

Nutritional and Pharmacological Aspects of Mushroom Cultivation

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Abstract

Mushrooms are the source of extra ordinary power and virility, used in conventional dishes, Have medicinal properties like ant cancerous, anticholesteral and antitumorous. Useful against diabetes, ulcer and lungs diseases, Mushrooms are the good source of protein, vitamins and minerals. As a low calorie high protein item with negligible starch and sugar, these are the delight of the diabetic. Very high potassium : sodium ratio, low calorie and fat make mushroom the choice of the dietician for those prone to obesity, hypertension. Many mushrooms are used traditionally as medicines in China, Korea & Japan. Ganoderma lucidum is the most popular medicine in China & used for wide range of health benefits, from preventive measures & maintenance of good health to treatment of chronic diseases. Mushroom cultivation is an income generating activity. On an extensive scale it can help solve many problems of global importance such as protein shortage resource recovery and reuse as well as environmental management. Cultivation of mushroom combined with waste utilization can be an economical and harmless method of waste disposal where lignocelluloses wastes are abundant. It can also provide employment opportunities for Landless Laborers, Rural Women and People from weaker sections and backward classes.

Keywords: *Mushrooms, maintenance, cultivation, opportunities*

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Introduction

Mushrooms are



The source of extra ordinary power and virility

Used in conventional dishes

Have medicinal properties like ant cancerous, anticholesteral and antitumorous.

Useful against diabetes, ulcer and lungs diseases

Mushrooms are the good source of protein, vitamins and minerals.

As a low calorie high protein item with negligible starch and sugar, these are the delight of the diabetic.

Very high potassium : sodium ratio, low calorie and fat (rich in linoleic acid and devoid of cholesterol) make mushroom the choice of the dietician for those prone to obesity, hypertension.

Mushroom cultivation is an income generating activity.

Mushroom cultivation on extensive scale can help solve many problems of global importance such as protein shortage resource recovery and reuse as well as environmental management.

Large quantities of renewable lignocellulosic residues are generated every year as a result of extensive agricultural practices. Lignocellulose consists of lignin, hemicellulose and cellulose. The chemical properties of the components of lignocellulosics make them a substrate of enormous biotechnological value. Disposal of this huge quantity of lignocellulosic wastes and their toxic effluents is an enormous environmental challenge. The burning of crop residues and wood for energy releases a number of toxic gases that causes environmental pollution. The huge amounts of residual plant biomass considered as “waste” can potentially be converted into various different value added products

1. Biofuels,
2. Chemicals,
3. Cheap energy sources for fermentation,
4. Improved animal feeds
5. Human nutrients.

Pleurotus species are fast colonizers that degrade a wide variety of lignin in different wood wastes. They produce extracellular enzymes (lignin peroxidases, manganese peroxidases, laccase etc.) that can modify and degrade lignin. The enormous increase

in our population has necessitated more and more production through alternate sources such as mushrooms.

The land is limiting factor in the production of food, but it is of relatively little importance in production of mushroom.

Cultivation of Mushrooms

Agro waste can be used as substrate

Preparation of Substrate :

i) Sterilization

- * Substrate straw is Sun-dried
- * Chopped into small bits (1-2cm long)
- * Soaked in water (18-24 hrs)
- * Boiled in water for 2 hrs
- * Cooled to ambient temperature
- * Excess of water drained out (moisture 70%)

ii) Spawning and spawn running

- * A unit straw is used
- * Layers of straw laid (5-6 cm height)
- * 2-4% grain spawn is inoculated
- * Bags perforated at regular intervals (9 cm) and kept in racks

iii) Incubation

- * The laboratory is ventilated with diffused light and disinfectant solution applied to avoid contamination
- * 85% humidity is maintained in the lab.
- * Full mycelial growth takes place within 10-15 days

iv) Harvesting

- * Developed matured fruiting bodies are harvested at once.

Biological Efficiency

$$\text{B.E.} = \frac{\text{Fresh wt. of mushroom}}{\text{Dry wt. of substrate}} \times 100$$

Food Value of Mushroom

Mushrooms are rich in proteins, vitamins and minerals, while poor in fat & carbohydrate.

A) Protein Content

- * Mushrooms contain 20-35% proteins (dry wt. basis) which are higher than in vegetables & fruits.
- * Quality of proteins is very good & can be a substitute for animal proteins.
- * These proteins are the sources of two essential amino acids *lysine & tryptophan* which are lacking in cereal diets.
- * Protein malnutrition problem in children and pregnant women can be minimized by supplementing the diets with mushroom.

B) Vitamins

- * Mushrooms have good source of several vitamins including thiamine (B₁), riboflavin (B₂), niacin, biotin & ascorbic acid.
- * Folic acid & vitamin B₁₂ (needed by pregnant & lactating women) and which are almost absent in vegetable are present in mushroom.
- * Vit K & Vit E are also reported in *A. bisporus*.

C) Minerals

- * Good source of minerals.
- * Calcium is present in significant amount.
- * Iron in low amount. But is present in available form which can maintain blood hemoglobin level.

D) Fats

- * Low fat content (0.3%)
 - Rich in palmitic, stearic, oleic & linoleic acid
 - Linoleic Acid – 70% of fatty acid content
 - This is comparable to that of fatty acid content of safflower seed oil
- * Cholesterol (dreaded sterol for heart patient) is totally absent
- * Ergosterol is present which can be converted into vitamin D by human body

E) Carbohydrate And Fibre

- Total carbohydrate content 4-5%
- (chitin, hemicelluloses & glycogen)
- *A. bisporus* – Pentoses, hexoses, amino sugars
- Mannitol-in high conc. (9-13%)
- Starch is absent
- Fibre content very high – 3-32%

which is helpful for prevention of constipation.

Thus Mushrooms are low calorie food with little fat and highly suitable for obese persons.

F) Moisture Content

* Fresh mushrooms contain 90% moisture

Pharmacological Activity

Many mushrooms are used traditionally as medicines in China, Korea & Japan.

Uses of Mushrooms in Medicine in China compiled by Yong & Jong (1989) are summarized in Table below

Mushroom In Chinese Traditional and Herbal Drugs

Sr. No	Mushroom	Indication
1	Agaricusbisporus	Stimulating digestion, curing hypertension
2	Auriculariapolytricha	Strengthening health, helping blood circulation
3	Boletus edulis	Causing muscles & joints to relax
4	Coriolusversicolor	Curing chronic diseases
5	Ganodermalucidum	Rejuvenating effects
6	Grifolafrondosa	Strengthening health & resisting diseases
7	Hericiumerinaceus	Beneficial to heart, kidney, liver, lungs & spleen.
8	Lentinusedodes	Strengthening health & resisting diseases
9	Pleurotusostreatus	Causing muscles & joints to relax
10	Tremellafuciformis	Strengthening health & resisting diseases
11	Tricholomamongoficum	Beneficial to stomach & intestine

Ganodermalucidum is the most popular medicine in China & used for wide range of health benefits, from preventive measures & maintenance of good health to treatment of chronic diseases (Chang, 1995).

Similarly use of

<i>Auriculariaauricula</i>	Piles & Stomach ailments
<i>Hericiumerinaceus</i>	for gastric ulcers
<i>Lentinulaedodes</i>	for B.P. & hyperacidity
<i>Volvarellavolvacea</i>	For B.P.

(Chang, 1996)

**Ganoderma +
Conventional Therapy**

For managing
Cancer & for its anti HIV effects
(Kim *et al.*, 1993)

antihepatitis B.

(Kino *et al.*, 1989)

Maitake

Anticancer effect Controlling B.P., diabetes
& Constipation to kill AIDS virus & enhance helper
T cells. National Cancer Inst. USA)

Medicinal effects of elements present in Mushroom.

Mushroom	Substances present	effect
Ganodermalucidum (Rishi Mushroom)	Polysaccharides, Triterpenes, Ling Zhi-8, adenosine, organic germanium, polyglycans, acid glucans, protein bind heteroglucans, eravinin, basiloglucan and peptoda-glycan	Impart resistance against various diseases such as anti HIV, anti-hepatitis B and Epstein Barr virus
Grifotafondosa (Maitake)	Proteoglucan	Blood pressure, diabetes, checking indigestion, cancer
Auricularia (Black ear)	Adenosine	Piles, stomach ailment health vigour. Blood pressure
Hanciunerinaceus	Polysaccharide, Eritadenic [2R, 3(R)-dihydroxy-4-(9-adenyl-butric acid)	Gastric ulcer, heart, kidney, liver, lung, spleen
Lentinusedodes (Shiitake)	Hirucitic acid, Lentinan	Blood pressure, Hyperacidity, cancer
Volvariella spp.	Volvatoxin, Flamutoxin	Blood pressure,
Tremellafusiformis		Maintaining health and developing resistance to different diseases
Pleurotusostreatus		Helpful in muscle and joints pain, cancer

Other uses of Mushrooms

S.N.	Important Ecological agent	General use
1	Fomesfomentarius, Ganodermaapplantum	A seude like substance is obtained for making costlier garments
2	Polyporusquamosus	Tissues like cork & used for making corks
3	Polyporusulphurus	To prepare yellow colour
4	Fomesignarius	To prepare brown colour
5	Amantiamuscaria (Poisonous mushroom)	To kill flies
6	P. fomentarius	Look like flowerpots
7	Ormaliamelia	Radiate light
8	Fomesanosus	Illuminate
9	Pleurotusjaponicus	Illuminate
10	Boletus edulis	One can read in illumination

Mushroom Cultivation: An Income Generating source.

To give one example - Returns of oyster mushroom cultivation in Lab-Scale Growing condition (Low-Cost Technology) will be approximately as follows

A) Expenditure (2 month period)	
Costs of materials used for one crop	
Residual agrowaste collected from local Agricultural fields	Rs. Nil
Spawn-available from local centre/ markets @ Rs. 30/-kg (@4% utilization).	Rs. 12.00
Polythene Bags for packing mushroom and cultivation purpose	Rs. 02.00
Fuel Cost	Rs. 05.00
Miscellaneous expenditure	Rs. 05.00
Total	Rs. 24.00
B) Returns	
Total yield (1 st flush + 2 nd flush) 284.80gm(W)+305.20gm(M)+280.64gm(T) +297.28gm(S)=1167.92gms Say 1.17 kg.	1.17 kg.
Local Market Selling Price @ Rs. 60/kg	Rs. 70.20 Say Rs. 70.00
Profit of Margin (for one crop only)	Rs. 70.00-24.00 = Rs. 46.00

Conclusion

Cultivation of mushroom combined with waste utilization can be an economical and harmless method of waste disposal. It has nutritional and medicinal benefits where nutritive foods are scarce and costly but lignocelluloses wastes are abundant. Thus “**Mushroom Growing Units**” can provide employment opportunities for Landless Laborers, Rural Women and People from weaker sections and backward classes.

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