



NEWSLETTER OF THE INTERNATIONAL SOCIETY FOR MUSHROOM SCIENCE

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Mushrooms International is the Newsletter of the International Society for Mushroom Science and is published 4 times a year. It aims to include news and views from around the world (concerning mushroom biology, business, trade and growing practices) and a list of forthcoming events. We welcome articles, news items and suggestions for topics of general interest to our readers.

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MEMBERSHIP:

The International Society for Mushroom Science (ISMS) has an open membership policy. Any individual person wishing to join should send a cheque for €45 (euros) to the Treasurer at the address on the last page.

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EDITORIAL - NEED TO WORK TOGETHER

The impending move, and possible down-sizing, of the world famous Dutch Mushroom Research Centre from Hoorst to its new location at Wageningen is yet another example of economic and political pressures reducing the provision of government funded research and development.

These pressures and reductions are particularly evident in so-called developed countries where survival of valuable and long established facilities is now often dependent on funding assistance from non-government sources.

Meanwhile, governments such as China, India, etc., continue to invest in R & D which is essential for the development for their edible fungi industries. Of course, many commercial companies are undertaking R & D to support development of their products and to identify new opportunities.

In this world of a continually changing R & D environment there must surely be a great opportunity for ISMS to play a lead role in facilitating co-operative and jointly funded projects involving scientists and facilities from around the world.

Tony and Frances Biggs

**DEADLINE FOR SUBMISSION OF ARTICLES
FOR ISSUE 106 : 31st January 2007.
ARTICLES SHOULD BE SENT TO:
tfbiggs@pacific.net.au**

**From the President's Desk**

First, my apologies for the delay in getting this edition of MI out to you, and also to the team who put the newsletter together. Everyone else had their jobs done by the deadline – it's this column that was holding up the works.

There's been a lot happening around the mushroom world so here's an overview from an ISMS perspective.

Second International Spent Mushroom Substrate Symposium

The 2nd International Spent Mushroom Substrate Symposium was held September 17-20, 2006 in Philadelphia PA, USA. The symposium was organized by Pennsylvania State University, American Mushroom Institute (AMI) and the International Society

of Mushroom Science (ISMS).

Symposium Convenor, Dr David Beyer, sent the following note following the event. "SMS symposium went very well, decent attendance, and those who attended stayed! Can't call it "spent" or "substrate" anymore, most of the group wants to call it "Mushroom Compost", more appealing to the market audience. It was a tense moment when voting on a new name, kind of like voting on whether Pluto is a planet or not."

Congratulations to David and to Laura Phelps, CEO at AMI who worked tirelessly in putting this successful symposium together. ISMS provided scholarships to support the attendance of several scientists selected by the organizing committee. It was pleasing to note that the papers presented by the scholarship winners contributed significantly to the symposium program and confirmed the value of the ISMS investment. Proceedings will be available for sale from AMI soon. Contact ami@mwmlaw.com for further information.



Australian Diagnostic Workshop

The Australian Mushroom Growers' Association (AMGA) recently sponsored a workshop on mushroom diagnostics as part of a research project that the Australian industry is currently funding to provide a state-of-the-art diagnostic service.

AMGA invited Dr Helen Grogan (Ireland/UK), Dr Anton Sonnenberg (Netherlands), Dr Pete Romaine (USA), and Dr Linda Meyer (South Africa) to workshop with our research team of Dr Sarah Dodd and Ruth Butler (NZ), Dr Brendan Rodoni, Dr Alan Clift and Judy Allan (Aust) to discuss the latest diagnostic research, and plan our project through to 2009.

The workshop was a great success and the level of collaboration during the event, and proposed for the future, was extremely exciting. The research work in each country is, and will continue to occur independently (funding and operationally). However, the sharing of

individual results will enable the availability of services to the scientist's respective industries to occur infinitely quicker and more efficiently than otherwise possible, if at all.

Second International Mushroom Cooking Competition

The 2nd International Mushroom Cooking Competition was held 6-8 September in Beijing, China. ISMS is a co-sponsor of this event. There was a cast of hundreds at the competition with nearly as many media representatives on hand to witness some truly creative and competitive cooking. This increasingly prominent event made the China TV evening news and was reported by national and local press, radio, TV and specialist magazines.

The PR value of this event is immense and it is a credit to Mr Gu Erxiong, Mr Li Shuping and their team of organizers at the Chinese Edible Fungi Association. They are seeking to increase demand for mushrooms via the "free" positive messages about mushrooms that are delivered to consumers by this newsworthy event.

The benefits are not limited to the Chinese industry. AMGA again sponsored a chef from Australia, Dominic Egger, to compete in the competition and was able to generate significant PR about mushrooms in our local media via his participation in Beijing. His winning of a gold medal will add another opportunity to interest the media Downunder.

I will be writing to ISMS corporate members to avail themselves of this inexpensive PR opportunity next year and encourage them to sponsor a chef from their country to compete in the 2007 event. If there is enough room, I will include some photos of this stunning event in the next edition of MI. Some of the dishes will blow your mind!

Mushroom Days 2006

The 2006 Mushroom Days in Den Bosch in the Netherlands in May/June was another exciting industry event. ISMS was graciously provided with a space at the exhibit by the organizers and our friends at ZLTO, to promote the 2008 Congress in Capetown. We also sought to create a greater awareness of ISMS and its role of supporting science and scientists that underpin the world mushroom industry. It was an extremely worthwhile exercise and led to some very important discussions regarding ISMS that I will share with you in the not too distant future.

Mushroom Days 2009

One important issue that was resolved during this year's event was the timing of future ISMS Congresses and Mushroom Days. Organizers for the ISMS Congress in Maastricht in 2000 collaborated with organizers of Mushroom Days to have both events coincide. For those of you who attended Maastricht, the success of the event for both organizers and delegates vindicated the smart collaboration. Subsequently there has been a potential clash of the events every four years.

The Mushroom Days organizers are to be congratulated on a decision to fix the scheduling problem by proposing their event in off years to the ISMS Congress. Consequently, the next Mushrooms Days is planned for 2009. This means we should have an absolutely tremendous showcase of the all the world's major mushroom industry suppliers at the ISMS Congress in Capetown.

North American Mushroom Conference

The 19th North American Mushroom Conference will be held on February 18-20, 2007 at the Sheraton Hotel and Marina in San Diego, California, USA. The program is still being finalized but details can be found at www.americanmushroom.org/namc19/information.htm

Laura Phelps has asked to advise any international mushroom industry CEO's who will be attending the NAMC that a world CEO's meeting is being planned in conjunction with the conference. Details will be advised in due course.

2008 ISMS Congress Papers - First Call

A first call for papers for the 17th ISMS International Congress in Capetown was issued by Congress organizers recently. Scientists from all disciplines from around the world whose research or development work has application to the mushroom industry are encouraged to send an abstract to organizers by 15 June 2007.

Those who missed the first call notice can contact ISMS Secretary, Martmari van Greuning secretary@isms.biz for a copy or it will shortly be on the ISMS website (www.isms.biz).

2012 ISMS Congress – Expressions of Interest

ISMS Corporate members have been asked for expressions of interest to host the 2012 ISMS Congress. Only one member has responded so far. The Executive Committee would like to hear from any corporate member who would like to be considered to host the 2012 event. Exco will discuss the matter at its pre-Christmas teleconference so please send an email as soon as possible.

African Conference

The 1st All-Africa Scientific Conference On Edible and Medicinal Mushrooms is just about underway. ISMS was pleased to be able to lend financial support to organizers through scholarships to assist scientists selected by the committee to attend the conference. Dr. Deo.Olila, Chairman of the Organising Committee, sent a note to ISMS recently regarding the scholarship money. An excerpt from the email reflects the importance of this type of financial support.

“The committee has selected nine worthy applicants. We have their abstracts. I will send a copy of the abstract book to you; it is coming out of the press today. I would like to thank you once again for the generous support. This has gone a very long way in assisting us here.”

Mushroom science is alive on all continents with media and general interest in our product and its benefits to consumers escalating daily all over the world. Lets keep the “pedal to the metal”.

ISMS in Poland

The Polish mushroom industry has indicated it is keen to become the newest corporate member of ISMS. Following a presentation to key players in the industry last month that highlighted the important role ISMS plays in underpinning the development of the mushroom category around the world, the audience requested the convenor, Dr Krystian Szudyga, to seek membership details from ISMS with a view to joining asap.

The Polish industry is booming and those present at the meeting understood the need to protect their assets and grow their businesses through science.

Till next time,

Greg Seymour
President

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OFFICER'S PROFILE

Vice President Mr Gu Erxiong



Mr. Gu Erxiong was born in Zhejiang Fenhua and graduated in 1964 from Hebei Agricultural University with a major in farming.

After graduation Mr. Gu Erxiong worked as a technician at a People's commune for ten years. During that time, he joined farmers working in their fields, helping them to solve problems they faced during harvest time. He led by personal example and also popularized a new planting technique which helped farmers increase their output.

After leaving the People's commune Mr. Gu Erxiong set up a fertilizer plant, which he managed for eight years. He used his knowledge from school and experience from working in the countryside to create an efficient and economically viable chemical fertilizer. It made a significant contribution to the economic development of the countryside, increasing income and raising agricultural production. He is honored as producing one of the ten red flag nitrogenous fertilizers in China. Because of his outstanding achievement, he was selected as the mayor and clerk in Qin Huangdao.

In 1991, he was selected as Vice-Director General in charge of Agriculture in Hebei province. During this period, he made a large contribution, with painstaking effort for the province's agricultural development. In 1995, Mr. Gu Erxiong was named as council's vice-dean of All China Federation of Supply and Marketing Cooperatives. He was responsible for the management of fertilizer distribution in China. His careful research led to stabilization of the fertilizer distribution system, ensuring the orderly supply of fertilizer. This hastened important policy measures for agricultural production, and drove some means for production's normal ordered circulation and supplementation. He has made an excellent contribution in Agriculture and China's economic development.

Then he worked as President of China Edible Fungi Association, in order to integrate Chinese mushroom production, selling, investigation and creation. Mr. Gu Erxiong did a lot of work for the Association, and was selected as the Vice-President of International Society for Mushroom Science. China has a large mushroom industry, and with his active involvement, he has played more and more of an important role for the world mushroom industry.

At present, Mr. Gu Erxiong is also the Member of Chinese People Political Consultative Conference Committee; Honorary President of China Edible Fungi Association; General Secretary of the Promotion Center for Emergency Assistance Ministry of Civil Affairs, PR China.

His daily life is busy with his duties, and his variety of interests. He practices his favorite interest, calligraphy, in his spare time.

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MUSHROOM CULTIVATION IN EGYPT

Food of the Gods Down the Nile Valley

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This article is dedicated to Mirette and her brothers Amged and Andrew

From ancient times man has been interested in mushrooms. The Romans referred to mushrooms as 'food of the gods' and the Greeks thought mushrooms provided strength for warriors in battles. The pharaohs of ancient Egypt prized mushrooms as a delicacy. According to Egyptian hieroglyphics (4600 years ago), mushrooms were the plant of immortality. The delicious flavor of mushrooms intrigued the pharaohs of ancient Egypt so much that they decreed that mushrooms were food for royalty and that no commoner could ever touch them. In the ancient Egyptian allegory, mushrooms were such a symbol of power that they were cultivated by the pharaohs and their priests (Figure 1). The deity Khnumu filled the crown with barley before giving them to an Egyptian priest who incubated it in a store room.]



Figure 1. Artist's self-impression on mushroom cultivation back in ancient Egypt

It is strange that even though mushrooms must have been known to very early civilizations, we have no evidence from Sumerian, Babylonian or even biblical sources that cite mushrooms. However, it has been hypothesized that the manna found in the Christian bible may have been a kind of mushroom sent by God to feed Israelites during their stay in the desert (Figure 2). After all, the usefulness of a plant was measured only by whether or not it was edible or had a medicinal purpose. The "oldest" representations of "mushrooms" in the world are in the Sahara Desert that was produced by wind and natural means (Figure 3).

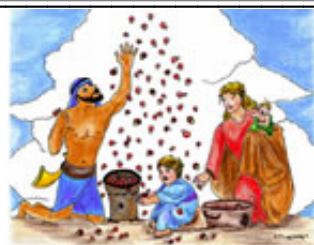


Figure 2. God provided food to the people of Israel in the form of manna during their Exodus from Egypt. Some scientists speculated that the manna may be a type of mushroom.



Figure 3. Rock carved by the wind in the Sahara Desert resembles mushrooms. ©Shunya 2006 – <http://www.shunya.net>

Hippocrates, born around 460 BC, wrote of using mushrooms in his practice of medicine, but gave no details of how he used them. About 100 years later Theophrastus, wrote the first scientific description of a mushroom that he named *Historia plantarum*. He classified this species as a plant because it did not move, even though it didn't have roots, stems, leaves, or fruit.

Mushrooms are essentially the 'fruit' of some members of the kingdom fungi. Like the apple is to an apple tree, a mushroom is to a fungus. Fungi are eukaryotic, have no light requirements, and are heterotrophic (acquire energy from organic matter). This distinguishes them from green plants, which are autotrophic (produce their own energy using the sun's rays). Along with bacteria, fungi are the key decomposers of Earth's dead organic matter (e.g. dead trees, leaves, dead animals, etc.). Without these powerful decomposers, the earth would be completely covered with this organic matter. Some fungi produce edible fruit or mushrooms. There are approximately 250 species of mushrooms that are considered to be good edibles, but only a handful of these are commercially cultivated. During the past few decades, the cultivation of mushrooms has spread world wide (Chang and Miles, 1982). Total mushroom production world wide has increased more than 18 fold in the last 32 years, from about 350,000 metric tons in 1965 to about 6,160,800 metric tons in 1997 (Chang, 1999).

Since cultivated mushrooms can grow on agricultural and industrial wastes they constitute a source for not only degrading such wastes, but also to provide a source of food for human consumption. Mushrooms have been used medicinally for hundreds of years, mainly in eastern medicine. The Chinese, have used dried mushrooms as diuretics and some species have recently been getting attention as carcinostatic substances (Mizuno, 1995; Waser and Weis, 1999; Chihara, 1970, Chihara, 1989; Daba, 1998; Daba and Ezeronye, 2003). Starting in the 1970's, Japanese researchers found that antitumor compounds in some mushroom species were polysaccharides whose basic structure is a beta glucan. These polysaccharides were different from the usual carcinostatic drugs and their mode of action seems to be based on the stimulation of the immune system.

The following is a report of research carried out over 2 years (in Egypt and as a Fullbright Scholar at the University of Wisconsin-La Crosse with Dr. Thomas Volk) to identify suitable conditions for growing mushrooms in Egypt and elucidating the anti-cancer effect of polysaccharides isolated from these cultivated mushrooms. A fair degree of success was obtained for growing the oyster mushroom, *Pleurotus*, in Egypt. The mode of production has been established and cultivation is presently being carried out on a small scale in mushroom growing rooms. The author's would be pleased to receive comments and reprints from other research workers about their recent experiences with cultivation of oyster mushroom.

The cultivation of mushroom in modern Egypt

Egypt is located in the northeastern corner of Africa where much of the land is part of the great desert, but the Nile River flows through Egypt making portions of the land very fertile, especially near the Nile delta (Figure 4). Mushroom growing is concentrated in the delta region.



Figure 4. The Nile delta is the most fertile part of Egypt and is also where the majority of mushroom cultivation takes place. (From <http://mbarron.net>)

A considerable number of mushrooms are edible, but remember that you should never eat a mushroom unless you are sure of its identification and edibility. In Egypt, only a minute portion of mushrooms are for sale in shops and markets, and they are always either *Pleurotus* or *Agaricus* mushrooms. The Egyptian people as a whole are wary of mushrooms and generally most will only eat commercially cultivated mushrooms. Therefore only the common species like *Pleurotus*, *Volvariella*, and *Agaricus* mushrooms are cultivated in Egypt.

Mushroom cultivation is an exercise in applied ecology and not a pure culture process, except for the initial production of spawn. Mushroom spawn is prepared in special laboratories; it is made by inoculating a pure culture of the fungus into sterilized grain. Because spawn making is so critical to successful cultivation, companies that specialize in spawn production have been established. Rye and millet grains are generally used for commercial spawn making, but theoretically any type of grain that does not become soft upon boiling may be used.

The primary substrate used for *Pleurotus* spp. production in Egypt is chopped rice straw (3-5 cm) because of availability. Other suitable substrates include wheat straw and cottonseed hulls. At the Mushroom Research Center (Mubarak City for Scientific Research, Egypt) the substrate is filled into galvanized metal boxes with perforated floors. The substrate is subjected to pasteurization for 1 hour in order to kill any competing microorganisms and the pH is adjusted to approximately 7.5. The dry desert climate may actually be beneficial for cultivation because of the reduced risk of airborne disease contamination. Spawn is transferred to polyethylene bags containing the sterilized rice straw substrate and incubated for 21 days at 27°C. Humidity is also regulated to approximately 80% and the bags were carefully spaced out for airflow. Humidity and temperature are controlled by using a spraying system that emits a mist of water and a cooling unit consisting of a fan and evaporative pads.

During spawn run, the growing hyphae (vegetative growth form of fungi) colonize the substrate to form the base for the production of mushrooms. Increasing the amount of spawn used has resulted in increased yield; the increased level of spawn would provide more energy for mycelial growth. After completion of spawn run the bags are exposed to light by cutting holes of about 2 cm in diameter. Tiny knots of mycelia are formed, which later differentiate into tiny mushroom structures called initials or primordia. The initials lengthen and enlarge to form mature mushrooms after 7-10 days of exposure to light (fig 5. A,B). A study of the effect of temperature on the mycelial growth of the *Pleurotus* showed that the optimum temperature for growth is 25°C. Development intensity decreases by lowering the temperature and stops at 10°C, while the heat tolerance reached its maximum at 40°C. In describing the ecology and industrial production of *P. osteratus*, Zadrazil (1976, 1978) established that the spread of mycelial growth was related to temperature of the substrate. At temperatures below 15°C the growth rate was linear, and from 15-20°C there was an acceleration of growth which dropped off between 20°C and 30°C. Mycelial development forms the vegetative growth phase of mushroom growing, and temperature is highly important since it affects the growth and adaptability as well as quantity and quality of fruiting bodies produced. Production of mushroom mycelium by

submerged culture process.

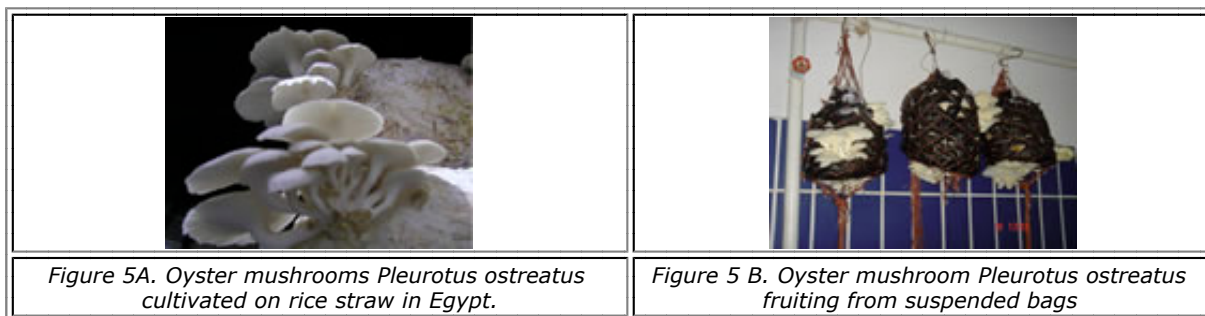


Figure 5A. Oyster mushrooms *Pleurotus ostreatus* cultivated on rice straw in Egypt.

Figure 5 B. Oyster mushroom *Pleurotus ostreatus* fruiting from suspended bags

The growth of an edible mushroom is a lengthy and complex process involving the use of lignocellulosic wastes, such as straws followed by a long cultivation period. The potential of mushrooms as fungal protein and as a source of medicinal compounds make the production of mycelium in submerged liquid culture a most attractive prospect. Submerged culture has been used extensively for the production of industrial and economical important compounds such as citric acid by *Aspergillus niger* and penicillin by *Penicillium chrysogenum*. *Pleurotus ostreatus* mushrooms can be grown in submerged culture (Figure 6), using glucose as a medium for growing the mushroom. In this fashion, large amounts of desired compounds can be produced from the mycelial pellets.



Figure 6. (A) Submerged culture of *Pleurotus ostreatus* mycelia and (B) a microscopic view of the mycelia

Mushroom as a Nutritious Food:

In recent years *Pleurotus* has gained importance as an edible mushroom in Egypt. *Pleurotus* species thrive over a wide range of subtropical climates and are white rot fungi, which are a group of fungi that can degrade both the components of wood-lignin and cellulose. Having the ability to produce extensive hydrolyzing and oxidizing enzymes, these mushrooms yield the possibility of successful cultivation on a variety of cheap substrates such as rice straw (El Katan, 1991).

One may consume mushrooms for their palatability and their nutritive value. Palatability is obviously subjective, but mushrooms have a unique texture and flavor that is not found in other foods. Mushrooms are actually quite healthy and have an amino acid profile that rivals beans. Most of the research into the nutritive value of mushrooms has been done with *Agaricus* species and there is limited information available on the oyster mushroom, but efforts are being made in that direction. While most information is based on chemical analysis, it is unjustified to conclude anything definite unless extensive animal feeding trials are conducted. While discussing the nutritive value of mushroom Crisan and Sand (1978) showed the position of mushrooms among various food stuffs (meats, legumes, and vegetables). According to them, the most nutritive mushrooms have a high essential amino acid index, almost equal to meats and milk. On the other hand, mushrooms showing a lower nutritive value are comparable to some common vegetables, i.e. carrots and tomatoes. If the nutritional value of mushrooms is taken into consideration, they rank above all vegetables and legumes, with soy beans being an exception. It is therefore desirable to cultivate species of mushrooms which have high protein contents.

The chemical composition of *Pleurotus ostreatus* fruiting bodies produced on rice straw substrate shows that they have a high moisture content. Carbohydrates represent the major foodstuff constituent in *Pleurotus* species ranging from 50 to 80%.

Medicinal Properties of Mushrooms:

The old proverb says medicines and food result from the same root. Mushrooms prove this to be true and are one of the foods that are favorable to current health conscience people. Mushrooms have been used as medicinal materials for hundreds of years. Only relatively recently have mushrooms received attention as an anticancer agent. However, the origin of efficacy of these medicinal mushrooms has not been identified.

Starting in the 1970s, Japanese researchers found that antitumour components in some mushroom species were polysaccharide in nature. Polysaccharides are different from the commonly used chemotherapy agents and their carcinostatic effects seem to be based on the stimulation of the immune system. From these findings, development of medicines from mushrooms has drawn public attention.




Recent studies have shown that the polysaccharides occur mostly as glucans some of which are linked by (1-3), (1-6) glycosidic bonds. Because of their chemistry, polysaccharides have the potential for great structural viability which improves chances that they will interact with complex cell systems. The available evidence indicates that the anticarcinogenic properties of these polysaccharides were attributed to enhancement of the numbers and or functions of macrophages, NK cells, and subsets of T-cells that modulate innate and adaptive immunity (Chihara, 1994).

Recently, a demonstration of an *in vivo* anticancer effect of oyster mushroom extracts was attempted. Polysaccharides were isolated from *Pleurotus ostreatus* (both fruiting bodies and mycelia) and had a high molecular weight. These compounds showed an increase in lifespan and a 80% decrease in tumor size by 80% in Swiss albino mice that were transplanted with solid carcinoma.

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About the Authors

	<p>Ayman Sammy Daba is a Fulbright Scholar working under the supervision of Dr. Thomas J. Volk at the University of Wisconsin-La Crosse He obtained his Ph.D in Biochemistry at the University of Cairo, Egypt with thesis entitled, "Biochemical studies on the effect of oyster mushrooms and its extract in hypercholesterolemic hamsters." His work focused on cultivation of mushrooms and recycling of agricultural and industrial wastes. He has a special interest in continuous cultures, fungal physiology, extraction and purification of bioactive compounds from wild and edible fungi mainly anticancer compounds.</p>
	<p>Maria Lee is a student pursuing her Master's degree at University of Wisconsin-La Crosse ". The title of her research work is "Proteomic profiling of <i>Penicillium marneffe</i>, an opportunistic fungus affecting immunocompromised patients in South East Asia".</p>
	<p>Jonathan Palmer recently received his Master's degree in August 2006 from the University of Wisconsin-La Crosse under the tutelage of Dr. Thomas Volk with his thesis entitled, "Morphological and molecular characterization of mycorrhizal fungi associated with a disjunct stand of American chestnut (<i>Castanea dentata</i>) in Wisconsin." .</p>

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Third Workshop for Compost Producers - Helvoirt, Netherlands

Report by David M. Beyer, Associate Professor, The Pennsylvania State University.

The 3rd Compost Workshop held in late May was hosted by PPO, Christiaens Group, C-Point and AdVisie. The workshop was opened by the Chair, Robert van Loo from PPO Paddestoelen, outlining the research organization he directs. The research conducted there covers basic compost science, spawn breeding, virus research and alternatives to chemicals for pest control. The goals of the workshop were outlined as:

- Sharing information among researchers and commercial composters
- Interactive discussions on all aspects of composting
- Definition of our knowledge gaps for research opportunities
- Discussion of the differences and/or similarities in Phase I through Phase III systems.

The first speaker, Gerben Straasma, discussed the various alternative uses for compost ingredients that contain lignocellulose and cellulose. The wide variety of potentially more profitable uses for straw and straw-bedded horse manure is amazingly broad. General agriculture feeding materials, paper-pulp uses, potential fuel sources and even building materials are all developing uses for compost bulk ingredients. An example was the 60,000 hectares of wheat planted in Germany just for the production of ethanol fuels, this should be disconcerting to growers because of the potential value of straw and what that would do to supply and the cost of making compost. Some important points of the degradation of lignin and cellulose by microbes and mushrooms were reviewed.

I was the next speaker, charged with a discussion of quality and characteristics of bulk ingredients for mushroom composting and nutrition. A brief description of the different straw and grasses used and their chemical and physical characteristics were presented. The importance of Phase I chemical reactions on the chemical constituents in straw and hay were related to mushroom nutrition and examples of other possible ingredients used or tested were presented. The research conducted at Penn State on Kenaf Core, a by-product of a hemp plant used in fiber production, served as an example of the importance of Pentosans, an important carbohydrate found in corn cobs, sought out by chemical companies, but important for mushroom nutrition. A farm using straight dairy manure (no straw) to grow mushrooms suggested that materials cows cannot digest are the type of lignin-nitrogen compounds that the mushroom can use.

Jan Gielen, from C Point, gave a very descriptive talk on important environmental parameters for maintaining optimum compost conditions and mushroom quality. He described the drying processes where heat release helps production and moisture release helps mushroom quality. Critical control of heat, moisture and carbon dioxide (HMC) measuring systems were important for all tunnels and monitoring these variables can be related to efficiency and quality of the compost.

A discussion session followed on the quality to production chain, methods and criteria to assess and control raw materials and compost quality. It was the group's consensus that feedback from the compost and mushroom customers was the most important factor. Input criteria include people, goody water, structure, laboratory data, sensory and sampling techniques, etc. Outputs include laboratory results, temperature, oxygen, moisture and discussions with internal customers and many other subjective and objective observations. Feedback on compost could include growers results, mushroom quality and shelf life, shrink, advice to growers and again most importantly, feedback from customers.

Con Hermans, of AdVisie, covered a very difficult topic - "Troubleshooting a Compost Yard". Key points included: to find mistakes one has to work systematically; be critical; compare; and make connections. He suggested there are three types of mistakes made on compost yards: 'conscious', 'unexpected' and 'unconscious'. Details in the construction and maintenance of tunnel operations are critical for preventing or correcting problems. Infections can occur inside or between tunnels, they can occur from Phase II to Phase III tunnels, in Phase III tunnels, or anytime thereafter when the compost is exposed. Growers must use feedback, checklists, graphics and most importantly, control urges to make changes or try new procedures.

The "Law of Limiting Factors" was theme of Gerben Straatsma's next presentation. When mushroom yield is limited by the lack of a particular nutrient and that nutrient is then provided, another nutrient becomes the limiting factor or the "weakest link" in the total yield. Analysis of the compost throughout the cropping cycle and of the mushroom fruit bodies during the different breaks has suggested that phosphorous and magnesium may be limiting factors in mushroom yield. However, he was quick to note that this data must be carefully interpreted because of the many variables that can occur in sampling and analysis. He also suggested that water is probably a more important limiting factor in mushroom yield and quality.

Jos Buth of C Point gave an overview of Phase III compost, covering both the benefits and pitfalls of these systems. The obvious benefits include a reduced volume of compost to handle, more growing cycles for production rooms each year, more homogeneity of the compost, less energy required and more efficiency from the composts and farms. Limitations are the need for very selective compost, very strict hygiene requirements and depending on cooling capacity, possible limitation for the use of supplementation. He described the key points for construction of tunnels and loading and emptying hallways. These points include an over-pressurized air handling system with efficient filtration. Fan capacity is also a critical component and under sizing the fan can cause major cultural problems.

The last discussion session was on Avian influenza virus and its impact on poultry manure supplies around the world. Breakout groups discussed their previous experiences and also what they either have tried or would try to reduce or eliminate poultry manure from a compost formula. Compost with synthetic nitrogen, ammonium sulfate, ammonium nitrate and or urea has been tried or used at some farms around the world. Other "organic" sources of nitrogen were considered as alternatives, however cost and availability was the major concern. It was pointed out that if all producers were simultaneously hit by a shortage of poultry manure, cost would not be a concern to compost producers, but would impact on customers and may create difficult times for growers. Other feedlot manures could be used and some European composters have already successfully used pig manure in a formula. It was mentioned that maybe the ISMS could play a role in disseminating information and or alternative formulations to growers worldwide. Research facilities around the world could concentrate on this problem, but the question of who would fund this research needs to be addressed.

The workshop was well organized and run, thanks to Ms. Els Josten, who was ever present and efficient in getting things done. There was plenty of time for informal discussions between suppliers, growers and researchers which helps all to prioritize the challenges of our mushroom community. It was interesting to see the difference in topics from the workshop I attended 4 years ago, when odors were a major issue and this workshop, where the subject was mentioned but not considered a

challenge anymore. The consensus of the workshop attendees was that this type of meeting is important, but a broader scope to the organization of these meeting may bring different visions for the program. All agreed that many thanks should be given to the organizers who have the foresight to put together this workshop and provide a venue for the productive discussion it stimulated.

BOOK REVIEW

Frontiers in Mushroom Biotechnology

by R.D.Rai, R.C.Upadhyay and S.R.Sharma

National Research Centre for Mushrooms, Chambaghat, Solan 173213, Himachal Pradesh, India.

Email<nrcmushroom@rediffmail.com>.

The Indian Council of Agricultural Research (ICAR) sponsors refresher courses for scientists and teachers involved with mushroom production.

A course on Emerging Areas of Mushroom Research and Production was held at the National Research Centre for Mushrooms (NRCM), Solan in 2003. One of the important mandates of NRCM is to train scientists, teachers and students in mushroom science and technology.

The 2003 refresher course was attended by scientific personnel from institutes and state agricultural universities throughout India. Presentations were given by Indian experts in the form of reviews of their particular specialities.

These reviews have been compiled into one volume, published in 2005, consisting of 38 individual presentations. The contents primarily deal with *Agaricus bisporus* but several presentations are devoted to other edible fungi, including *Pleurotus*, *Volvariella*, *Calocybe*, *Leustinus* and *Auricularia*.

Frontiers in Mushroom Biotechnology is a 430 page volume with extensive coverage of all aspects of *Agaricus* production and marketing. It provides an insight into the development of the Indian industry and mushroom production from a uniquely Indian perspective.

Footnote:

Attempts through email and facsimile with NRCM to obtain details, such as price, availability, etc, have been unsuccessful.

ISMS members may be able to provide this information to the Newsletter Editor.

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Coming Events

2007

February 18-20: 19th NAMC, Sheraton San Diego Hotel & Marina.

<www.americanmushroom.org>>

September 23-27th: 4th International Medicinal Mushroom Conference, Ljubljana, Slovenia.

November: 1st International Symposium of Edible and Medicinal Mushrooms and 2nd Meeting in the Biology of Edible and Medicinal Mushrooms, Bahia Blanca, Argentina.

2008

May 21-24: 17th International Congress on the Science and Cultivation of Edible and Medicinal Fungi, Cape Town, S. Africa. <www.mushroominfo.co.za>.

4th International Medicinal Mushroom Conference (IMMC4) in Ljubljana, Slovenia

The 4th International Medicinal Mushroom Conference (IMMC4) will be held in Ljubljana, Slovenia between the 23rd and 27th of

September, 2007. Slovenia, a member state of the European Union, will host it in its historical capital Ljubljana with a tradition of memorable hospitality. IMMC4 would provide a creative and informative event for mycologists and mycology students, medical doctors, immunologists, contagious disease specialists, naturopaths, ecologists, bioremediators and all those who are interested in studying and discussing the most current research on the biological properties of mushrooms.

We would like to invite you to participate in this event. Please visit the IMMC4 website <http://www.immc4.si> for further information.

On behalf of the organizing committee,

Prof. Dr. Franc Pohleven



ISMS
 Cape Town 2008 **CAPE TOWN INTERNATIONAL CONVENTION CENTRE, CAPE TOWN, SOUTH AFRICA**

Wednesday 21 to Saturday 24 May 2008

LOCATION:

Cape Town, South Africa, has been voted one of the top international destinations in the world and is filled with natural beauty and a rich variety of stimulating activities. It is blessed to have South Africa's top six tourist attractions within one hour's drive from the city centre: The Victoria & Alfred Waterfront, Table Mountain, Cape Point, the Winelands, Kirstenbosch Botanical Gardens and Robben Island.

VENUE:

The Cape Town International Convention Centre (CTICC) was opened in 2003 and is in Cape Town's city centre, beneath Table Mountain, and only a 20 minute drive from the International Airport. Major hotels are within walking distance to the CTICC.

PROGRAMME:

The academic programme will be held over the four day period, with Farm Walks in the Cape Town area.

TRADE EXHIBITION:

There will be a trade exhibition at the conference. Any interested exhibitors are to please contact Tanya Schmidt at Eastern Sun events: tanya@easternsun.co.za.

SOCIAL EVENTS:

An excellent social programme showcasing the quality of life and beautiful surroundings of the city are planned.

- Winelands theme – dinner on a wine farm
- Cape Malay Street Party
- Cocktails at the Victoria and Alfred
- Waterfront

PRE- AND POST – TOURS:

Delegates can take the opportunity of staying in South Africa a little longer to explore the unique ura of Africa. Examples of pre- and post- tours re:

- Day tours in and around Cape Town
- Wild Flower viewing tours to the northern parts of South Africa.
- Whale watching tours
- Tours to the spectacular Garden Route and Route 62 (which incorporates the world's longest wine route)
- Wildlife excursions to safari lodges

ACCOMPANYING PERSONS TOURS:

Tours will be arranged for accompanying persons that will showcase the wonderful city of Cape Town and environs.

ORGANISING COMMITTEE:

Roddy Cairns (MD, Denny Mushrooms)
 Ross Richardson (MD, Highveld Mushrooms)
 Dr Martmari van Greuning (Country Manager, Sylvan)

CONFERENCE ORGANISERS

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 E-mail: info@easternsun.co.za
 Website: <http://www.mushroominfo.co.za/>

2ND INTERNATIONAL SPENT MUSHROOM SUBSTRATE SYMPOSIUM

September 17-20, 2006

<http://www.ppath.cas.psu.edu/SMS-Symposium/Symposium.htm>

Hotel

(You are responsible for your own hotel reservations)
 Best Western-Concordville Route 322 & US Route 1 Concordville, PA 19331
 Tel: 610/358-9400 Fax: 610/358-9381 Website: www.concordville.com
 Room rate: \$105/night (Room rate includes a full hot and continental breakfast)
 Reservations: Call 610/358-9400 and ask for the "Spent Mushroom Symposium" room block
 *You must call this reservation number to guarantee the discounted room rate.
 Reservations must be made by Friday, July 14, 2006

Meals

Lunch provided on Monday, Tuesday and Wednesday. All other meals are on your own. The Best Western offers free breakfast for all guests. There is a restaurant in the hotel in addition to several within a few minutes drive. A hotel shuttle is provided Monday-Thursday from 5:00 p.m. – 10:00 p.m. within a 10 minutes radius.

Transportation

Philadelphia Airport is the closest to Concordville.
 Airport Shuttle Services:
 Rainbow Shuttle-610/696-6060
 Eagle Limo-302/325-4200
 Please call to make your arrangements.
 Car Rental:
 Hertz-610/558-4730
 Travel Arrangements
 You are responsible for all of your own travel arrangements. For international travel assistance or advice you may visit the U.S. State Department website <http://www.state.gov/>. Please contact AMI if you will need an invitation letter.

Websites

SMS Symposium- <http://www.ppath.cas.psu.edu/SMS-Symposium/Symposium.htm>
 Best Western-Concordville- www.concordville.com

For more information, contact: AMI at 202/842-4344 or ami@mwmlaw.com
 Penn State at 814/863-4967 or kpaley@psu.edu

PAYMENT OF MEMBERSHIP FEES:

Memberships fees can be paid now by electronic bank transfer to the following account:

IBAN: NL28RABO0109770862
 BIC: RABONL2U
 Address: Schouburgplein 13, 5801BV Venray, The Netherlands

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