characteristics, without a complete description. The CortBase website currently lists six accepted species in the genus *Paullicorticium*.

This genus is easily overlooked because the species form the thinnest of growths on the underside of woody substrates and are mostly nearly invisible, without very careful observations.

The multiple sterigmata, often more than four, seen on the basidia of this species is an interesting feature. Infrequently, I also observed some basidia with only one or two sterigmata, as I noted in my description. It's unusual to see more than four sterigmata on basidia, but this feature can also be found in the unrelated genus *Sistotrema*. (For a brief report on *Sistotrema* in Washington State, see Luther, 2014.)

Reports in the literature give the maximum spore size as about a micron larger than what I observed in the collection described here, but the ranges overlap, and all other characters appear to be identical.

Eriksson (1958). Liberta (1962), Eriksson et al. (1978), and Hansen & Knudsen (1997) note that this species is found on conifer substrates, but the collection detailed above was found on hardwood (Madrone); this appears to be the only known specimen not found on a coniferous substrate.

Ginns & Lefebvre (1993) cover four species of *Paullicorticium* in North America (one of these is no longer in the genus), but none of these are recorded from Washington State. Also, they do not list *Paullicorticium allantosporum* from North America at all. My collection of this species discussed here appears to be a rare find for North America and possibly the first in the genus to be documented from Washington.

DNA studies have shown that *Paullicorticium* is phylogenetically somewhat of an unknown. It appears to be related to some jelly

fungi, in the order Dacrymycetales (Binder et al., 2005). Larsson (2007) has a question mark in his Order column, so further studies are needed to clarify its relationship with other fungi.

**Acknowledgment**

Special thanks to my daughter Arnica who always takes time off of her job to serve as my research assistant on Cypress Island.

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## TOMATOES ARE MORE RESISTANT TO NEMATODES WHEN COLONIZED BY AN ENDOPHYTE FUNGUS

**Tabea Turrin**

*The Spore Print*, L.A. Myco. Soc., Dec. 2016

For tomato plants, major enemies are nematodes of the species *Meloidogyne incognita*. These are little worms that first induce the roots to form galls, which they then inhabit, feeding on the plant tissue. The plants' problem is they cannot run away from their attackers. However, they have other means of defending themselves, namely chemical substances that are toxic or deterrent to the parasitic nematodes. The production of these compounds in the plant is tidily regulated by small hormones, like salicylic and jasmonic acid.

William Wergin and Richard Sayre

*Meloidogyne incognita, magnified 500X, shown here penetrating a tomato root. Once inside, the larva establishes a feeding site, which causes a nutrient-robbing gall.*

Similar to microbial communities in the human gut, microbial communities associated with roots can provide their hosts with essential functions related to nutrient acquisition and protection against infections. One example for such an association has now been reported by an international team of researchers in the journal *New Phytologist*: a fungus of the genus *Trichoderma* lives inside the tissue of tomato plants (endophytically) and helps its host to defend itself against infestations by parasitic nematodes.

Ainhoa Martínez-Medina

*When tomato plants are infested with nematodes, the roots form galls (arrow) that are then inhabited by the little worms.*

"The fungus boosts plant immunity by enhancing the production of toxic chemical compounds upon nematode attack. This limits the invasion of the roots by nematodes, reduces nematodes' fecundity, and compromises the formation of root galls," explains Dr. Ainhoa Martinez-Medina, first author of the study and a scientist at the German Centre for Integrative Biodiversity Research and the Friedrich-Schiller-University Jena. Martinez-Medina has conducted the experiments at Utrecht University (Netherlands), with which she had been affiliated before moving to Leipzig.

To investigate the complex interactions between the tomato plants, the fungus, and the nematodes, the researchers have used a sophisticated study design in the laboratory. Half of the roots of their test plants were grown in one pot, and the other half in another pot. This allowed the scientists to test different combinations of their experimental treatments, namely infestation with nematodes versus no infestation, and association with fungus versus no association.

Subsequently, the marker genes involved in pathways modulated by salicylic and jasmonic acid were investigated. The results show that the *Trichoderma* fungus "primes" the plant, which can then defend itself faster against nematodes. "Such a 'priming' is comparable to a vaccination for us humans, through which our immune system learns and subsequently can react more effectively to an infection," explains Martínez-Medina. In the future, the knowledge about beneficial fungi could also help to develop sustainable solutions for agriculture, the scientist says: "Inoculants based on these beneficial microbes help to 'immunize' the plants against pathogens and pests, thereby reducing yield losses due to infections, in a sustainable way."

## MOLDY MARIJUANA?

**Melia Robinson**

*Business Insider*, Dec. 15, 2016

Studies show that marijuana sampled across the US carries unsafe levels of pesticides, mold, fungi, and bacteria. Earlier this year, Colorado recalled hundreds of batches that tested positive for banned pesticides.

It's unclear how much *Cannabis*, whether purchased legally in a dispensary or bought from a college roommate's cousin's friend, is at risk. But as the industry goes mainstream, experts suggest it's time legal weed gets quality assurance.

## BIOMASS HEATING COULD GET A "GREEN" BOOST WITH THE HELP OF FUNGI

American Chemical Society, Nov. 30, 2016

Newswise - In colder weather, people have long been warming up around campfires and wood stoves. Lately, this idea of burning wood or other biomass for heat has surged in popularity as an alternative to using fossil fuels. Now, in the journal *ACS Sustainable Chemistry & Engineering*, scientists report a step toward a "greener" way to generate heat with biomass. Rather than burning it, which releases pollutants, they let fungi break it down to release heat.

The benefit of biomass, which consists of plant material and animal waste, is that there is no shortage. It is produced continuously in enormous quantities as a waste product from paper and agricultural industries. But burning it emits fine particles and volatile organic compounds, or VOCs, linked to health and environmental problems. So scientists have been trying to figure out how to use biomass with minimal emissions. One approach involves adding microorganisms that can degrade the materials. In this process, heat is released without giving off fine particles or VOCs. So far, most investigations into this method have involved room-temperature conditions. But for sustained use, these reactions would need to take place at temperatures above ambient conditions as heat is produced. Leire Caizán Juanarena and colleagues wanted to warm things up to see how much heat they could coax out of the process.

The researchers incubated two fungi species that do well in hot climates—lignin-degrading *Phanerochaete chrysosporium* and cellulose-degrading *Chaetomium thermophilum*—with blocks of birch wood, either sterile or with its natural biota. *Chaetomium thermophilum* produced the most heat (0.63 Watt per kilogram) when degrading wood with its usual microbial inhabitants. To generate enough heat for an average home in the Netherlands, for example, the researchers say they need to determine optimal nutrient, moisture, and temperature conditions, as well as other parameters, to increase power production to 6 W/kg.

## MONSANTO UNVEILS SEEDS COATED WITH GROWTH-PROMOTING FUNGI

**Bryce Gray**

*St. Louis Post-Dispatch*, Dec. 6, 2016

Only a small percentage of microbes in the world can cause disease. Many, such as those in the human digestive system, are beneficial.

Similarly, many microbes found in soil have positive relationships with plants. Better understanding that association has attracted recent attention from researchers at Monsanto, which on Monday announced the upcoming release of a new microbial seed coating developed through a partnership with a European biotech company.

The product, called Acceleron B-300 SAT, will be applied to all of Monsanto's domestic corn hybrids starting in the 2017 growing season. It is the first jointly developed technology from the Creve Coeur-based agribusiness giant and the Danish company Novozymes, which announced a collaborative effort in December 2013 called The BioAg Alliance.

Monsanto says the technology is derived from a type of soil fungus called *Penicillium bilaiae* and can improve corn plants' ability to uptake key nutrients, such as phosphorus. The company says product testing shows improved yields.

"Our goal is to make sure these products improve yield or plant health that leads to yield," said Scott Bollman, Monsanto's microbial traits director, who oversaw the field trials done through the BioAg Alliance.

Bollman said the product is an improved formulation of an existing Novozymes product called JumpStart, which farmers currently apply at the time of planting.

"Our research has always said if you put it on the seed, it's much more efficient," Bollman said.

Monsanto will explore foreign markets for Acceleron B-300 SAT after its U.S. rollout, according to Bollman. The company projects that 90 million acres of crops worldwide could incorporate the technology by 2025.

Microbial research represents a key part of Monsanto's work with "biologicals"—a term company officials broadly apply to the relationship between crop systems and living organisms, as opposed to synthetic chemistries.

"What we're doing is taking something that's already in those soils and applying it in a more targeted manner," said John Combest, a Monsanto spokesman.

Bollman says the company is hoping that precision will give a competitive advantage to certain microbes and the crops they benefit.

"Can you make the good microbes compete better?" Bollman asks. "It's a community in itself with billions and billions of microbes and they're all competing."

## NEW TEST GENETICALLY IDENTIFIES FUNGAL WHEAT THREAT

**Jan Suszkiw**

http://www.minnesotafarmguide.com/, Dec. 10, 2016

A team of university and U.S. Department of Agriculture (USDA) scientists has developed a sensitive new assay method for detecting the fungus that causes "wheat blast," a disease of wheat in South America and, most recently, Bangladesh.

*A field in Bangladesh infected with wheat blast.*

The fungus *Magnaporthe oryzae* triticum (MoT) was first detected in Brazil in 1985. The disease has moved into the neighboring countries of Argentina, Bolivia, and Paraguay, but wheat blast hadn't been reported outside of South America—that is, until February 2016, when MoT was confirmed in wheat crops in Bangladesh.

Concerned that MoT could enter the United States, "blend in" with native strains of *M. oryzae*, and evade rapid detection, scientists from USDA's Agricultural Research Service (ARS) at Kansas State University and the University of Kentucky devised

a method to home in on a specific region of the fungus' genome that distinguishes it from other "look-alike" strains. The team reported the advance in September in the "First Look" section of the journal *Plant Disease*.

According to ARS plant pathologist Kerry Pedley, the method also distinguishes MoT from *Fusarium graminearum*, another fungal foe of wheat that causes disease symptoms similar to wheat blast. Symptoms include bleached grain heads and shrunken, malformed kernels of poor quality that greatly diminish marketability. Severe outbreaks of wheat blast can inflict 100-percent yield losses, making it a serious food security threat given the grain's status as a staple food for much of the world.

Traditional methods of diagnosing wheat blast include examining infected plants for the presence of spore-like structures, called "conidia." Procedures that genetically detect *M. oryzae* fungi are also used. However, they're limited to species-level identifications and can't distinguish among different fungal strains.

This lack of specificity can hamper wheat-blast-monitoring efforts and lead to false detections, as well as costly regulatory actions to contain a suspected occurrence, notes Pedley, with ARS's Foreign Disease-Weed Science Research Unit in Fort Detrick, Maryland. The new method overcomes this drawback by targeting a genomic marker unique to MoT.

In tests, it accurately distinguished all known strains (or "pathotypes") of MoT from more than 280 specimens of *M. oryzae* collected from around the world, including from South America and Bangladesh. The method yields results in less than 24 hours and is sensitive enough to detect trace amounts of the target sequence in samples, making it a valuable surveillance tool for field use, laboratory diagnosis, and port-of-entry inspections, among other applications.

The research was made possible by a competitive grant from USDA's National Institute for Food and Agriculture and additional support from ARS.

## CALIFORNIA MUSHROOM PICKER RESCUED FROM FOREST

*Record Searchlight*, Dec. 8, 2016

REDDING, CA - A woman who went to pick mushrooms in the Six Rivers National Forest North of Trinity Village needed to be rescued on Wednesday after falling into a creek.

Family members of Rayona Scott called the Trinity County Sheriff's Office to report she went to hike in Hawkins Bar to pick mushrooms on Tuesday and did not return home.

Scott was supposed to call someone to pick her up on Tuesday night, according to the Sheriff's Office.

Scott's family had not heard from her, and it was unusual for her to stay out overnight. Deputies and the Trinity County Search and Rescue members and U.S. Forest Service Fire Crews searched the area where Scott was picking mushrooms, and at 2:30 pm she was found near the Hawkins Creek drainage.

She slipped into a creek and was yelling for help, according to law enforcement.

Search and Rescue crews carried Scott through the steep terrain to an ambulance and she received treatment at a local hospital.

## KOJI

**Kashmira Gander**

*The Spore Print*, L.A. Myco. Soc., Dec. 2016

*Aspergillus oryzae*, also known as koji, is a type of fungus that has been used in Chinese and East Asian cooking for over 2,000 years.

Koji is used to turn soy beans and bean paste into soy sauce and added to rice to make sake wine. Chefs also use rice that has been treated with koji and then dehydrated to cure meats and add flavor to sauces.

The enzymes in koji turn carbohydrates from grains and vegetables into simpler sugars and also break down proteins in meat. The result is a crispier, more tender chicken with sweet and savory notes.

While your local supermarket might not stock koji products, they can be found in Japanese and Chinese stores, as well as online.

## ROAST KOJI CHICKEN

**Nick Blue**

*Bon Apettit*, Nov. 2016


Alex Lau

If possible, plan in advance for this easy chicken recipe; letting it chill for 2 days after being seasoned has a huge impact on the flavor and also gives the skin time to dehydrate, which magnifies its crispy potential.

*Ingredients*

2 TBs granular rice koji
1 TBs Diamond Crystal or 2 tsp Morton kosher salt
1 3½–4-lb chicken, patted dry
Freshly ground black pepper

*Preparation*

Grind koji in a spice mill or a blender to a fine powder. Transfer to a small bowl and mix in salt; set aside.

Starting at the neck end of the chicken, gently slide your fingers between the skin and breast to loosen skin; continue working down the thighs and legs to fully separate skin from meat (be careful not to tear). Rub koji mixture under skin all over meat and inside cavity, distributing evenly. Season outside of chicken generously with pepper and place on a wire rack set inside a rimmed baking sheet. Chill at least 8 hours and up to 2 days, leaving uncovered up to 24 hours, then loosely covering if chilling longer.

Let chicken sit at room temperature 45 minutes.

Preheat oven to 425°F. Roast chicken until skin is starting to brown all over, 15–20 minutes. Reduce oven temperature to 350°F and continue roasting chicken until an instant-read thermometer inserted into the thickest part of a thigh registers 165°F, 40–45 minutes. Transfer to a cutting board and let rest at least 15 minutes before carving. 4 Servings

## TUCSON COMPANY GROWS MUSHROOM THAT TASTES LIKE BACON

http://www.freshplaza.com/, Nov. 30, 2016

A mushroom that captures the deliciousness of bacon? That's exactly what Sonoran Mushroom Company LLC has recently introduced into the marketplace.

"We have some vegans in the family and we started thinking about how it would be good to have a meat alternative that tastes decent. So we started kicking around the idea of making a mushroom that tastes like bacon," says John Jacobs of the Tucson, Ariz-based company. So Sonoran began experimenting by growing multiple strains of mushrooms and inoculating them to produce the pink fungi that tastes like bacon.

It's a tricky process though, growing mushrooms in the dry desert climate of Tucson. "The biggest challenge is controlling the climate, especially in the summers when we reach 110 degrees and have humidity levels that are extremely low. Mushrooms love moisture and humidity to grow," Jacobs says.

While for now Sonoran is producing approximately 1,000 lb a month of the mushroom out of its 3,000 square-foot facility, growth plans are in place. By summer of 2017, Sonoran would like to grow an extra 10,000–14,000 out of a 10,000 square-foot-facility currently being built and by 2018, out of a 30,000 square-foot facility. "Right now everything we grow is pretty much presold to the Tucson market via a dozen or so restaurants, some smaller grocery stores, and a farmer's market," he says. "By next summer, we'll sell to Phoenix, and by 2018, we'd like to expand selling to the East Coast and possibly the northwest."

Meanwhile Sonoran is also experimenting with producing another mushroom meat alternative: a mushroom that tastes like fried chicken.




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