EVALUATION OF TOTAL POLYPHENOLS AND ANTIOXIDANT CAPACITY IN MUSHROOM EXTRACTS PLEUROTUS OSTREATUS AND LENTINULA EDODES

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INTRODUCTION

Knowing that mushrooms are present in all habitats due to adaptability in almost any substrate and climate. There are more than 200,000 species of which only 7,000 are known. Production of cultivated mushrooms exceeds 6.2 million tons, the value of which is close to 30 billion dollars. The growth rate is 11% and this is due to research on its medicinal and nutritional properties. This is the reason for the high demand for edible mushroom derived products [1].

The Orellana mushroom (Pleurotus ostreatus) is one of the edible mushrooms with the highest productivity growth during the last ten years due to its nutritional properties and the high percentage of proteins that allow replacing those of animal origin [2]. The mushroom is normally produced in organic matter and is considered as an alternative for the use of agro-industrial waste at low cost [3].

These mushrooms form a large group with very diverse species, differentiated by: color (yellow, white, gray, brown, pink), shapes, flavor and technical requirements [4]. Lentinula edodes is one of the most important edible mushrooms in the world from the point of view of production and is one of the most popular cultivated mushrooms [5].

It is known that the extracts of some mushrooms inhibit antioxidant activity by the natural aging process resulting from the action of free radicals and metabolism, which have antioxidant activity and whose study has focused on the kingdom plantae [6].

The research focused on studying the body of Pleurotus ostreatus and Lentinula edodes in order to exploit the presence of phenylpropanoids, as well as the determination of their antioxidant activity; these compounds could be responsible for the presence of such action in the extracts of these mushrooms.

The objective of this research work was to evaluate the total polyphenols and antioxidant capacity in extracts of Pleurotus ostreatus and Lentinula edodes mushrooms.

MATERIALS AND METHODS

This work was carried out in the Molecular Biology laboratory of the Research Department, as well as an air-conditioned room, with temperature and humidity control, Bolivar State University. To carry out this research, strains of edible mushrooms were used Pleurotus ostreatus (716/12) and Lentinula edodes strain L-SSG.

Experimental measurements

In the powdered mushrooms (Pleurotus ostreatus and Lentinula edodes) physical analyses were performed as: Humidity. It was performed under the international standard (AOAC 923.03); Elemental analysis of Carbon and Nitrogen, using an elemental analyzer (various macro cube/1922261/120V, USA), this according to the Dumas methodology.

Extracts preparation

To obtain extracts rich in phenolic compounds, extraction was carried out using two types of solvents: methanol and ethanol due to their polarity. For which a block design with factorial arrangement, AxB was applied (table 1). For the process, previously heavy mushrooms (3 g), dehydrated and pulverized by lyophilization and with a humidity of 4-6% were placed in amber glass bottles, then 25 ml of each of the solvents (80%). Each of the dilutions was stirred in a Thermo shaker (YVIMEN TR100-G, USA) for 15 min, then stored at 6000 rpm, at 10 °C, the supernatant was filtered through Whatman # 1 filter paper, the extracts were stored.

Statistical analysis

For this an analysis of variance (ANOVA) was applied to establish the differences between the treatments, also, to know the
because this minimum nitrogen content allows the formation of amino acids, proteins and fiber, in our study, _Pleurotus_ has the highest percentage with 5.33% followed by the _Lentinula_ with 4.87%, values that are within the established bibliographic ranges. Likewise, the same authors consider that the carbon content must be greater than 30%, in this case, the _Lentinula_ mushroom had the highest percentage with 38.87%. _Cortez et al._ [11], establishes that freeze-dried and powdered mushrooms must have carbon/nitrogen ratio values greater than 65%; As shown in our work, the two types of mushrooms have values higher than those mentioned in the bibliography.

### Polyphenol concentration

The results obtained show that the content of polyphenols predominates in the a1b1 treatment corresponding to the mushroom _Pleurotus_ + extraction with ethanolic and the lowest value corresponds to treatment 4 (78.92 mg/100g) (table 3).

### References

1. **Garcia et al.** Int J Curr Pharm Res, Vol 12, Issue 2, 96-99
are independent in presenting highly significant differences in polyphenol content.

Table 4: Analysis of variance for the response variable of total polyphenols

| Font                        | Gl | Sum of squares | Medium squares | F-Reason | P-Value |
|-----------------------------|----|----------------|----------------|----------|---------|
| A: Type of mushroom         | 2  | 12.64          | 6.32           | 0.000    |         |
| B: Type of solvent          | 3  | 3007.77        | 1002.59        | 0.000    |         |
| Interaction AB              | 6  | 9.52           | 1.59           | 639.7**  | 0.000   |
| Total                       | 11 | 3029.93        |                |          |         |

*Highly significant difference

The results are verified by Orús [13], which establishes that theoretical F values greater than 500 determine a widely marked difference between the different study factors. Having values that have statistical significance (639.7), the Tukey test was carried out to establish the difference in the means between the treatments.

Table 5: Comparison of means according to tukey at 5% for the treatments of the polyphenol response variable expressed in mg. gallic acid/100 g

| Treatments | Means     | Ranges |
|------------|-----------|--------|
| 1          | 102.78    | a      |
| 2          | 100.45    | b      |
| 3          | 81.83     | c      |
| 4          | 79.82     | c      |

After Tukey’s analysis, three homogeneous groups were identified, confirming the existence of statistically significant differences between the 4 treatments applied. Treatment 1 (Pleurotus ostreatus Ethanolic extract) has the highest polyphenol value with 102.78 mg, followed by treatment 2 (Pleurotus ostreatus methanolic extract) with 100.45 mg per 100 g, as noted by Radvic et to the. [12], the content of polyphenols in foods and zetas should exceed 92 mg per 100 g of sample.

Table 6: Antioxidant activity of the mushroom samples evaluated

| Sample                  | % Peroxidase inhibition |
|-------------------------|-------------------------|
| Pleurotus ostreatus     | 89.41                   |
| Lentinula edodes        | 88.04                   |

A high antioxidant power and inhibition of lipid peroxidation were found in the mushroom Lentinula edodes by Liu et al. [15], who reported values between 80.52-93.73%. Jin et al. [16], found high antioxidant activity in the fruiting bodies of Pleurotus ostreatus.

Analysis of antioxidant activity

The antioxidant activity of the mushrooms evaluated by the TBARS method, among which the capacity of the mushroom Pleurotus ostreatus stands out, since having the highest value 89.41%, inhibits oxidative degradation thanks to its ability to react with free radicals (table 6), these values agree with what Guzmán et al. [14], in which it determines that the percentage of peroxidase inhibition of a mushroom must be greater than 85% because in this way the product would act to promote the activity of antioxidant enzymes preventing the mushrooms from deteriorating.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

Declare none

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