Contribution to the exploitation of oil by-products for use in the production of quality feed through the fermentation with the fungal strain LGAM P123 of basidiomyces *Pleurotus ostreatus*

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Abstract
In Greece, large quantities of by-products are produced annually from urban and industrial activities among them very high olive oil production by-products. Thus, the interest of the scientific community has focused on the utilization of olive oil waste mainly as a feed using various microorganisms and fungi, of which only a small number can biodegrade the waste. In the present study the effect of solid fermentation of olive mill waste (OMW)-straw (in various proportions) mixture using the LGAM P123 strain of *Pleurotus ostreatus* under the conditions of experiments on the quality of the olive pomace is investigated. LGAM P123 strain was grown in solid and liquid substrates as well as in a mixture of the hay and olive-pomace substrate. The results obtained from the experimental procedure resulted in an increase in the proportion of proteins in straw and OMW mixtures. In addition, the content of fibrous matter in the fermented samples showed a significant decrease whereas total polyphenols appeared an extremely strong decrease.
Keywords: olive mill waste(OMW), *Pleurotus ostreatus*, fermentation, straw ,polyphenols

1. Introduction

The olive growing in Greece covers an area equal to 18% of the cultivated land. Approximately 250000tn of contaminated streams pollute the environment if they are disposed of but are renewable potential for re-use in agriculture. At the same time, they are valuable currency that is wasted for the import of protein feeds. The ability of fungi and a small number of microorganisms capable of cleaving celluloses and polyphenolic compounds makes them a tool for biotransformation of final agricultural waste into valuable commodities in principle for animal feed.A high percentage of unprocessed plant fibers, unacceptable to animals, prevents the introduction of unprocessed oil seed meal as a feed rather than its qualitative composition. Its low protein content (~7%) inhibits its use as feed and the presence of compounds such as phenols (Zervakis, 1996) that show a strong antioxidant effect make the food unsuitable for animals when contained in large concentrations. The upgrading of its nutritional value to be accepted by an animal can be achieved by fermentation by fungi fermentation and especially *Pleurotus ostreatus*. The ability of fungi and a small number of microorganisms capable of digesting celluloses and polyphenolic compounds makes them a tool for biotransformation of final agricultural waste into precious commodities in principle for animal feeds .Bibliographical references (Delis, 1996;Niaunakis and Halvadakis, 2006;Nasehim*et al.*, 2017)have shown that the nutritional value of the olive upgrading is achieved by the use of white-spotted fungi such as *Pleurotus ostreatus* by solid phase fermentation for biotransformation into feed.

The purpose of this study was to investigate the increase of its percentage beneficial constituents such as proteins, the reduction of its negative elements concentration such as phenols and fibrous substances in order to enhance the digestive digestibility of the fodder with bioactive fungal components.

Table 1. Total polyphenol concentration(mg/g D.W.)of OMW-straw mixture after 14 days fermentation with *P. ostreatus*.

Mixture OMW-straw	Total polyphenols start	Total polyphenols end	Reduction %
100% OMW	6,85	1,43	79,1
80% OMW + 20% straw	6,85	1,57	77,1
40% OMW + 60% straw	6,85	2,57	62,5
100% straw	6,87	1,09	84,1

2. Analytical procedure

2.1. Materials & Methods

Mushroom strain used in this study wasthe LGAM P123 strain of *Pleurotus ostreatus* from the edible mushrooms

lab of ITAP. OMW come from a three-phase olive oil factory from Chalkida. Various mixtures of OMW and straw as well as 100% of OMW or straw were fermented with 10% (v/w) inoculum of *P. ostreatus* for 14 days. Samples were taken at random in triplicate runs and measured for: Protein %(Kjeldahl method - AOAC, 2000),polyphenols(mg/g)and fibrous substances (% D.W. - Wende method).

3. Results

From the results reported below (Table 1, Figure 1 and 2) concerning the strain studied with respect to the fermentation of agricultural waste that were vaccinated with this one, the following were observed: An increase in the percentage of proteins from 9.7-31% that can be attributed to the accumulation of fungal biomass after 2 weeks of fermentation under suitable conditions. Also, the content of fibrous matter in the fermented samples showed a decrease of 4.4 - 26.7% while total polyphenols under went a strong reduction from 62.5 - 84.1% which was a study's target and bibliographically documented.

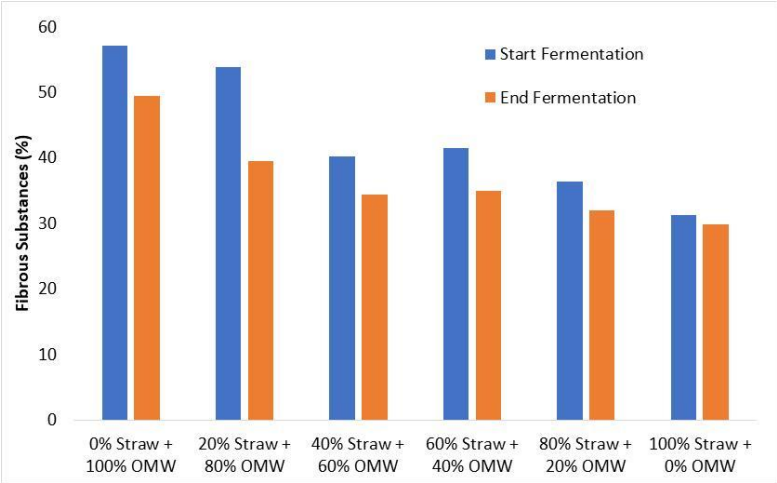

Figure 1. Fibrous substances variation (%d.w.) of OMW-straw after 14 days fermentation with *P. ostreatus*.

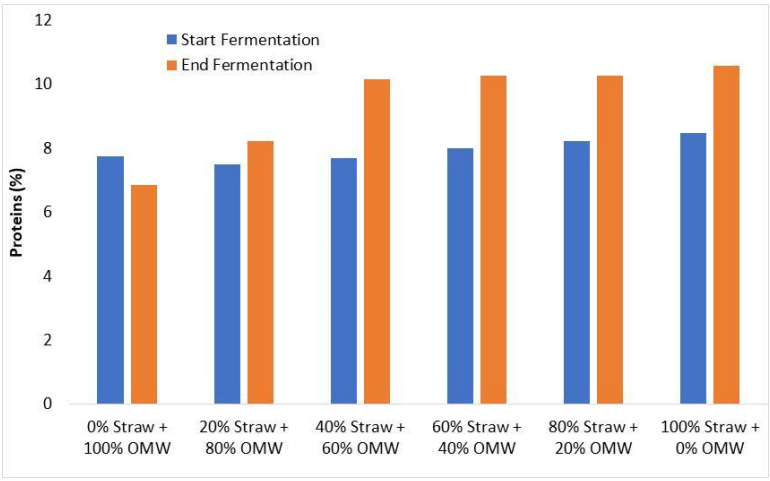

Figure 2. Proteins variation (% D.W.) of OMW-straw mixture after 14 days fermentation with *P. ostreatus*.

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