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The Growing Effect of Vineyard and Winery Wastes on the Production of Mycelia and Fruit Bodies of Edible and Medicinal Fungi

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It is well known that huge amounts of waste and residue are produced annually during agroindustrial activities, and their utilization could allow self-sustainable processes and products, having a beneficial effect on soil as efficient environmental protection. Many of the lignocellulosic wastes cause serious environmental pollution effects if they are allowed to accumulate in the vineyards, or much worse, to be burned on the soil. At the same time, these wastes could provide an environmentally efficient way to solve the problem by the application of micro-organisms and processes in vine waste treatment and management.

The main aim of this work was to find the best way of recycling vine wastes by using them as a growing source for edible and medicinal mushrooms, in order to extend the food chain in vineyard ecosystems. According to this purpose, two fungal species from the Basidiomycetes group—*Lentinus edodes* (Shiitake) and *Pleurotus ostreatus* (Oyster Mushroom)—have been used to determine the growing effect of lignocellulosic vineyard wastes used as culture composts as well as winery wastes on the production of mycelia and fruit bodies that could be processed and marketed as useful products, such as food and drugs.

The experiments of this research work were achieved by growing all these fungal species in special culture rooms, where all the culture parameters were kept at optimal levels in order to get the highest production of fruit bodies. During the experiments, the effects of culture compost composition (carbon, nitrogen, and mineral sources) as well as other physical and chemical factors (such as temperature, inoculum size, CO_2 and O_2 concentration, air humidity, watering, light intensity, incubation time) on mycelial net formation and, especially, on fruit body induction were investigated.

The registered data revealed that lignocellulosic vine wastes can be used as substrates for mushroom growing only after some mechanical pretreatments to break down the whole lignocellulose structure in order to be more susceptible to fungal enzyme action. All these pretreated lignocellulosic wastes were disinfected by steam sterilization at 120 °C for 60 minutes. The final composition of culture composts was improved by adding grain seeds (wheat, rye, rice), $CaCO_3$, and $NH_4H_2PO_4$, to each kind of culture medium composition, depending on the fungal species used to be grown.

All the culture composts for mushroom growing were inoculated using liquid inoculum, aged 5–7 days, and the volume size ranging between 5% and 7% (v/w). The optimal temperatures for incubation and mycelia growth were maintained between 23 °C and 25 °C. The whole period of mushroom growing from inoculation to fruit body formation lasted between 15 and 35 days, depending on each fungal

species used in experiments. From all these fungal species tested in our experiments, *Pleurotus ostreatus* was registered as the fastest mushroom culture (15–20 days), in comparison with the fungal strains of *Lentinus edodes* (25–30 days).

As control samples for each variant of culture composts used for experimental growth of all these fungal species, we used wood chips of the oak that were kept in water 3 days before the experiments and were then steam sterilized for disinfection. Because of their high content of carbohydrates and nitrogen, the variants of culture composts supplemented with wheat grains at a ratio of 1:10 and rice grains at the ratio 1:5 as well as a water content of 60% were optimal for the fruit body production of *Pleurotus ostreatus* and, respectively, *Lentinus edodes*. In addition, some strains of this fungal species were grown in our experiments on culture substrates made of winery wastes and rye grains at a ratio of 1:7 and a water content of 50%. A higher ratio of rye grains might lead to an increase of total dry weight of the fruit body, but also could induce the formation of smaller fruit bodies than those of the control samples.

The results achieved by using propylene-bag cultures revealed that the composition of culture substrate had significant effects on fruit body production as well as on the characteristic shape of the fruit bodies. The final fruit body production of these fungal species used in experiments was registered between 7 and 10 kg, relative to 100 kg of compost.