



A REVIEW

A review on medicinal properties of *Pleurotus ostreatus*

Sunil Kumar, Shivam Singh*, Akshay Kumar Ruhela, Rohit Bhatia, Subham Saurabh and Tummala Sirichand
Department of Plant Pathology, School of Agriculture, Lovely Professional University, Phagwara (Punjab) India
(Email: shivam.23596@lpu.co.in)

Abstract : Mushroom are eaten and liked by people all over the world not only because of their taste, aroma or nutritive values in food but also because of their medicinal properties. They are beneficial for human or animal health due to presence of active polysaccharide which boosts our immune system as well as prevent cell or microorganism growth which is harmful for our body. The extracted drug and oral doses both are efficient in prevention of many harmful biological effects like HIV, polio, inflammation, cancer, tumor, or virus growth. With their potential value and scavenging effect they are most significant functional food and can be used as food supplement.

Key Words : *Pleurotus ostreatus*, Medicinal properties, Antioxidant, Oyster mushroom, Active polysaccharide

View Point Article : Kumar, Sunil, Singh, Shivam, Ruhela, Akshay Kumar, Bhatia, Rohit, Saurabh, Subham and Sirichand, Tummala (2021). A review on medicinal properties of *Pleurotus ostreatus*. *Internat. J. agric. Sci.*, 17 (2) : 681-684, DOI:10.15740/HAS/IJAS/17.2/681-684. Copyright@2021: Hind Agri-Horticultural Society.

Article History : Received : 28.02.2021; Accepted : 15.03.2021

INTRODUCTION

Mushrooms belong to fungi family and are saprophytic in nature, having no chlorophyll (Tiram *et al.*, 2013). They contain hypha and a group of connected hyphae termed as mycelium (Jonathan *et al.*, 2012). Mushroom consist pileus or cap with stipe (stem) and volue (cup). They are rich in proteins (31-40%) and extremely good in potassium. Acc. to ancient records they are good source of food for the strength of Greek warriors in wars and Romans discern mushroom as food of Gods. Commercial cultivation have been started from last few decades and now it is a prominent source of food in today's world with wide industry network over 120 countries contribute to 4.3 billion tons (Chang *et al.*, 1996). At global market after button mushroom, oyster

mushrooms are succeeding in production and consumption account about 25% in production and consumption (Sethi *et al.*, 2012).

Mushrooms are found in thousands of varieties but oyster mushroom benevolent in slacking of tendons and veins (Tiram *et al.*, 2013 and Jonathan *et al.*, 2012). With the change in trend, the cultivation of *Pleurotus ostreatus* (oyster mushroom) attracted farmers along with the cultivation of *Agaricus bisporus* (button mushroom) (Salata *et al.*, 2018). The first cultivation of *Pleurotus ostreatus* was done in Germany for the sufficient food supply during World War II (Deepalakshmi *et al.*, 2014). The optimum temperature required for the growth of mycelium is 28°C and they can be cultivated in different kinds of agriculture waste. The ratio water to dry matter is 90:10 (Hoa *et al.*, 2015).

* Author for correspondence :

Apart from good taste, oyster mushrooms have antihypertensive, anti-aging, anti-microbial and antioxidant potential (Iwalokun *et al.*, 2007).



Fig. 1: Different types extracts for *Pleurotus ostreatus*

Medicinal properties:

Pleurotus ostreatus mushroom shows many medicinal properties due to which they are prepared in diet and contribute huge role in medicinal science. They shows anti-oxidant, anti-viral, anti-tumor, anti-lipidemic, hyperglycemia, hypotensive, anti-inflammatory, hypochlolesterolic, hypo protective, immunodulatory, anti-ageing, anti-bacterial, anti-fungal, anti-diabetic, anti-cancer and anti-allergic (Khan *et al.*, 2012).

Antioxidant:

Pleurotus spp. (Oyster mushroom) contains higher level of anti-oxidant than any other cultivated mushroom (Patel *et al.*, 2012). The presence of polysaccharide pleuran (β -glucan) (Bobek *et al.*, 2001) and Lectin (Zhang *et al.*, 2012) is responsible for the antioxidant potential. There are different kind of methods for extraction of antioxidant components - Ethanol extract, Methanol extract, Water and CO₂ extract, Watery extract, Acetone extract and Acid hydrolysis (Cruz *et al.*, 2020).

The naturally occurring components found in methanaloic extract (Yang *et al.*, 2002) which is ascorbic acid, α -tocopherol, Γ -tocopherol and Δ -tocopherol contributes about 10-15mg/ml. Due to its health beneficial properties, these mushrooms used as dietary supplement (Bjelakovic *et al.*, 2007). The scavenging activities are depending upon color with the concentration of 5mg/ml having EC₅₀ – 50.0 values (Olukemi *et al.*, 2021).

Antiviral :

Pleurotus ostreatus Mushroom show activity against human immunodeficiency virus-1 (HIV-1) reverse transcriptase (Wang *et al.*, 2000), influenza virus, dengue, respiratory, polio, hepatitis B (Hernández-Sánchez *et al.*,

2021) and hepatitis C (EL-Fakharany *et al.*, 2010). The aqueous methanol extract work against HSV-1, water extract work against the herpes simplex virus, in vitro extraction work against influenza A virus and HSV-2 whereas Ubiquitin inhibits HIV (Vlasenko *et al.*, 2018). These antiviral properties oyster mushroom play a significant role in improving immune system against many serious diseases.

Anti-tumor:

Solid tumor is occurred in the body due to presence DLA line cells. For cure of solid tumor Aqueous-Ethanol Extracts of *H. ulmarius* is used. Acc. to Panavalappil Greeshma *et al.* (2016), with experiment on mice stated that Blue oyster mushroom is highly responsible for anti-tumor activity. With their experiment they concluded that with the dose fruiting body of 1000mg/kg for 15 days resulted in 68.7% to 78.9% whereas with the oral dose, solid tumor reduced by 88% in mice (Greeshma *et al.*, 2018). *Pleurotus* spp. two type of highly active polysaccharides named Water-soluble polysaccharide (POPS-1) inhibit HeLa tumor cells and Heteropolysaccharide antioxidant and antitumor activity (Tong *et al.*, 2009; Ren *et al.*, 2015 and Pandya *et al.*, 2019).

Anti-cancer

With a study by Khan and Tania (2012) showed that water soluble extract inhibit prostate cancer PC-3 cells, hot water extract reduces MCF-7 breast cancer whereas methanol extract reduces MCF-7, MDA-MB-231 breast cancer and HT29, HCT-116 colon cancer (Khan *et al.*, 2012). But this provides significant cytotoxicity on PC-3 cells than any other cancer cells (Gu *et al.*, 2006). Oyster mushroom highly effective on 65.0-75.0% in 5mg/ml but not significantly effective on 80.5% cancer growth (Choi *et al.*, 2015).

Anti-Inflammatory :

In today's world with the change in environment and due to aging many inflammatory diseases increasing day by day such as Rheumatoid arthritis (Rivero-Perez, *et al.*, 2016). The best inhabitant property against inflammatory shown by aqueous extract of spent of oyster mushroom of barley straw/ *Chenopodium ambrosioides* L. with percentage of inhabitant of 89.5-99.5% (Rivero-Perez *et al.*, 2016). The carrageenan-induced paw oedema mode is used to decide the effect of anti-inflammatory aqueous extract (Winter *et al.*,

1962).

The Anti-Inflammatory Activities consists – Antihistamine activity, *In Vivo* Assay for Nitric Oxide Production by Peritoneal Cells, *In Vitro* Assay for Nitric Oxide Production by Peritoneal Cells, Assay for Membrane Stabilizing Activity and Assay for Carrageenan-Induced Infiltration of Peritoneal Cell. With these activities study concluded that mushroom is a potential anti-inflammatory functional food which prevents cell migration to the site of inflammation (Jayasuriya *et al.*, 2020).

Anti-bacterial and Anti-fungal :

Pleurotus spp. extracts also shows some anti-microbial activities like anti-bacterial and anti-fungal (Gregori *et al.*, 2007). P-anisaldehyde and 3-chloro-p-anisaldehyde inhibit growth of *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Aspergillus niger* and *Fusarium oxysporum* (Okamoto *et al.*, 2002). The crude extract is highly reactive against *Aspergillus niger* as well as on Gram negative and Gram positive bacteria (Gerasimenya *et al.*, 2002).

Other properties:

Pleurotus ostreatus also shows my other activities beneficial for health. They show Antihyperlipidemic which increases lipids amount in body (Abrams *et al.*, 2011), anti-allergic due to presence of β glucans polysaccharide (Abrams *et al.*, 2011), ant aging, hyperglycemia, hypotensive, hepatoprotective and anti-diabetic (Khan *et al.*, 2012).

Conclusion:

Mushroom possesses many biological activities. So many experiments performed on mice over the past few decades in search of significant medicinal use over diseases with their efficiency. With the proper consumption of mushroom in our daily life we can prevent many acute as well as chronic diseases. With the discover of new techniques and methods the extracted drug from *Pleurotus ostreatus* fruiting body helpful in manufacturing many medicines as well as consumed as supplement or functional food to full fill body requirement.

REFERENCES

Abrams, D. I., Couey, P., Shade, S. B., Kelly, M. E., Kamanu-Elias, N. and Stamets, P. (2011). Antihyperlipidemic effects of

Pleurotus ostreatus (Oyster mushrooms) in HIV-infected individuals taking antiretroviral therapy. *BMC Complementary & Alternative Medicine*, **11** (1): 1-8.

Bjelakovic, G., Nikolova, D., Glud, L. L., Simonetti, R.G. and Glud, C. (2007). Mortality in randomized trials of antioxidant supplements for primary and secondary prevention: systematic review and meta-analysis. *Jama*, **297** (8): 842-857.

Bobek, P. and Galbavy, S. (2001). Effect of pleuran (beta-glucan from *Pleurotus ostreatus*) on the antioxidant status of the organism and on dimethylhydrazine-induced precancerous lesions in rat colon. *British J. Biomedical Sci.*, **58** (3): 164.

Chang, S.T. and Buswell, J. A. (1996). Mushroom nutraceuticals. *World J. Microbiology & Biotechnology*, **12** (5): 473-476.

Choi, H. Y. and Ryu, H. S. (2015). Antioxidant and anticancer effects of water extract from *Pleurotus ostreatus*. *The Korean J. Food & Nutr.*, **28** (1): 60-65.

Cruz, C. P., Martínez, B. G. V., Santiago, A. D. P., Medina, M. A. S. and Montalvo, I. A. G. (2020). Antioxidant and antimicrobial activity of *Pleurotus ostreatus*. *J. Biology & Nature*, **12**(1): 47-56.

Deepalakshmi, K. and Sankaran, M. (2014). *Pleurotus ostreatus*: an oyster mushroom with nutritional and medicinal properties. *J. Biochemical Technology*, **5** (2) : 718-726.

Gerasimenya, V. P., Efremenkova, O. V., Kamzolkina, O. V., Bogush, T.A., Tolstych, I.V. and Zenkova, V.A. (2002). Antimicrobial and antitoxic action of edible and medicinal mushroom *Pleurotus ostreatus* (Jacq.: Fr.) Kumm extracts. *Internat. J. Medicinal Mushrooms*, **4** : 106.

Greeshma, P., Ravikumar, K. S., Neethu, M. N., Pandey, M., Zuhara, K. F. and Janardhanan, K. K. (2016). Antioxidant, anti-inflammatory and antitumor activities of cultured mycelia and fruiting bodies of the elm oyster mushroom, *Hypsizygus ulmarius* (Agaricomycetes). *Internat. J. Medicinal Mushrooms*, **18** (3) : 235-244.

Gregori, A., Švagelj, M. and Pohleven, J. (2007). Cultivation techniques and medicinal properties of *Pleurotus* spp. *Food Technology & Biotechnology*, **45**(3): 238-249.

Gu, Y. H. and Sivam, G. (2006). Cytotoxic effect of oyster mushroom *Pleurotus ostreatus* on human androgen-independent prostate cancer PC-3 cells. *J. Medicinal Food*, **9** (2) : 196-204.

Hernández-Sánchez, B., Santacruz-Juárez, E., Moore, D. and Sánchez, C. (2021). Bioactive compounds from fungi with antiviral activities: Mechanism of action and biosynthetic. *Mexican J. Biotechnol.*, **6** (1) : 165-189.

Hoa, H. T. and Wang, C. L. (2015). The effects of temperature and nutritional conditions on mycelium growth of two oyster

- mushrooms (*Pleurotus ostreatus* and *Pleurotus cystidiosus*). *Mycobiology*, **43** (1) : 14-23.
- Iwalokun, B. A., Usen, U. A., Otunba, A. A. and Olukoya, D. K. (2007).** Comparative phytochemical evaluation, antimicrobial and antioxidant properties of *Pleurotus ostreatus*. *African J. Biotechnology*, **6**:15.
- Jayasuriya, W. J. A. B. N., Handunnetti, S. M., Wanigatunge, C. A., Fernando, G. H., Abeytunga, D. T. U. and Suresh, T. S. (2020).** Anti-Inflammatory activity of *Pleurotus ostreatus*, a culinary medicinal mushroom, in wistar rats. *Evidence-based Complementary & Alternative Medicine*, :1-9.
- Jesenak, M., Hrubisko, M., Majtan, J., Rennerova, Z. and Banovcin, P. (2014).** Antiallergic effect of pleuran (β -glucan from *Pleurotus ostreatus*) in Children with Recurrent Respiratory Tract Infections. *Phytotherapy Research*, **28**(3): 471-474.
- Jonathan, S.G., Popoola, K.O.K., Olawuyi, O. J., Ajiboye, M. and Oyelakan, A.O. (2012).** Insect and fungal pests of some mushrooms collected from university of Ibadan, Nigeria campus. *Nature &Sci.*, **10** (9) : 142-147.
- Khan, M. A. and Tania, M. (2012).** Nutritional and medicinal importance of *Pleurotus* mushrooms: an overview. *Food Reviews Internat.*, **28**(3): 313-329.
- MEL-Fakharany, E., M Haroun, B., Ng, T. M. and Redwan, E. R. (2010).** Oyster mushroom laccase inhibits hepatitis C virus entry into peripheral blood cells and hepatoma cells. *Protein and Peptide Letters*, **17**(8):1031-1039.
- Okamoto, K., Narayama, S., Katsuo, A., Shigematsu, I. and Yanase, H. (2002).** Biosynthesis of p-anisaldehyde by the white-rot basidiomycete *Pleurotus ostreatus*. *J. Bioscience & Bioengineering*, **93** (2) : 207-210.
- Olukemi, B.C., Omomowo, I. O., Bukola, M. A., Elegbede, J.A. and Adebayo, E.A. (2021).** Free radical scavenging ability, mechanisms of action and health implications of oyster mushrooms (*Pleurotus* species): *Pleurotus* species (oyster mushrooms): free radical scavenging capacity. *J. Microbiology, Biotechnology & Food Sciences*, **10** (4):636-647.
- Pandya, U., Dhuldhaj, U. and Sahay, N.S. (2019).** Bioactive mushroom polysaccharides as antitumor: an overview. *Natural Product Research*, **33** (18) : 2668-2680.
- Patel, Y., Naraiian,R. and Singh, V.K. (2012).** Medicinal properties of *Pleurotus* species (*Oyster mushroom*): A review. *World J. Fungal & Plant Biology*, **3** (1) : 1-12.
- Ren, D., Jiao, Y., Yang, X., Yuan, L., Guo, J. and Zhao, Y. (2015).** Antioxidant and antitumor effects of polysaccharides from the fungus *Pleurotus abalonus*. *Chemico-Biological Interactions*, **237**: 166-174.
- Rivero-Perez, N., Ayala-Martinez, M., Zepeda-Bastida, A., Meneses-Mayo, M. and Ojeda-Ramirez, D. (2016).** Anti-inflammatory effect of aqueous extracts of spent *Pleurotus ostreatus* substrates in mouse ears treated with 12-O-tetradecanoylphorbol-13-acetate. *Indian J. Pharmacology*, **48** (2) : 141.
- Salata, A., Lemieszek, M. and Parzymies, M. (2018).** The nutritional and health properties of an oyster mushroom (*Pleurotus ostreatus* (Jacq. Fr) P. Kumm). *Acta Sci Pol Hortoru*, **17** : 185-197.
- Sethi, S., Sodhi, H.S., Dhanda, S. and Kapoor, S. (2012).** Cultivation of blue oyster mushroom, *Hypsizygous ulmarius* (Bull.) Redhead in Plains of Northern India. *Indian J. Ecol.*, **39** (2) : 195-199.
- Tiram, C. (2013).** Effect of different drying techniques on the nutritional values of oyster mushroom (*Pleurotus sajor-caju*). *Sains Malaysiana*, **42** (7) : 937-941.
- Tong, H., Xia, F., Feng, K., Sun, G., Gao, X., Sun, L. and Sun, X. (2009).** Structural characterization and *in vitro* antitumor activity of a novel polysaccharide isolated from the fruiting bodies of *Pleurotus ostreatus*. *Bioresource Technology*, **100** (4) : 1682-1686.
- Vlasenko, V. and Vlasenko, A. (2018).** Antiviral activity of fungi of the Novosibirsk Region: *Pleurotus ostreatus* and *P. pulmonarius*. In: *BIO Web of Conferences*, **11**:1-4.
- Wang, H. X. and Ng, T. B. (2000).** Isolation of a novel ubiquitin-like protein from *Pleurotus ostreatus* mushroom with anti-human immunodeficiency virus, translation-inhibitory, and ribonuclease activities. *Biochemical & Biophysical Research Communications*, **276** (2) : 587-593.
- Winter, C. A., Risley, E. A. and Nuss, G. W. (1962).** Carrageenin-induced edema in hind paw of the rat as an assay for antiinflammatory drugs. *Proceedings of the society for Experimental Biology & Medicine*, **111** (3): 544-547.
- Yang, J.H., Lin, H.C. and Mau, J.L. (2002).** Antioxidant properties of several commercial mushrooms. *Food Chemistry*, **77** (2) : 229-235.
- Zhang, Y., Dai, L., Kong, X. and Chen, L. (2012).** Characterization and *in vitro* antioxidant activities of polysaccharides from *Pleurotus ostreatus*. *Internat. J. Biological Macromolecules*, **51** (3) : 259-265.