International Journal of Medicinal Mushrooms, Vol. 7 (2005)

Cultivation of the King-Oyster Mushroom *Pleurotus eryngii* (DC.:Fr.) Quél. on Substrates Deriving from the Olive-Oil Industry

Georgios I. Zervakis

National Agricultural Research Foundation, Institute of Kalamata, Lakonikis 87, 24100 Kalamata, Greece, email: zervakis@kal.forthnet.gr

The cultivation of edible fungi is a controlled bioconversion of agro-industrial lignocellulosic wastes and residues into value-added products. The development of mushroom production methodologies on nonconventional substrates is one of the main targets of applied research in this domain. In the Mediterranean region, olive-oil mill wastes and byproducts are generated in huge quantities, and their handling or treatment is problematic mainly because of their high organic content, composition, and physicochemical properties. In contrast to the dominant centrifugal olive-oil extraction systems (where, in addition to olive oil, waste water and pomace are generated), the recently introduced two-phase decanters function by separating the malaxed olive paste from the oily phase without requiring any addition of water, thus producing very limited quantities of liquid wastes and a moister pomace, which resembles a semisolid sludge ("alpeorujo").

Until now, very limited research has been conducted on methods of treating wastes from the two-phase oil extraction system; it seems to improve olive oil quality, while resulting in an elevation of environmental problems associated with the generation of large quantities of waste water. In preliminary experiments, *Pleurotus eryngii* strains of various origins were screened for their efficacy to colonize media composed of alpeorujo and composted mixtures with olive press cake. For all fourteen strains tested, mycelium grew faster through the composted substrate than through the raw medium. The pretreatment-composting process partly elevated the toxicity of alpeorujo, while at the same time provided readily available nutrients from the action of the thermophilic microorganisms. It also ensured the presence of inducer compounds, which in the case of the white-rot fungi enhance the activity of their lignin-degrading enzymes.

Qualified strains were subsequently tested for their ability to grow and produce basidiomata on composted mixtures of alpeorujo and olive press cake; their performance was evaluated in comparison to data obtained from their cultivation on wheat straw supplemented by wheat bran. After evaluating several cultivation characters (earliness, total yield, yield per flush, biological efficiency, and basidioma mean size), it was found that earliness values, total yield, and basidioma mean size values were not statistically different between the two substrates. On the other hand, biological efficiency was slightly higher on wheat straw; for this particular substrate over 50% of the total mushroom yield was produced from the first flush, while the yield on alpeorujo was rather evenly distributed among the three flushes harvested.

It should be noted that the quality and organoleptic value of the mushrooms produced were exceptionally good in both media for all strains examined. To further enhance the productivity of the two substrates, a *P. eryngii* cultivation methodology was developed based on the application of a casing layer prior to primordia formation. In general, the use of olive by-products as alternative substrates provided promising results, as compared to wheat-straw based

substrates, for the cultivation of *P. eryngii*. These data confer significance to environmentally hazardous and/or low-economic-value agricultural wastes, which could be combined with the diversification of the mushroom market and the introduction of highly prized mushroom species.