出國報告（出國類別：兩岸研討會）

第 18 屆國際菌蕈學學術研討會

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摘要（200-300 字）

此次參加第 18 屆國際菌蕈學術研討會，吸收全世界相關蕈菌研究開發的新取向，並瞭解國際間對蕈菌產業投入之現況，新研發技術以及新產品之開發導向。主辦單位由中國農科院、中國食用菌協會、中國食品土畜進出口商會聯合參與，並由中國農業科學院農業資源與農業區劃研究所，北京市通洲區政府承辦。專題演講分別爲中國現階段食用菌產業發展現況與趨勢、食用菌育種新技術及新目標、菌根食用菇類的培養及一些新開發的新興菇菌類、食用菇菌類對人類族群學及其他物種間和食用菇菌類間之相互關係。在分組討論中，其中關於種質資源多樣性涵蓋了非常多的新食用菇菌類資源。食藥用菇菌類產業鏈環緊密連接，正確建立過程與步驟，才能讓整個產業鏈結合完整。

目次

目的

中國從事食用菇菌類栽培已有一段很長的歷史，除此之外，中國生態多樣性高，菌蕈資源相對的豐富，近年來中國投入菌蕈營養及醫學的利用已有豐富的成果。國際菌蕈學會舉辦之國際學術研討會，頗受該領域產業的世界專家學者重視。有緣參加此次（第 18 屆）國際菌蕈學術研討會，吸收全世界相關蕈菌研究開發的新取向，並同時瞭解國際間對蕈菌產業投入之現況，及新研發技術以及新產品之開發導向。更重要的，可以吸收並得知該學術領域之世界最近研究趨勢以及研發能量。職欲利用在本大學開設食用菌生物學、菌蕈學、食用及藥用菌生物科技以及菌蕈學特論等課程，因此，欲利用參加此次國際學術研討會，吸收並彙集最新資訊與教材，用來啓發我國年輕學子，對該學術領域技術研發提升。除此之外，藉助此次會議心得，將相關學術及技術提供業界參考以提升食用菌產業之水準。

過程

國際菌蕈學學術研討會，定期由國際菌蕈科學會(International Society for Mushroom Science，ISMS)召開。本屆（18 屆）國際菌蕈學術研討會主辦單位是由中國農科院、中國食用菌協會、中國食品土畜進出口商會聯合參與。並由中國農業科學院農業資源與農業區劃研究所，北京市通洲區政府承辦。國際菌蕈（菇類）學會(ISMS)成立以來，致力於食用菌學術領域的新進展，促進該科學領域科學研究人員及栽培業者之間的學術及技術交流平台。因此，該學術會議的舉行，對世界食用菌類及新興菌蕈的發展與進步貢獻良多。該學會(ISMS)設有執行委員會，委員來自不同國家，負責歷屆大會的籌備指導工作。

從 1950 年在英國的彼得伯勒召開第一屆國際食用菌大會以來，截至 2012 年底，已經先後在法國、德國、日本、澳大利亞、荷蘭、美國等國家召開了 17 屆國際菌蕈學(食用菌)大會，會議國家及地點如表格 1 所示：

表格 1 ：歷年來舉辦會議之地點及國家

Year	Location	Country/Region
2008	Cape Town	South Africa
2004	Miami	USA
2000	Maastricht	The Netherlands
1995	Oxford	England
1991	Dublin	Ireland
1987	Braunschweig	Germany
1981	Sydney	Australia
1978	Bordeaux	France
1974	Tokyo and Taipei	Japan and Taiwan
1971	London	England
1968	Hamburg	Germany
1965	Wageningen and Amsterdam	The Netherlands
1962	Philadelphia	USA
1959	Copenhagen	Denmark
1956	Paris	France
1953	Gembloux	Belgium
1950	Peterborough	England

本屆(18 屆)國際會議主要內容包括：食用菌產業現狀與發展展望、食藥用菌類生產技術、食藥用菌類營養與健康、食藥用菌類種質資源及其多樣性、食藥用菌類生物化學和分子生物學、食藥用菌類遺傳與育種、及其病蟲害管理與品質控制、市場管理營養與藥用、菌種製作和栽培技術、菌根菌開發與應用。

本屆會議主要對象是以從事食用菇菌類相關研究學者及研究機構，經營食藥用菇菌類相關企業（食品、休閒、通路、研發、生產與製造以及準備菇菌生產開

發之潛在業者、生技業者)。會議地點在北京國際會議中心，會議議程安排如表格 2 所示：

表格 2：研討會議程表

日期	內容
8 月 26 日	現場註冊、報到
8 月 27 日	會議開幕式、主題演講、分組會議
8 月 28 日	分組會議
8 月 29 日	通州專業參訪（參觀實用菌工廠化栽培、菌棒場）
8 月 30 日	分組會議、閉幕式

這次國際會議，由北京農業科學院等單位精心安排，爲世界食藥用菌研究人才及相關業界人士提供良好的交流平台，促進全世界食用菌及藥用菌產業的發展。除此之外，可以透過此機會瞭解目前中國大陸食藥用菌領域之學術發展與技術創新之現況，將此資訊提供政府相關單位參考，並就參加會議心得報告提供學術界及業界參考。

本屆國際會議分成幾項重要議題與分項報告與討論。分項報告與討論前，大會舉行開幕式(Opening Ceremony)及專題演講(Keynote Lectures)。開幕式分別由國際食用菌學會理事長(Mr. Greg Seymour)及主辦國之大會主席—中國農業科學院唐院長(Dr. Huajun Tang)致歡迎詞。ISMS 理事長致歡迎詞時，指出國際食用菌學會已成立多年，累積了非常多的能量與經驗，該學會已在世界各個角落提出了相當多的技術與貢獻，藉由該學會的召開會議，讓全世界從事該領域的學術專家與業者以及相關領域的企業界、社會菁英與消費大眾激發了非常寶貴的思維。

接著是由中國農業科學院唐院長致歡迎詞，唐院長在致詞時，特別指出，中國是一個古老文化的國家，同時也是一個使用食用菌量非常大的國家，除此之外，這幾年中國食用菌的研發技術提升，種質資源豐富，因此帶動了中國食用菌

遺傳研究，栽培、生理以及生物技術的應用。另外，在食用菌之加工處理以及產銷均有長足的發展，而中國及外國專家學者的互動研究及技術合作已奠定了非常雄厚的基礎。他希望全世界的專家學者、業界，可以透過這次國際學術會議的交流平台，進行充分合作與切磋，共同創造對人類福祉的貢獻。

開幕式結束後，即進行四位專家學者專題演講，分別爲中國吉林農業大學李玉院士提出中國現階段食用菌產業發展現況與趨勢（(Present Development Situation and Tendency of Edible Mushroom Industry in China))。在其演講中指出中國每年食用菇類生產已超過 20 億噸，而目前仍然在繼續成長中。目前已有 60 多個品種被栽培利用或食用。而洋菇的現代化栽培是非常重要的方向，因此，可透過這次的機會，向全世界專家學習請益。第二位是由荷蘭的咸已根植物育種系教授（Wageningen UR Plant Breeding）Dr. Anton S.M. Sonnenberg 提出食用菌育種新技術及新目標。Dr. Anton 演講者提出食用菌的育種技術，一直是食用菌產業的關鍵技術，尤其是產量、品質及保鮮儲藏。食用菌之營養價值及生物活性物質等獨特的特性，以及消費者大眾及食品加工利用等需求，提出了研究者及業界的新育種目標思考。除此之外，食用菇菌類能快速分解多種之複雜有機材料，於短時間內能進行高效率之生質能源轉換（biomass）由於這些特性也吸引了很多業界對其應用的興趣，除此之外，食用菇類的變異性伴隨著上述特性，一直是非常重要的研究及擬解決的課題。由於新的科學育種技術投入這些新的育種目標，因此，也促進食用菇類產業轉變成重要作物的機會。第三位是由紐西蘭的松露及食用菇菌類開發公司顧問進行專題演講，其講題爲菌根食用菇類的培養及一些新開發的新興菇菌類。他提及食用菇菌類可分成三個主要群，第一群主要是以在生態中利用植物殘體或動物的廢棄物爲生長基質而形成的菌類；第二群，則是以具有病原性的種類，主要需生於活的植物體或動物；第三群，則以菌根形成方式，共生於是當的寄主植物的根部生長，而菌根食用菇菌特殊的香味和滋味，使該類食用菌之價格向上提升。

第一個菌根食用菇菌栽培成功的例子，是在 19 世紀初期由法國二位專家

Pierre Mauleon 及 Joseph Talon 共同成功開發黑松露。在開發黑松露之栽培過程中，他們發現只要有黑松露感染的植株幼苗，移植到其他區域，仍然會有大量黑松露產生。他們又根據這個成功的方法，在 1970 年代，開發用黑松露孢子感染的植株進行人工栽培測試，一年能生產大量的黑松露。而利用這個方法，也成功的培養 *Rhiopogon rubescens*（shoro）。後來，也成功的在很多菌根食用藥菌類從栽培菌根食用菌類，如：*Lactarius deliciosus*（Saffron milk cap），*Lyophyllum shimeji*（honshimeji）除此之外，事實上還有將近 1000 種以上的菌根食用菇類也在開發中。最近，Hall. et. al, 2007, 2009 的松露奇蹟（Taming the truffle）及 Zambonelli and Bonito, 2012 有關食用菌根菇菌新書亦將出版。

第四位專題演講專家是由美國加州希望城市貝克曼研究所腫瘤細胞生物學系陳博士（Division of Tumor cell Biology, Beckman Research Institute of the city of hope, Duarte, QISA）提出 Protective effect of *Agaricus bisporus* against cancer and metabolic disease，他提出：洋菇是全世界重要的食用菇菌，市場大且潛力無窮。除了可提供食用外，事實上，目前有相當多的研究室找到了非常多的菌蕈化合物，可以保護並對抗各種癌症及代謝瘤。陳博士所領導的團隊目前也發現了洋菇（WBM）等菌類的菌蕈化合物可以抑制乳癌（breast cancer）及前列腺癌（prostate cancer）的細胞發育，從這些研究中，也可以對人類族群學及其他物種間和食用菇菌類間之相互關係。

專題演講後，分別在 8 月 27 日下午四點到六點，8 月 28 日上午八點半到下午五點半以及 8 月 30 日上午八點半到下午三點，分別展開分組專題報告，8 月 26 日上午九點到 8 月 30 日下午四點壁報討論，分組專題報告分成 session Ⅰ：種質資源多樣性(Germplasm Diversity)；session Ⅱ：生化和分子生物學(Biochemistry and Molecular Biology)；session Ⅲ：遺傳和育種(Genetics and Breeding)；session Ⅳ：病害蟲害和品質控制(Disease Pest and Quality Control)；session Ⅴ：市場和商業(Marketing and Business)；session Ⅵ：營養學和醫學的觀點(Nutritional and Medicinal aspects)；session Ⅶ：菌種製作培養和技術(Technology of Cultivation and

spawn-making)。

種質資源多樣性的分組討論中涵蓋了非常多的新食用菇菌類資源，如：Tropical *Agaricus*、Tign-milk mushroom(*Lignosus rhinocerus*)、*Hypsizygus marmoreus*、*Pholiota*、*Tricholoma matsutake*、*Ganoderma*、Chinese Truffle、*Rhizopogon roseola*、*Pinus thunbergii*、*Clavariadelphus sulrfas*; *Tigiatus-Basidiomycota*; *gomphid-phalloid clade* from Pakistan、cvild mushrooms diversity and ethnomyeology in Jammu and Kashmir，India，在這個分組討論中各國專家利用族群遺傳研究分析(Population genetic analysis)遺傳多樣性的概念(Genetic diversity)，菌種製作和菌株多樣性的探討(Spawn-making)，多基因座核甘酸序列分析技術(multilocus sequence typing)，基因條碼分析(Baroding)，寄主植物之反應性(Host plants)，核醣體核酸多型性分析(Intraspacific rDNA-ITS polymorphism)等技術進行種質資源多樣性之研究。

遺傳與育種分組討論中，本次國際會議中涵蓋了百雪菇(Wild ferula mushrooms)，*Volvariella volvacea*，*Agaricus bisporus*，*Auricularia auricula*，*Pleurotus cornucopiae*，*Lentinula edodes*，*Flammulina velutipes*，*Pleurotus ostreatus*，*Ganoderma* strains，*Agrocybe saficacola*，*Pleurotus eryngii* var. *tuoliensis*，在本組分組討論中，世界專家以交配型基因座(mating type locus)進行菌株間之族群結構及生物學特性比較分析，或基因表現的技術探討耐熱性，耐儲藏性等育種技術，或利用單孢篩選技術(single spore crossbreeding)。

心得及建議

真菌學家、地衣專家 David L. Hawsworth 估計，地球上的蕈菌估計爲 140,000 種，目前已知的蕈菌有 14,000 種，根據大型蕈菌種群總數的 50%是可食用的結論評估，已知種類中大約有 7,000 種是可以食用的。各類大型真菌菇已知 3,800 種以上，子實體可以食用的約有 871 種，估計目前全中國已知近 1000 種。目前馴化栽培的食用菌種類 90 多種，其中商業化栽培的 50 多種。

食用菌種質資源十分豐富，目前和今後相當一段時間內，收集種質資源是非

常重要任務之一。食用菌種質資源搜集的對象主要包括：一．目前正在栽培的品種，尤其是那些優良稀有地方品種；二．過去栽培但現生產已淘汰的品種；三．栽培中的野生菌株及其近緣種；四．特殊的種質資源，如變異體、有特殊遺傳標記的菌株等；五．對人類可能有潛在利用價值的野生食用和藥用種類。

收集種質資源首先是有計畫地組織各地食用菌種質資源多樣性調查。然而事實上查明某些地方的食用菌資源非常困難。在瑞士 Straatsma 等在蕈菌生長季節每周去一個地方採集一次，連續採集 21 年，在 1500(m)^2 中發現有 408 種菌蕈，每年採收到的種類由 18 種到 194 種，其中一年採集到 19 個新種，這說明有些蕈菌的菌絲在地底下存活多年，只有遇到適合的氣候條件子實體才形成（Straatsma et al., 2001）。目前食用菌種質資源調查主要是線路考察法，即使是對自然保護區的研究資料也僅 1~3 年，缺乏長期全面系統的調查。收集的資源樣本應能充分代表收集地的遺傳變異性。在實際取樣過程中往往要求保證居群內 95%的基因頻率爲 0.05 的等位基因至少被保留一份拷貝，爲此根據公式 S-3/〔(F-2) log (1-ρ)〕(S 指樣本數，F 指居群的近交係數，ρ 指基因頻率)，計算得到近交係數 F 值在 0 到 1 之間變動時，樣本數應在 29~58 之間。因此，在某一物種生物學特性和遺傳背景未知的情況下，對一個居群進行資源保護的隨機取樣數目至少應在 30 個左右。

一旦居群內的取樣個體數確定以後，還要考慮樣本的空間分布。通常異宗結合的種類個體間的基因交流較充分，遺傳變異的分布相對比較均勻，與空間距離沒有顯著的相關性，如香菇，同一根倒木上的香菇子實體之間存在豐富的遺傳多樣性；而同宗結合、次級同宗結合以及無性繁殖的種類多個體間的基因交流受到限制，遺傳變異的分布成斑塊狀，如 *Armillaria bulbosa* 一個菌株的占地面積能達到 15(hm)^2。同時生物環境異質性也會導致居群內遺傳變異存在一定的空間分布格局。因此，爲了達到科學取樣目的，還應對不同物種居群遺傳變異的空間結構有大致的了解，然而目前食用菌在這方面的研究還非常的薄弱。多年來食用菌採樣的一般策略一直是盡量選取不同地點和不同環境中的樣品。

確定某一地區居群取樣數目要比確定某一居群內的樣本數更加困難，尤其是對於真菌方面的研究報導更少。

採集樣本時，應該事先計劃周詳，首先要確定採集的目的，了解採集地點之各方面情況，擬定採集路線。在安排妥當食、衣、住、行以及醫藥衛生等事項，準備採集工作所需用具與物品。

通常採集標本應做好的準備工作如下：

1．熟悉採集地的地形：應備有當地的地形圖，確定地點與方向，通常地圖比例尺越大越好。若有當地嚮導帶領更好。

2．各種許可證的申請，特別是進入各類的保護區，應事先向有關的管理部門聯絡，以取得調查和採集許可。

3．望遠鏡：用於觀察遠處或高處的食用菌。

4．GPS 和海拔儀：用於確定方位和海拔高度。

5．紀錄和照像用具：攜帶《大型真菌野外採集紀錄》、鉛筆、直尺、白紙板、照相機（及備用電池）等。

6．切割、挖取工具：如小鏟、小刀、手鋸等。

7．放大鏡：觀察食用菌的微細構造。

8．圖鑑或參考書：查不認識的食用菌種類。

9．菌種分離用具：酒精燈、酒精棉球、PDA 試管、解剖刀、小鑷子、記號筆、橡皮筋等。

10.標本和寄主盛裝用具：吸水紙、信封或網兜、塑膠袋、紙箱等。

11.標本烤乾設備：如小型烘箱。

12.個人裝備：依據地點的狀況及工作時間的長短，選擇輕便、實用爲原則，但舒適與安全也必須考慮，以免影響採集工作的進行。如深秋以後才進入高山地區，則應注意保暖。

採集編號過程中，應注意到《大型真菌野外採集紀錄表》、照片、菌株號和標本一一對應。

同時也要積極展開從國外引種。引種爲食用菌產業的發展做出了巨大貢獻，特別是雙孢蘑菇和香菇等食用菌類。

對於徵集、交換和引進的菌種資源要進行純度檢測和複合鑑定，確保菌種的純度與信息的準確性，然後進行編號，入庫保存。

對於能夠栽培出菇的種類，尤其是栽培品種、其野生菌株和野生近緣種要進行栽培性狀鑑定，主要包括適培養料、菌絲生長速度、栽培週期、菌絲最適生長溫度和耐受溫度範圍、子實體發生溫度、子實體生長溫度、子實體形狀和質地、風味、生物學效率、抗病性、抗逆性等。

菌質資源種原庫資料建檔是菌質資源開發的重要工作，完備的資料庫能顯著提高種質資源的利用價值，有助於該菌株的安全保藏，促進該菌株的社會共享。資料庫主要來源於採集時獲取的記錄、整理鑑定和評價過程中獲取的分類學資料和栽培性狀特性資料、徵集交換或引進時獲得的資料庫以及資源共享過程中獲取的反饋資料或文獻資料，將這些資料整理建立菌種檔案。

食用菌和其他生物一樣，都具有遺傳性和變異性。遺傳性，保證了子代特徵的相對穩定，是科學利用的基礎；變異性，使子代的性狀與親本有所不同，給菌種保藏和科學利用帶來困難。當我們進行大量菌種選育工作獲得了優良菌株後，由於變異性，其高產量優質等優良特性可能逐漸衰退，最終可能完全丟失原有的優良性狀。

菌種保藏的主要目的在於能在較長時間內保持菌種的生存，保持菌種在遺傳、型態和生理上的穩定性。對於生產用的商業品種，就是要保持其生產性狀的穩定性。同時還要保持菌種的物種獨立性，使其免受其他微生物的侵染，保持純培養狀態。菌種保藏的主要意義就在於盡可能保持其原有性狀和活力的穩定，確保菌種不死亡、不變異、不被汙染，已達到便於生產、研究、共享和利用等諸方面的需要。

食用菌菌種是食用菌生產的首要生產資料。一個優良的菌種，如果保藏不好，就會引起退化，汙染雜菌，甚至死亡，給生產者帶來嚴重損失。因此，保藏

菌種和選育菌種具有同樣重要的意義。

不論是人工培育的栽培品種還是野外採集、分離和鑑定的野生菌株，以及研究中獲取的突變體，都凝聚了科研人員大量的心血。每一份資源都擁有其獨特的遺傳特性，蘊藏一套完整的基因和一種基因組合。對於這些有價值的材料都應很好地保藏和利用。

參加第 18 屆國際菌蕈（食用菇菌）會議後，有一些想法，分述於下，食藥用菇菌類產業鏈環緊密連接，因此每一過程與步驟均須正確建立才能讓整個產業鏈結合完整。基於上述思考，提出一些想法：

一、強化菌種管理、規範菌種生產

1、加強優良品種選育：

品種選育是一項非常重要的工作，必須持續篩選，除此之外，要建立食藥用菇菌類之技術規範。選育品種須要有深厚的學理基礎，應用既有之現代科技，具高智慧、高投入的抱負，才能真正把這種要工作做好，否則，一切都將成爲空談。

2、加強品種管理：

食藥用菌種對環境變化敏感，菌株變異快、退化快，加上氣候變遷日益加速，栽培模式多樣，因此，關於食藥用菌的品種管理爲刻不容緩之事。

3、品種認定（證）制度建立：

菌種質與量的提升，基於品種認定與認證的機制是否完備。

二、強化菌種生產市場的標準化

食藥用菌產業是以菌種之確定與活性爲栽培過程的重要指標，因此，菌種之技術及品質之規範需要標準化。

三、標準化生產栽培制度的建立

食藥用菌標準化建立，對於食藥用菌生產過程之前、中、後，過程可以完全掌握狀況。基於此，可促進先進的食藥用科技成果和經驗迅速推廣，可確保食藥用菌市場的秩序，進而指導生產，引導消費，使經濟、社會和生態

皆取得最佳利益。

標準化生產是保證安全生產的關鍵措施，同時可以促使專業化分工及合作，可提高生產環節的工作效率，因此，可利用農業良好規範（GAP），衛生標準操作程序（SSDP）和無公害食品食用菌的相關標準基礎或危害分析及關鍵控制點（HACCP）識別，即可達到良好安全的食品要求。

四、食用及藥用產業國際化的戰略思維

1、產業國際化的戰略目標

a、利用可靠的科技研發技術，加強人才培育訓練。

b、GAP、HACCP、SSDP 等操作的標準化及確實性。

c、創造信任品牌。

d、以國際市場爲導向，積極創新研發。

2、食用藥用菇菌國際化戰略措施

a、品種多樣化，積極開發國際需求市場的菌種。

b、栽培週年化，以新技術及持續經營的戰略思想，開發週年栽培的菌種模式。

c、生產規模化，才能適應國際市場的質與量。

d、質量標準化，積極建構食品安全標準規範體系，才能適應國際化的標準。

e、加工增值化，食藥用菌的加工是該產業增產、增值的重要環節，因此，要積極發展食用藥用菌加工技術，並發展應用其中之生理活性物質成分，開發保健食品及藥用品等高科技產品，延長產業鏈，增加產業價值。

f、市場國際網路化，因爲電子訊息事業發展迅速，因此，可以透過國內外食用及藥用菌的訊息，加速國際化。

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2012 Beijing China

MUSHROOM SCIENCE XVIII

ABSTRACTS OF THE 18TH CONGRESS OF THE INTERNATIONAL SOCIETY FOR MUSHROOM SCIENCE

ISMS
INTERNATIONAL SOCIETY FOR MUSHROOM SCIENCE

AUGUST 2012 BEIJING CHINA

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PROCEEDINGS OF THE 18TH CONGRESS OF THE INTERNATIONAL SOCIETY FOR MUSHROOM SCIENCE

Editors:

Jinxia ZHANG Hexiang WANG Mingjie CHEN

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Visiting Vietnam

'pluQ is a marketing tool'

McKeever in Northern Ireland

Hillcrest: learning from each other

Risotto ai funghi:

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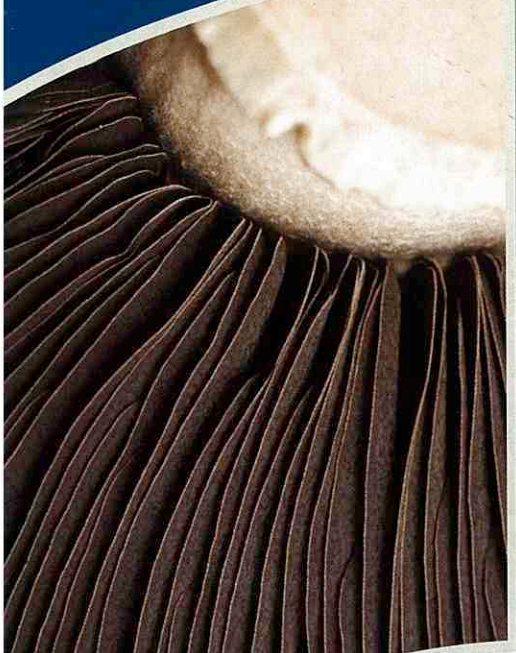
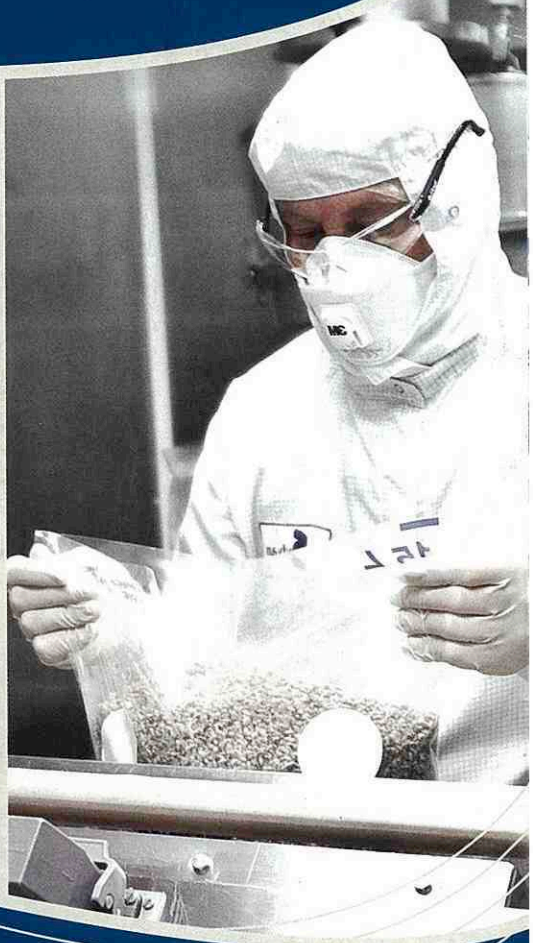


The Science of Success



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Pre-wet or pre-fermentation

Loosened bales of straw are sprayed and turned by a shovel.

There are almost as many different fermentation schedules as there are compost companies. The same applies for pre-wetting methods. The soaking of straw to moisten it and make it heavier and more compact is done in many different ways around the world.

AdVisie 'de champignonteeltadviseurs'
Con Hermans
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Some companies produce phase 1 compost in three days, while others take three weeks to do so. This all depends on the required degree of final fermentation, but the most important influential factor is the type of raw material used for the compost. Composters that use horse manure as the main constituent, compost on average one week shorter than compost producers that use straw. But what actually causes this difference, and what is horse manure?
Horse manure is a mixture of straw that has been trampled and broken up by the horse's hooves and enriched with urine and faeces. The damaged sprigs of straw allow the easy access of moisture containing bacteria. This triggers the fermentation process, the temperature starts to rise and the straw softens.

Straw quality

After grain has been threshed, the straw is often left behind on the fields for a while to dry before it is baled. One of the main quality indicators of straw is namely its moisture content. Bacteria and moulds cannot develop in dry straw, so the straw retains it quality for longer. Compost companies have to make do with their stocks of straw for a whole year. Good quality straw - i.e. low moisture content and thick, shiny waxy coating- can even retain its quality for several years.
However, the factors that positively impact on good quality straw (dry, intact, waxy coating) act as inhibiting factors when you want to get the fermentation process started quickly, as the entry of moisture and bacteria into the sprigs of straw is prevented.

To lower the transport costs, bales of straw these days are getting bigger and bigger. This means that during harvest the straw is treated mechanically far more intensively than before, so that it already has a damaged, open structure.
The pre-wet process is intended to dissolve the waxy coating and soften the straw, to enable moisture to be absorbed more easily.

Pre-wet

Pre-wetting is precisely what the term suggests. The dry, baled straw has a moisture content of around 10-12%. During composting, moisture contents in excess of 70% are used. Every composter knows that you need huge volumes of water if you are making straw-based compost. Around 5000 litres of water is used for every ton of straw. The straw is unable to absorb this water in one go, so the process is done in stages - the first of which is pre-wetting. What happens to horse manure in the stables, has to happen with the straw at the composting plant. Many different pre-wetting methods are used. A lot more attention has been devoted to this aspect recently, and the systems used for pre-wet have been refined.
The most important aim of pre-wetting is of course to soak the straw. During pre-wetting the straw is moistened, but this water is not absorbed properly yet by the straw. The moisture clings to the outside of the particles so the water is easily repelled again.
Another effect of pre-wetting is that it makes the straw heavier and more compact so that it is easier to treat in the hopper, the mixing drums and on the belts.

Sprinkling effectively in this way means the bales have to be positioned properly.

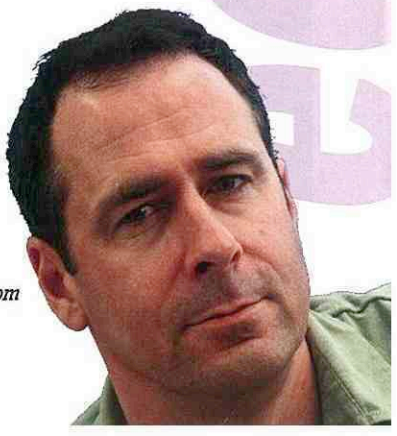
And....

Cover Photo: International flags line the entrance of Floriade 2012, the world's greatest horticultural expo.
Photo: John Peeters

Foul play?

And did you enjoy all the sport this summer? The European Football Championship, the Tour de France, Wimbledon, the Olympic Games? The parade of top athletes who push their bodies to the utmost limits year in, year out, who are prepared to sacrifice many of life's pleasures to win the battle with their competitors makes for great events.
But some also engage in foul play. Sportsmen who are willing to go just a step further to beat the competition. Terry kneeing Sánchez in the Champions League, the battle between Ainslie and his rivals in the Olympic sailing, and the badminton players expelled for deliberately losing their matches in an attempt to manipulate the following round. There are countless examples of cheating, from the infamous dive (schwalbe) to the use of blood doping. Because of the latter, it takes 20 years to find out who really did win the Tour.
Performing in the mushroom sector is top sport too. Everyone pushes his or hers company to the utmost limits, but not everyone wins a gold medal, and there are cheats her too - some get caught, some don't. Selling 'ordinary' mushrooms as 'organic', things like that.
Just as we were rounding off this edition the authorities and the Labour Inspectorate raided Prime Champ in Horst. Three suspects were taken into custody. The company is suspected of exploiting Polish pickers. The pickers are alleged to be underpaid, forced to work (extremely) long hours and have virtually no days off. It's a suspicion that has existed for years, and not just with the authorities or the trade unions. And once again on the internet there were reactions such as; "Close them down!"
However, the suspects were later released, and the question is whether the case can be brought to court this time. There have been other raids in the past, without any serious consequences, and Geert Verdellen's company is as innocent as a babe unborn. What is more, Prime Champ is one of the initiators behind Fair Produce NL, a recently introduced certification mark propagating fair harvesting practice.
Is this Lance Armstrong, fighting against the use of doping in sport? Is Prime Champ using 'the hand of God' to win the game of mushroom production? It's not certain, because IF Prime Champ is engaging in illegal practices, then it is not as obvious as the cheating badminton players. Is a well-executed dive a dive all the same? There are plenty of players who walk a fine line and the legal battle continues. The Big Loser in this 'event' is the Dutch mushroom sector. It's a bitter shame that this happens again and again and grabs all the attention in the regular media to the detriment of the image of our produce and our sector.
I would like to ask the cheats in the industry to stop this unsporting behaviour and give the other players, who do keep to the rules of play, a fair chance. And I would like to say to the 'referees' at the trade union and the Ministry of Justice and the Labour Inspectorate that IF you do have any real evidence, let's have it, and otherwise refrain from holding up the game unnecessarily every time.

And now onto the Olympic Games of mushroom science, the ISMS 2012 in Beijing!



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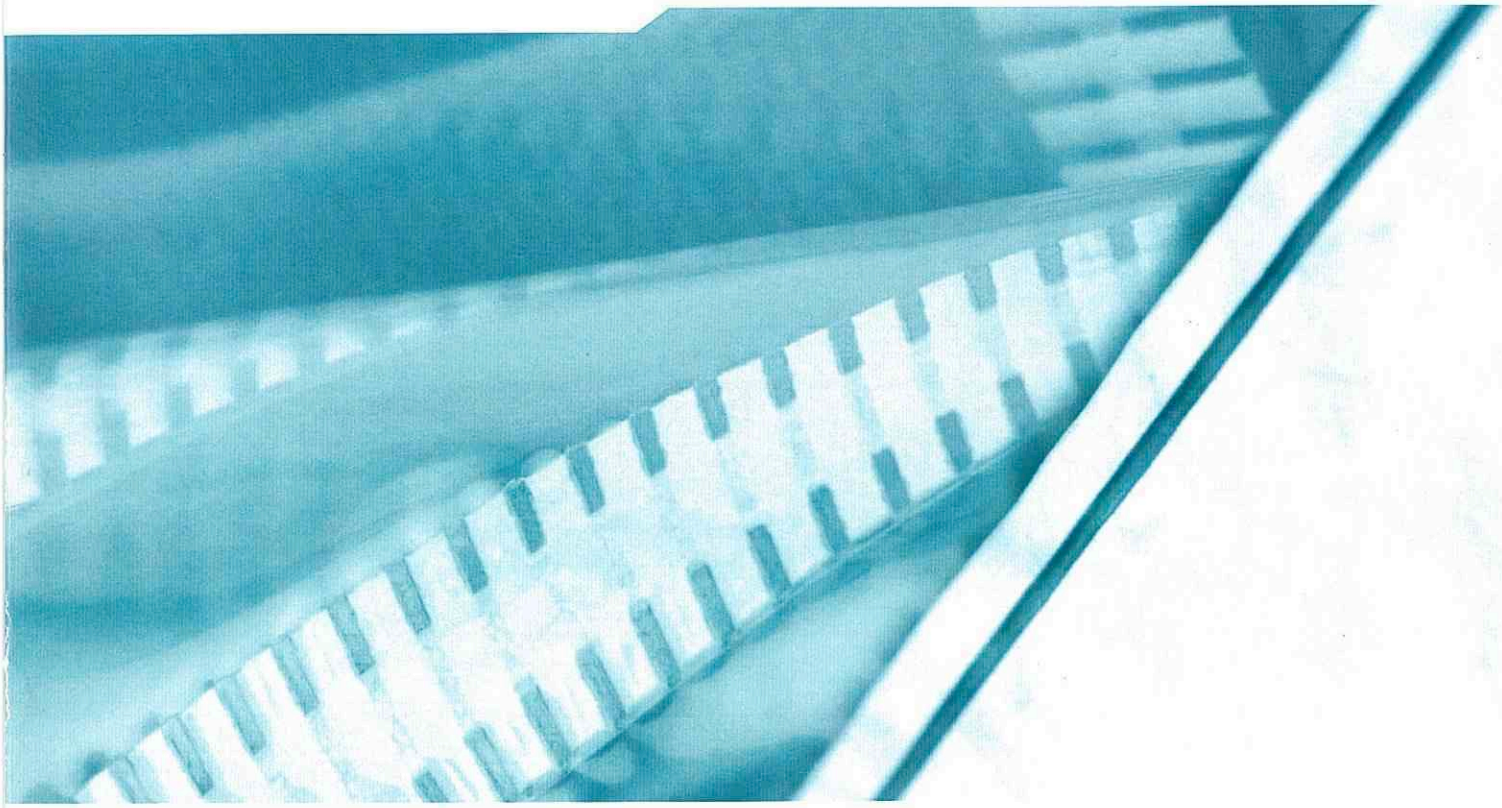
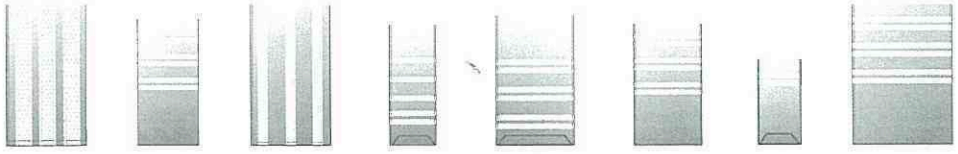




SAC O_2 microsac

Iran, June 2012

Mushroom growers and composters in Iran have been facing some problems recently. The lack of wheat straw and rising costs because of sanctions imposed on the country are only some of the hurdles for the industry.

By Rodney Barrett

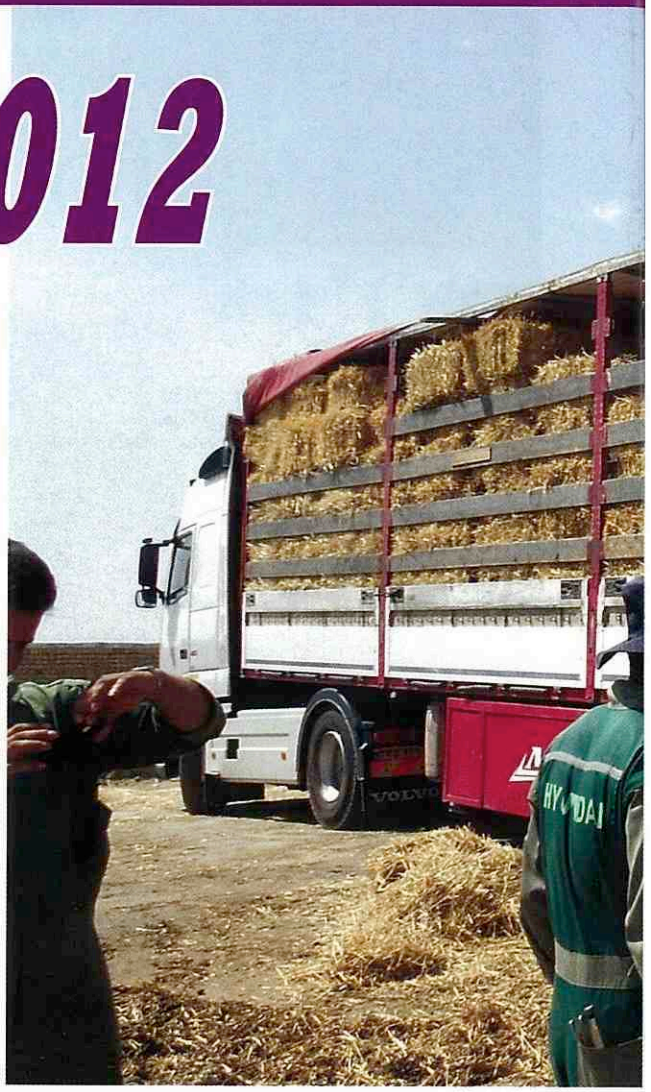
Following a year of fast expansion on the new compost yard, the Javaneh Mushroom Compost Company ran out of last year's wheat straw before the start of the new local harvest. The same thing has happened at the compost yard at Malard Mushrooms where insufficient straw was stacked away last season.

Straw worries

Fortunately, Iran is a big country and the harvest starts a lot earlier in the south of the country than it does in the area of Tehran, where both these compost yards are located. This meant that the lack of local straw supplies which threatened the ability of both companies to maintain the compost volumes has been helped by transporting the new straw from over 1,000 kilometers from the south, and some from the eastern areas of the country, just enough to keep the Javaneh yard working at about 80% capacity, while the Malard Company has dropped to about 50% some weeks recently for the same reason a lack of straw.

This problem will result in that some growers will be receiving less compost than normal or no compost at all for some week's ahead, as local straw will not become available for at least three more weeks. It will also be interesting to see what impact the resulting drop in mushroom production caused by this lack of compost will have on the sales price for mushrooms being sent into the fresh market in Tehran.

This is a sample of the new harvest straw with most baling almost finished now. There are big differences in straw types and quality. Some is fine stems and some broad and leafy as seen in the



The other problem is the new straw itself, for because of the normally beautiful summer weather the straw is harvested in very good condition and the waxy new straw is more difficult to deal with than the older stored material. Couple this to the fact that southern straw varieties are broader and softer than the eastern material, which is a much finer and harder material, and the problems multiply for the composter in trying to blend and pre-wet them equally.

Chicken manure and spawn

Other problems recently have been with Chicken Manure supplies with some really low nitrogens in some deliveries, which mean other nitrogenous materials need to be sourced. Often the chicken manure is very variable with chicken bedding ranging from old newspaper to thick cardboard, soft wood savings to larger wood chips or rice hulls. Adding large volumes of some of these materials due to poor nitrogen levels is not best practice.

While I was at Javaneh, several containers of spawn from Italy were held up by the customs due to concerns about the possible use of GM grains, this then puts pressure on the locally made spawn supplies which normally are of an inferior quality, having been copied from some western strains in growers laboratories.

Expanding anyway

Not at all put off by any of these problems which they seem to face on a daily basis, already the company has

JFM sheds being constructed.

An Irish Shed

All over the Emerald Isle you can come across many of these mushroom growing sheds. They are tunnel shaped structures, made of tubular steel frames covered by insulation material and heavy duty polythene covers - usually in green. In recent years, these "Mushroom Sheds" have been gradually appearing in other parts of the world, in green and in other colours. The company behind these sheds is J.F. McKenna, located in Armagh, N Ireland

By John Peeters

John F. McKenna founded the company around 50 years ago with the aim of supplying cardboard packaging and sundry products to the mushroom industry. Prompted by the explosive growth of mushroom growing in Ireland in the 1980s, JFM introduced an economic type of shed, specially designed for the satellite system of mushroom production. This shed, not to be confused with the tunnels used for composting, has been refined and further developed right up to this day.

In the beginning.....

Brendan McKenna explains how these semi-permanent structures came about. "The original Irish sheds were developed to provide growers with a low-cost growing room, equipped with a simple climate control and air handling system. The farmers could grow mushrooms in bags filled with incubated compost (18 tonnes per room) which they bought from a local compost supply company. Polythene covers were used to clad the interior and exterior of the sheds with layers of fibre glass wool insulation in between. In the early days, growers would buy 2 or 3 sheds, fill with phase 2 compost bought from composting companies and then supply the harvested crop to the mushroom marketing companies who in turn would sell the produce to the UK market.

This satellite system was such a success that the farms and growing rooms in Ireland quickly became a lot more sophisticated. In recent years though, the number of production facilities in Ireland has fallen but the remaining farms have expanded their production capacity to cater for increased demand. Almost all production in Ireland is now grown on shelves.

Igloos, Quonsets or Sheds?

McKenna continues: "The development of modern mushroom growing in Ireland is predominately based on the Irish-style sheds. But of course, today's versions are completely different to the ones used 30 years ago. Today the materials used are far superior, with galvanised steel frames, high performance Nulla Wrap insulation and Nicotarp covers on the inside and outside that are resistant to the influence of weather and UV. JFM now supplies these growing rooms to all corners of the globe. We have built sheds in the USA, Canada, Australia, the Middle East, Central America, Asia and Europe.

Funnily enough, these structures go by a different name wherever they are found. In North America

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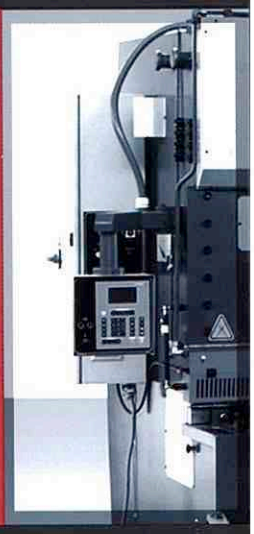
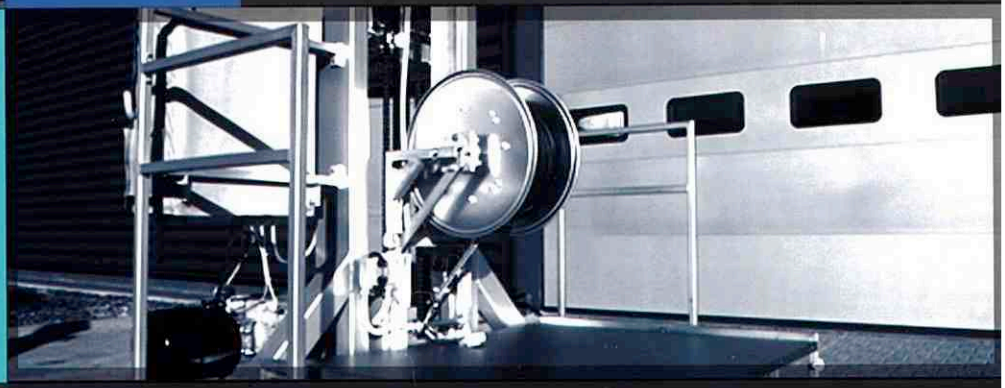
- mushroom tech
- invest
- machines
- services
- energy





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庆祝国际著名蕈菌学家张树庭教授八十华诞文集之一

丰碑高耸

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A COLLECTION OF PUBLICATIONS ON MUSHROOM BIOLOGY

BOOK IV

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30 September 2010
Beijing, China

中国菇业大典

COLLECTION OF MUSHROOM INDUSTRY IN CHINA

（上册）

罗信昌　陈士瑜　主编

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第 18 屆國際菌蕈學學術研討會
圖片附件

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圖片 1 開幕儀式前會場情形

圖片 2 開幕儀式前會場情形

圖片 3 開幕儀式

圖片 4 開幕儀式情形

圖片 5 開幕演講情形

圖片 6 開幕後於會場外和大會看板合照

圖片 7 會場攤位情形

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圖片 9 會場攤位情會場攤位情形

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