

IHC2018-Symposium 30 Culinary Herbs and Edible Fungi

ORAL PRESENTATIONS

OS 1-1:

INVESTIGATING THE POTENTIAL USE OF COMPOSTED GRAPE MARC IN THE PRODUCTION OF *AGARICUS BISPORUS*

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Mushroom production is gradually spreading in Lebanon and becoming more modernized, however, the high cost of substrates remains one major constraint facing this industry. The large number of wineries in Lebanon produces huge amounts of winery wastes which in general are not reused. Therefore, an experiment was carried out in May 2017 where a mushroom production room was installed providing traditional conditions of production. The general aim was to assess the potential use of composted grape marc on mushroom production seeking to valorize local winery wastes. This was achieved by comparing the effect of five different substrates on yield and quality of *Agaricus bisporus*; S1: 100% conventional compost based on horse manure, S2: 30% conventional compost + 70% composted grape marc, S3: 50% conventional compost + 50% composted grape marc, S4: 30% composted grape marc + 70% conventional compost and S5: 100% composted grape marc. Results showed that the substrate S3 induced the earliest and highest yield compared to other substrates. However, yields were not affected with less than 50% composted grape marc in the substrate. Fruit characteristics such as average individual fruit weight, mushroom length, cape diameter and stipe diameter were not significantly different between S3 and S1, while in S3 productivity was increased by 32% and nutritional composition was enhanced; higher protein, crude fibers, ash, fat, and carbohydrates compared to S1. Mushroom shelf-life was increased with increasing proportions of conventional compost while production costs were reduced by higher proportions of composted grape marc. Finally, using composted grape marc could provide an economic benefit to the Lebanese mushroom sector by lowering the cost of production while maintaining mushroom quality.

Keywords: *Agaricus bisporus*, composted grape marc, conventional compost, yield, quality

OS 1-2:

EFFECTS OF CULTURE PERIODS ON FRUITING BODY FORMATION AND BIOACTIVE COMPOUNDS PRODUCTION OF *CORDYCEPS MILITARIS*

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Cordyceps militaris was traditionally used as a tonic and traditional folk medicine, especially in East Asia. Adenosine and cordycepin (3'-deoxyadenosine) were an important active ingredient of *C. militaris*. The objective of this study were to investigate the effect of culture periods on physico-chemical of fruiting body (fresh weight, length, firmness, total soluble solids concentration (TSS), and color) and determine the bioactive compounds (adenosine and cordycepin) production of *C. militaris*. The experiment design was done by using Completely Randomized Design. *C. militaris* was cultured on the rice culture medium (PDB, white rice, silkworm pupa and egg) for 1, 2, 3, 4, 5, 6, 7, 8 and 9 weeks. Results showed that the fresh weight, length, TSS of fruiting body were significantly increased as the culture period increased and was stable from 7th week to 9th week. The lightness (L*) decreased as the culture period increased while the redness (a*) and yellowness (b*) were increased and then slightly decreased from 2nd week to 9th week. Adenosine and cordycepin contents were detected after 1st weeks of culture periods. Adenosine and cordycepin contents significantly increased from 1st week to 7th week



of the culture periods. After 7 week, these bioactive compounds significantly decreased. This experiment revealed that the optimal harvesting time for *C. militaris* was 7th week. At this culture period time, the yield of fresh weight of fruiting bodies was 41.77g/bottle and the amounts of adenosine and cordycepin were 2.7 mg g⁻¹ and 6.21 mg g⁻¹, respectively.

Keywords: adenosine, cordycepin, *Cordyceps militaris*, culture period

OS 1-3:

USING LOCALLY AVAILABLE CHICKEN MANURE AS A SUBSTITUTE TO HORSE MANURE IN COMPOST FORMULAS FOR GROWING *AGARICUS BISPORUS* IN LEBANON

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Mushroom production is rising in Lebanon facing the high demand for this highly nutritious food. However, the growth of this sector is faced by one major constraint that is the high production cost due to the need to import the conventional compost substrates at high prices from the Netherlands or the USA. Thus, efforts were done through this study to formulate a local compost mixture based on widely available chicken manure and to investigate its potential use for growing the white button mushroom (*Agaricus bisporus*) in small scale production. Mushroom yield and quality were evaluated among 5 compost mixtures: A: 100% conventional compost (based on horse manure) (control), B: 70% conventional compost+30% local compost (based on chicken manure), C: 50% conventional compost+50% local compost, D: 30% conventional compost+70% local compost and E: 100% local compost. Results showed that average fruit number and yield produced in the mixtures B, C, and D were not significantly different compared to control (around 40 fruits and 2.5 kg/box for the 4 mixtures). The mixture E was the least productive. Average individual fruit weight obtained in B (61 g), and C (60 g) did not significantly differ compared to A (66 g) and was higher than D (48 g) and E (42 g). Mushroom length and cape diameter in the mixtures A and C were the best compared to all other mixtures. Fruit nutritional composition (crude fibers, proteins, fat, water, P, Mg, Fe, Cu, B, Al, Zn, Na, K and Ca content) in all mixtures containing local compost was close to that of control and in the mixture B fruit composition was almost the same compared to A. Therefore, local compost has shown a significant advantage in mushroom production allowing the potential reduction in production costs for Lebanese mushroom producers and an efficient way to recycle chicken manure wastes for further agricultural purpose.

Keywords: Lebanon, *Agaricus bisporus*, compost, chicken manure, yield

OS 1-4:

CHALLENGES AND OPPORTUNITIES OF GROWING ORGANIC OYSTER MUSHROOM (*PLEUROTUS OSTREATUS*) ON STUMPS FOR MODEL FOREST AND CHEMICAL AND NUTRITIONAL VALUES

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Non-wood forest products (NWFPs) sustainability is important for Model Forest mission. Edible mushrooms are the one of the most important NWFPs and some of the wild mushrooms are collected and exported. Thinning is usually applied for sustainability forest management. Stumps after thinning process were decomposed naturally by the forest parasitic and saprophytic organisms whereas stumps might be big potential for organic oyster mushroom. Harvested organic oyster mushroom yield, morphological features, chemical and nutritional components were changed according to locations of forest. Highest yield was obtained under forest of Güneyköy with 300.29 g per stump however protein content was highest (23.94%) at Sermayecik location. Total acidity were determined 0.09% to 0.13%, and pH 5.93-6.21. The total phenolic contents were calculated 84.32 to 87.12 mg GAE/100g and antioxidant activity were 502.17 to 788 µM TE/100g. 10% of fresh mushroom grown on stumps was infected by the larvae of scarid and cecids while 1% infected by Hirudinea. *Trametes versicolor*, *Bjerkandera adusta*, *Trametes gibbosa*, *Armillaria mellea*, *Hypoloma fasciculare*, *Auricularia auricula-judae*



were also other parasitic mushroom species recorded grown naturally on some stumps. Possibility of organic oyster mushroom on stumps under forest ecosystem and its nutritional values were discussed.

Keywords: Organic, oyster mushroom, stump, inoculation, model forest, nutritional value

OS 1-5:

ECOGEOGRAPHICAL VARIATION AND NEW HOST PLANTS OF *PLEUROTUS ERYNGII* SPECIES COMPLEX IN TURKEY

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Pleurotus eryngii species complex mushrooms are found association with certain plant species of Compositae and Umbelliferae as facultative biotrophs in nature. This complex species comprises var. *eryngii* (DC.:Fr) Quel, *ferulae* Lanzi, *nebrodensis* (Inzenga) Sacc, *elaeoselini* Venturella et al., *tigitanus* Lewinsohn et al. *P. tuoliensis* C.J.Mou, *Pleurotus hadamardii* Costantin and *Pleurotus fossulatus* (Cooke) Sacc. Turkish wild *P. eryngii* species complex were collected from different location of Turkey in this study. Host plants association with Turkish wild *P.eryngii* species complex was identified. Associated host plants of Turkish *P. eryngii* species complex were *Erynginum compastre* L., *Ferula communis* var. *communis* L., *Ferula orientalis* L., *Heracleum antasiaticum* Maden, *Prangos uechtritzii* Boiss and Hausskn, *Prangos ferulacea* (L) Lindley. *Ferula orientalis* L., *Heracleum antasiaticum* Madenand *Prangos uechtritzii* Boiss and Hausskn were first record as a new host plants of *Pleurotus eryngii* species complex in the world. Three taxon belonging to *Pleurotus eryngii* species complex were determined. According to morphological data these taxon were *Pleurotus eryngii* var. *eryngii* (DC.:Fr) Quel, *Pleurotus eryngii ferulae* Lanzi and *Pleurotus nebrodensis* (Inzenga) Sacc.

Keywords: *Pleurotus eryngii* species complex, host plant, *ferulae*, *eryngii*, *nebrodensis*

POSTER PRESENTATIONS

PS 1-1:

BIOCONVERSION OF LIGNOCELLULOSIC WASTES INTO ECO-FRIENDLY AND USEFUL PRODUCTS

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Every year huge amounts of lignocellulosic wastes are produced all over the world. But the most part of these lignocellulosic wastes are not used at all being stored in improper places or left on the fields leading to the environmental pollution. Also, a lot of them are used as heating sources in their rough shape or as briquettes or pellets. For a better valorizing of the wastes, the main scope of the experiments presented in this paper was to set up the biotechnology for bioconversion of lignocellulosic wastes that are come out from forestry and wood processing industry, pomiculture and viticulture, through the application of biotechnologies based on controlled growing of edible and medicinal mushroom species. To carry out the laboratory-scale biotechnological experiments, two mushroom species were used, namely, *Ganoderma lucidum*, which is a wood degrading fungus, belonging to the group of lignin decomposers (white rot fungi) and *Pleurotus eryngii*, having a high potential to grow on lignocellulosic wastes. Both mushroom species were cultivated on many types of lignocellulosic wastes (tree chopped branches, wood chips, sawdust from forest industry, and wastes which are produced in fruit growing and viticulture) as raw substrates for mushroom growing inside of stainless steel



matrices with the shape of pots. The first category of final products resulted from the application of such laboratory-scale biotechnology is represented by a large scale of fully biodegradable materials in the shape of pots, supports or protective structures being made of the compost resulted from mushroom mycelia growing on these lignocellulosic wastes, and that can be planted right into the field or garden, eliminating the root shock. The second category of final products is referring to mushroom fruiting bodies of both species, the fresh organic foods that are produced at the end of their biological cycles.

Keywords: biotechnology, controlled fungal growing, edible and medicinal mushrooms, wastes of wood processing industry, fruit growing and viticulture

PS 1-2:

PHYSICAL, CHEMICAL AND BIOLOGICAL PROPERTIES OF SPENT MUSHROOM SUBSTRATES OF DIFFERENT MUSHROOM SPECIES

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The production of different mushroom species in the world and Turkey, and the amount of spent mushroom substrate remaining after mushroom production process increase year by year. Mushroom substrates released in large quantities are removed from the enterprises by burning, discarding, or incorporating into the soil in agricultural areas. These practices are not economical for the enterprises and cause some serious environmental pollution problems. However, the spent mushroom substrate is a material that could be included the economy by reusing in many different fields. The composition of the spent mushroom substrate varies depending on produced mushroom species and also the materials used in compost preparation. Therefore, determining the properties of spent mushroom substrates is of great importance. In this study, some physical, chemical and biological properties of spent mushroom substrates obtained from the production of different mushroom species (*Agaricus bisporus*, *Ganoderma lucidum*, *Hericium erinaceus*, *Lentinula edodes* and *Pleurotus ostreatus*) cultivated in Turkey have been determined and compared with peat and standard media in terms of these properties. Statistically significant differences were determined among spent mushroom substrates and peat and standard media in terms of all examined properties. EC, organic matter, C, C:N rate, water holding capacity, microbial biomass carbon, arylsulphatase activity of spent mushroom substrate had been found significantly higher than that of peat and standard media. Results of EC, pH, C:N rate and phytotoxicity experiment had shown that fresh spent mushroom substrates taken after mushroom production process haven't got similar properties to an initial matured compost.

Keywords: Spent mushroom compost, enzyme activity, organic matter, minerals, microbial biomass

PS 1-3:

DETERMINING OF USABILITY OF GARLIC WASTE IN *PLEUROTUS ERYNGII* CULTIVATION AND PHYSICAL- CHEMICAL PROPERTIES OF GARLIC BASED SUBSTRATES AT DIFFERENT STAGES OF PRODUCTION

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The objective of this study was to determine the usability of garlic waste, appeared in a large amount after garlic processing, as substrate in *Pleurotus eryngii* (DC. ex Fr.) Quel. cultivation. In this study, *P. eryngii* 3065 strain was used and substrates prepared with the mixture of poplar sawdust (PS) and garlic waste (GW) at different ratios (95%PS+5%GW, 90%PS+10%GW, 85%PS+15%GW, 80%PS+20%GW and 75%PS+25%GW) were compared with the 100%PS (control) substrate. The effects of those substrates on yield, biological efficiency (BE) and quality of mushroom were investigated. However, pH, moisture content, ash, organic matter, carbon (C), nitrogen (N), C:N ratios, lignin and mineral contents of PS and GW materials and substrates prepared by those materials were determined in the samples taken just after sterilization and in the spent mushroom substrate after harvest. In the study, the highest yield, BE and production rate were obtained from 75%PS+25%GW substrate (314.60 g bag⁻¹, 84.94% and 0.74%), this was followed by 80%PS+20%GW substrate (251.20 g bag⁻¹, 84.78% and 0.71%) which was not statistically different with 75%PS+25%GW. The results revealed that garlic waste could be used in *P. eryngii* cultivation.



Keywords: *Pleurotus eryngii*, mushroom, garlic wastes, yield, biological efficiency

PS 1-4:

SOME ORGANIC MATERIALS USED FOR IN VITRO MYCELIUM GROWING OF *PLEUROTUS OSTREATUS*

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Organic mushroom production is limited in Turkey. Only a few mushroom farmers grows organic mushroom on organic stumps. There is no organic spawn production in Turkey. Organic oak sawdust, wheat bran, potato, carrot, mulberry, sweet cherry extracts were used as organic material and Potato Dextrose Agar (PDA) as a control for mycelium growing test on *Pleurotus ostreatus*. Sawdust without wheat bran gave lower mycelial growth than PDA however Sawdust with 10% and 15% wheat bran (10.81 mm/day and 10.88 mm/day), 50% potato and 50% carrot (9.28 mm/day), 40% mulberry (15.32 mm/day), 20% sweet cherry (12.49 mm/day) gave higher mycelial growth rate than PDA. Organic mulberry gave the highest mycelial growth rate and could be alternative organic material for in vitro mycelial growth of the *Pleurotus osteratus*. Although mulberry and sweet cherry extracts had higher mycelial growth, oak sawdust and wheat bran extract could be offered to spawn producer since the extract is available in every season and cheaper than the other materials.

Keywords: Organic, oyster mushroom, mycelium, inoculation, spawn

