ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11, S Iss 3, Dec 2022

Quantitative Phytochemical And Antioxidant Analysis Of *Pleurotus Opuntiae* (Durieu & Lev.) Sacc. Using Different Lignocellulosic Agroindustrial Residues

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ABSTRACT

Mushrooms have high protein content, usually around 20-30% by dry weight. This can be useful for vegetarians or anyone looking to increase the protein content in their diet. *Pleurotus* mushrooms commonly known as oyster mushrooms grow in the wild in tropical, subtropical and temperate regions. Cultivation of *Pleurotus* is a valuable and profitable agribusiness and is gaining rapid popularity amongst the entrepreneurs. In the present study quantitative phytochemical analysis of edible mushroom *Pleurotus opuntiae* was analysed using the extract acetone, aqueous and petroleum ether in the substrates of paddy straw and jack leaves The compounds such as protein and amino acid, glycoside, flavonoid, phenol and tannin were analysed. Antioxidant activity was determined by Superoxide anion scavenging activity, Hydroxyl radical scavenging assay and DPPH radical scavenging activity using the solvent acetone.

Key words

Pleurotus opuntiae, protein and amino acid, glycoside, flavonoid, phenol.

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Introduction

Mushrooms are characterized as macroscopic fungi which are recently introduced into the plant kingdom having spores and cell wall. Mushroom has been treated as a special kind of food, flavors, sauces and medicine for thousands of years. Edible mushroom means that this fungus has no dominant poisonous effect on human health and has aroma and pleasing taste. Mushroom is a type of macro fungi, due to their large structure seen with naked eye. They can appear either in hypogenous or epigeous form (Afiukwa *et al.,* 2013). In the family of

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Pleurotaceae, species of the genus *Pleurotus* are second most important commercial mushroom (Alan *et al.,* 2010). The genus *Pleurotus* (oyster mushroom) is an organoleptic fast growing fungus, which belongs to basidiomycota group. Although seventy species are discovered for this genus, only few of them are available in market such as *Pleurotus florida, Pleurotus sajor-caju* and *Pleurotus ostreatus.* The biodiversity of *Pleurotus* is main concern of numerous researchers. Most of research studies were conducted with the aim of clarifying more about this genus and its identification in terms of morphological appearances (Zervakis *et al.,* 2012). Mushrooms are not only used for foodstuff but also used as medicine because they contain phytochemicals like alkaloids, saponins, tannins, triterpenes, sterols and flavonoids (Ashoka and Shabudeen, 2015; Yadav and Agarwala, 2011). Antioxidants are defined as chemicals, whether synthetic or natural, capable of preventing the oxidative reactions of free radicals by exchanging its electrons with that of the free radicals for stabilization (Sanchez, 2017).

Materials and Methods

Kingdom	-	Fungi
Division	-	Basidiomycota
Class	-	Agaricomycetes
Order	-	Agaricales
Family	-	Pleurotaceae
Genus	-	*Pleurotus*
Species	-	*Opuntiae*

Collection of materials:

The spawn of edible mushroom *Pleurotus Opuntiae (Durieu & Lev.)* was collected from Vellayani Agriculture college, Thiruvananthapuram. The substrates used were paddy straw and jack leaves (*Artocarpus heterophyllus).*

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Preparation of extractions

About 10 gm of powdered mushrooms material was soaked separately in 100 ml of Acetone, Petroleum ether and Aqueous for 3-4 days at room temperature in dark condition. The extracts were filtered by using what man No. 1 filter paper. The filtrate was concentrated to dryness under reduced pressure at 400C using a rotary evaporator and stored at 40C for further use. Each extracts was re-suspended in the respective solvent and used for the quantitative analysis and antioxidant assays. Quantitative phytochemicals were analyzed by using standard procedures. Protein (Lowry *et al.,* 1951), Flavonoid (Ordonez *et al.,* 2006), Phenol (Siddhuraju, 2007), Glycoside (Solich *et al.,,* 1992), Tannin (Van – Burden and Robinson, 1981).

Antioxidant activity were analyzed by standard procedures DPPH radical scavenging activity assay (Williams *et al.,* 1995). Superoxide anion scavenging activity (Beauchamp and Fridovich, 1971)

Percentage of inhibition = (control OD−sample OD) / (control OD)] ×100

Results and Discussion

Quantitative Phytochemical Estimation

Quantitative phytochemical estimation of different solvent extracts of *Pleurotus opuntiae* in paddy straw substrate

The quantitative phytochemical analysis of different solvent extracts of *Pleurotus opuntiae* in paddy straw substrate were presented in table 1.

The acetone solvent extract showed maximum protein content 7.81 ± 0.02 mg/g followed by flavonoid 4.23 ± 0.08 mg/g, phenol 2.75 ± 0.10 mg/g and tannin 1.43 ± 0.07 mg/g resepectively. This result was correlated with the similar study by Okwulehie and Ogoke, (2013). The aqueous extract showed maximum protein content 7.38 ± 0.21 mg/g followed by flavonoid 3.61 ± 0.25 mg/g, glycoside 2.84 ± 0.10 mg/g, phenol 2.29 ± 0.12 mg/g and minimum content was noticed in tannin 1.30 ± 0.19 mg/g. In petroleum ether extract the protein content was maximum (6.84 ± 0.04 mg/g) and minimum amount was recorded in glycoside (2.42 ± 0.08

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mg/g). In the all three solvent extracts the protein content was maximum in acetone extract and tannin was minimum in aqueous extract. Similar reports were supported to this from previous literature (Ashoka and Shabudeen, 2015).

Table 1 : Quantitative phytochemical estimation of different solvent extracts of *Pleurotus opuntiae* in paddy straw substrate

Substrate	Chemical compounds (mg/g)	Different solvent extracts		
		Acetone	Aqueous	Petroleum ether
Paddy straw	Protein	7.81 ± 0.02	7.38 ± 0.21	6.50 ± 0.29
	Glycoside	2.30 ± 0.24	2.84 ± 0.10	2.21 ± 0.04
	Flavonoid	4.23 ± 0.08	3.61 ± 0.25	3.26 ± 0.17
	Phenol	2.75 ± 0.10	2.29 ± 0.12	2.68 ± 0.11
	Tannin	1.43 ± 0.07	1.30 ± 0.19	1.84 ± 0.10

❖ Each value is a mean of three data

Quantitative phytochemical estimation of different solvent extracts of *Pleurotus opuntiae* in jackfruit leaves *(Artocarpus heterophyllus)*

The quantitative phytochemical analysis of different solvent extracts of *Pleurotus opuntiae* in jack leaves *(Artocarpus heterophyllus)* were presented in table 2.

The acetone solvent extract of *Pleurotus opuntiae* cultivated in jack leaves substrate, the protein content (6.34 ± 0.08 mg/g) was maximum and phenol (2.11 ± 0.45 mg/g) was minimum. The aqueous extract showed the protein content 6.39 ± 0.11 mg/g glycoside 2.24 ± 0.16 mg/g, flavonoid 3.31 ± 0.06 mg/g, phenol 2.41 ± 0.17 mg/g and tannin 2.28 ± 0.21 mg/g respectively. In petroleum ether extract the protein content was maximum (6.84 ± 0.04 mg/g) and glycoside content was minimum (2.42 ± 0.05 mg/g). These results correlated with the previous work of Egwim *et al.,* (2011). In the all three solvent extract the protein content was maximum in

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petroleum ether extract and phenol was minimum in acetone (2.11 ± 0.45 mg/g) extract. The present study was related with Aarti and Astha, (2016).

Table 2 : Quantitative phytochemical estimation of different solvent extracts of *Pleurotus opuntiae* in jack leaves (*Artocarpus heterophyllus)*

Substrate	Chemical compounds (mg/g)	Different solvent extracts		
		Acetone	Aqueous	Petroleum ether
Jack leaves	Protein and amino acid	6.34 ± 0.08	6.39 ± 0.11	6.84 ± 0.04
	Glycoside	2.30 ± 0.05	2.24 ± 0.16	2.42 ± 0.08
	Flavonoid	3.34 ± 0.12	3.31 ± 0.06	3.32 ± 0.14
	Phenol	2.11 ± 0.45	2.41 ± 0.17	2.65 ± 0.09
	Tannin	2.75 ± 0.05	2.28 ± 0.21	2.76 ± 0.08

❖ Each value is a mean of three data

Antioxidant activity

Superoxide anion scavenging activity of *Pleurotus opuntiae* in paddy straw substrate

The acetone extract of *Pleurotus opuntiae* at 20, 40, 60, 80, and 100 µg/ml concentrations showed percentage activity values about 20.61 ± 0.22 %, 33.79 ± 0.49 %, 48.22 ± 0.09 %, 71.81 ± 0.33 % and 95.78 ± 0.70 % respectively. The IC_{50} Value of *Pleurotus opuntiae* extract was 50.56 µg/ml. Standard (Ascorbic acid) percentage activity at 20, 40, 60, 80 and 100 µg/ml concentration was 25.35 ± 0.55 %, 35.24 ± 0.58 %, 53.88 ± 0.46 %, 75.21 ± 0.32 % and 98.11 ± 0.23 % respectively. The IC_{50} value of Standard (Ascorbic acid) was 52.27 µg/ml. *Pleurotus opuntiae* extract showed less activity than that of standard (Ascorbic acid). Similar reports were reported by Ajith and Janadhanan, (2007).

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Table 3 : Superoxide anion scavenging activity of *Pleurotus opuntiae* in paddy straw substrate

Concentration	Inhibition (%)	IC 50
20	20.61 ± 0.22	50.56
40	33.79 ± 0.49	
60	48.22 ± 0.09	
80	71.81 ± 0.33	
100	95.78 ± 0.70	
Standard (Ascorbic acid)		52.27
20	25.35 ± 0.55	
40	35.24 ± 0.58	
60	53.88 ± 0.46	
80	75.21 ± 0.32	
100	98.11 ± 0.23	

❖ Each value is a mean of three data

DPPH radical scavenging activity of ***Pleurotus opuntiae*** **in paddy straw substrate**

DPPH radical scavenging activity of *Pleurotus opuntiae* showed 16.57 ± 0.23 % (20 µg/ml), 20.57 ± 0.62 % (40 µg/ml), 42.23 ± 0.29 % (60 µg/ml), 67.41 ± 0.31 % (80 µg/ml), 80.90 ± 0.63 % (100 µg/ml) respectively. The IC_{50} Value of *Pleurotus opuntiae* extract was 49.29 µg/ml. Standard (Ascorbic acid) showed the percentage values of 17.34 ± 0.13 %, 42.31 ± 0.38 54.88 ± 0.17 %, 68.18 ± 0.26 % and 91.92 ± 0.38 % at 20, 40, 60, 80 and 100 µg/ml concentrations. The IC_{50} Value of Standard Ascorbic acid was The IC_{50} Value of Standard Ascorbic acid was 54.70 µg/ml. The percentage activity of *Pleurotus opuntiae* compared to Standard ascorbic acid which showed less activity than that of standard value. Similar reports were supported to this study Ferreira (2009).

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Table : 4 DPPH radical scavenging activity of ***Pleurotus opuntiae*** **in paddy straw substrate**

Concentration	Inhibition (%)	IC 50
20	16.57 ± 0.23	49.29
40	20.57 ± 0.62	
60	42.23 ± 0.29	
80	67.41 ± 0.31	
100	80.90 ± 0.63	
Standard (Ascorbic acid)		54.70
20	17.34 ± 0.13	
40	42.31 ± 0.38	
60	54.88 ± 0.17	
80	68.18 ± 0.26	
100	91.92 ± 0.38	

❖ Each value is a mean of three data

Conclusion

Phytochemicals are naturally occurring and biologically active compounds found in plants which provide health insurance to human being and also protect plants from various diseases. According to the results reported the acetone extracts of *Pleurotus opuntiae* cultivated under paddy straw substrate had significant phytochemical activity. Further research should be focused to isolate the active compounds from *Pleurotus opuntiae* to commercialize their production and marketing. The overall study suggested that *Pleurotus opuntiae* contain natural antioxidant drug resource and used for scientific research in food and pharmaceutical industry

Acknowledgement

The authors thank the department of Botany and Research Centre, Scott Christian college (Autonomous), Nagercoil for providing laboratory facilities during the period of this research.

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