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Research Paper :

Hypolipidemic effect of oyster mushroom nutraceuticals

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ABSTRACT

Pleurotus sajor-caju which is commercially grown was selected for development of nutraceutical. The present study was a multivariate experimental research design in which four nutraceuticals were developed out of mycelium and fruiting powder of oyster mushroom and in order to feed about 30 male albino rats which were randomly divided into five groups for a period of 30 days. Blood serum samples of rats were analyzed for lipid profile to know the effect. The effect of doses on serum lipid levels *i.e.* total cholesterol, triglyceride, HDL cholesterol and LDL cholesterol of albino rats were observed. Findings showed that the total cholesterol, triglyceride and LDL-ch levels were found significantly ($P < 0.01$) low in rats kept on doses of matured mycelium and immature two gram mycelium dose was found the most effective. The present study has identified the lipid lowering property of mushroom nutraceuticals. The study concludes that large doses of mycelium showed better lipid lowering effect than small doses.

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Key words : Oyster mushroom, *Pleurotus sajor-caju,* Mycelium, Hypolipidemic property

"Let food be your medicine and medicine be your food" said Hippocrate 2500 years ago. The philosophy of food as medicine is more relevant today than ever before. The Asian population has started recognizing the need of nutraceuticals because of the increasing degenerative diseases, healthcare costs and the lack of nutrition. In the last two decades, there has been an upsurge on the use of mushrooms as nutraceuticals. Mushrooms are the fungi that have been used as food since time immemorial.

Mushroom in general, *Pleurotus*, *Lentinus* and *Grifola* are popular because of their high fibre, proteins, micronutrient content and low calorific value which are almost ideal for cardiovascular diseases as first suggested by traditional Chinese medicine (Breene, 1990). Mushrooms contain several physiologically active substances including polysaccharides, heteroglucans, chitinous substances, peptidoglucans, heteroglucans, lectins, dietary fibre and organic substances, such as novel phenols.

Besides the aspects which make mushrooms 'the ultimate health food', because of presence of many useful medicinal attributes, active principles are like to be immunostimulating polysaccharides. Cochron (1978) have reviewed the literature on antibiotic activities (antiviral, antifungal and antibacterial) antitumor and hypolipidemic effects of mushrooms but most important and significant medicinal effects having recently attracted the attention of researchers are the antitumor, hypocholesterolemic, hypolipidemic, antihypertensive and hypoglycemic effects.

Mushrooms are traditionally used in Chinese medicine and are commonly used for pharmaceutical purpose and health foods. A number of medicinal mushrooms have recently been reported to posses significant antioxidant activity (Jones and Janardhanan, 2000). Oyster mushroom (*Pleurotus* species) is extremely delicious as well as conferring various health giving properties and benefits. Traditionally it has been used to strengthen veins and relax tendon. In China oyster mushroom is indicated for joint and muscle relaxation. An aqueous extract from the popularly cultivated oyster mushroom (*Pleurotus sajor-caju*) has been shown to exhibit hypotensive effect (Tam *et al.,* 1986).

Attempts have been made to develop medicines from wild mushroom as are highly medicinal but none of the attempts has been made to design dietary supplements out of commercially grown oyster mushroom. Therefore present investigation was designed to determine the hypolipidemic effect of oyster mushroom nutraceutical doses on serum lipid level of albino rats.

EXPERIMENTAL PROCEDURE

The study was conducted during the year 2006 in

the Department of Home Science, Sant Gadge Baba Amravati University, Maharashtra. It was a multivariate experimental research design in which four doses of mycelium were under study. A oyster mushroom sp. *i.e. Pleurotus sajor-caju* was selected because it is grown commercially in central India. Oyster mushroom nutraceuticals were developed out of immature mycelium (at filament stage) and matured mycelium (fully grown mycelium). Animal experiment was carried out to study the hypolipidemic effect of mycelium doses.

Mycelium was grown on Agar-agar medium and fruiting of oyster mushrooms was cultivated by polybag technique. Soy straw was selected for the cultivation of said mushroom species since it is locally available and showed highest biological efficacy (Deshmukh and Mane, 2001). Mycelium and fruiting of oyster mushroom were harvested from media and bags, respectively and were dried at 37^0C temperature. Dried matured and immature myceliums were then ground to form a fine powder.

About thirty male albino rats (Wistar strain) weighing 200-300g were obtained from the Department of Biochemistry, Rashtra Sant Tukdoji Maharaj Nagpur University, Maharashtra, India. Rats were randomly divided into five groups. Each group comprised of 6 rats. An animal laboratory was established in the department for feeding purpose.

Diets of animals under experiment were formulated as shown in Table 1. Control diet comprised casein, cornstarch, vegetable oil, vitamin mixture and mineral mixture (Oyetayo, 2006). Diets were fed to albino rats for a period of 30 days. Food and water were given in *adlibitum*.

After 30 days, blood samples from the control and experimental rats were collected by orbital sinus puncture using heparinized capillary glass tubes after 8 to 10 hours fasting. Blood samples were kept at room temperature for 2 hours and serum samples were separated by centrifugation at 3000 rpm for 10 minutes. Blood serum samples were analysed for total cholesterol by Liebermann-Burchard method (Raghuramulu, 2003), triglyceride by spectrophotometer method (Raghuramulu, 2003), HDL cholesterol by Heparin method (Varley *et al.,* 1984).

OBSERVATIONS AND ANALYSIS

The effect of doses on serum lipid levels *i.e.* total cholesterol; triglyceride, HDL cholesterol and LDL cholesterol of albino rats were observed (Fig. 1).

Fig. 1 indicates that lowest level of total cholesterol (51.77mg/dl) of albino rats kept on 2 g immature mycelium and highest level of cholesterol (59.98mg/dl) was observed in rats kept on matured mycelium dose. Cholesterol levels (64.60mg/dl) of rats kept on all the four doses were lower than the rats kept on control diet.

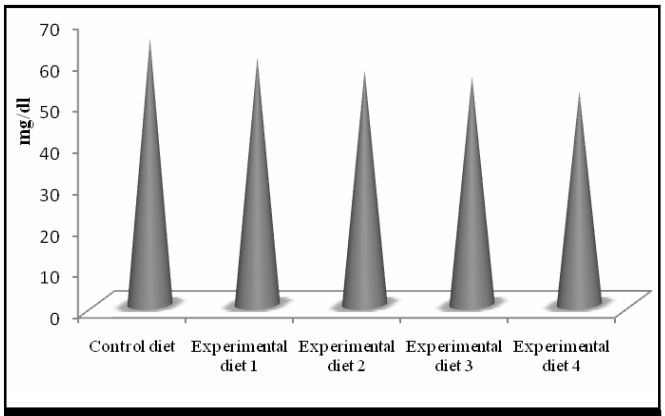

Fig. 1: Total cholesterol level (mg/dl) of albino rats fed on control and experimental diets

The effects of mushroom mycelium nutraceutical doses on triglyceride are shown in Fig. 2. High level of triglyceride (98.53mg/dl) was noted in rats kept on control diet which was without mycelium doses. In experimental diets, the highest triglyceride level (75.45mg/dl) of rats was observed in experimental diet 1 which comprised 5 g matured mycelium and lowest level (56.85mg/dl) was found in experimental diet 4 which comprised 2 g immature

Table 1: Composition of control and experimental diets (g)

Sr. No.	Ingredients (g)	Diets				
		Control	Experimental 1	Experimental 2	Experimental 3	Experimental 4
1.	Casein	10.00	10.00	10.00	10.00	10.00
2.	Matured mycelium Nutraceutical	-	05.00	10.00	-	-
3.	Immature mycelium Nutraceutical	-	-	-	01.00	02.00
4.	Corn starch	70.00	65.00	60.00	69.00	68.00
5.	Vegetable oil	20.00	20.00	20.00	20.00	20.00
6.	Vitamin (Mix)	00.50	00.50	00.50	00.50	00.50
7.	Mineral (Mix)	00.20	00.20	00.20	00.20	00.20

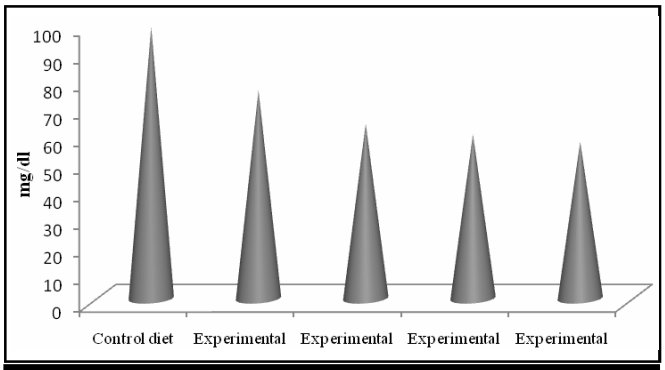

Fig. 2: Triglyceride level (mg/dl) of albino rats fed on control and experimental diets

mycelium. Experimental diet 2 showed better triglyceride (63.33mg/dl) reducing effect than experimental diet 1 (75.45mg/dl). Whereas experimental diet 4 comprised 2 g immature mycelium nutraceutical showed better triglyceride (59.52mg/dl) reducing effects than experimental diet 3 having 1 g immature mycelium. This reveals that matured as well as immature mycelium nutraceutical doses have triglyceride reducing property. Immature mycelium nutraceutical was found more effective than matured mycelium nutraceutical.

Fig. 3 shows no change in HDL cholesterol after feeding various experimental diets.

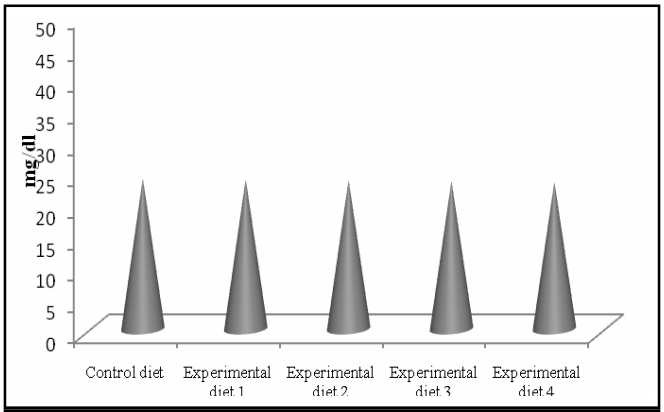

Fig. 3: HDL-ch level (mg/dl) of albino rats fed on control and experimental diets

Fig. 4 indicates the highest LDL-ch. level (21.08mg/dl) in rats fed by experimental diet 1 and the lowest LDL-ch. level (17.05mg/dl) were found in rats fed on experimental diet 4. Immature mycelium nutraceutical doses showed better LDL-ch. reducing property.

Fig. 5 shows the serum lipid levels of rats fed by experimental and control diet. The significant difference was found between the control and experimental diet 1 and 2 (between matured mycelium) at 1% level of

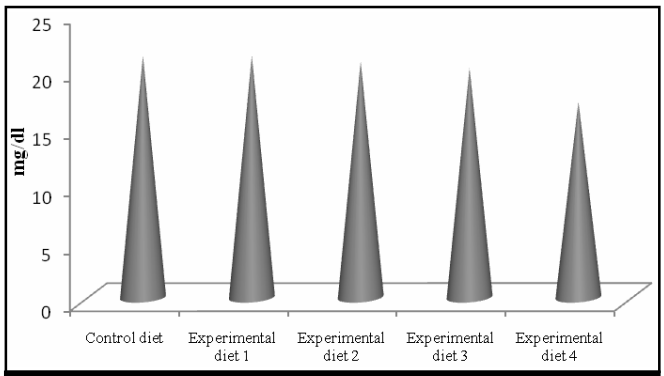

Fig. 4: LDL-ch level (mg/dl) of albino rats fed on control and experimental diets

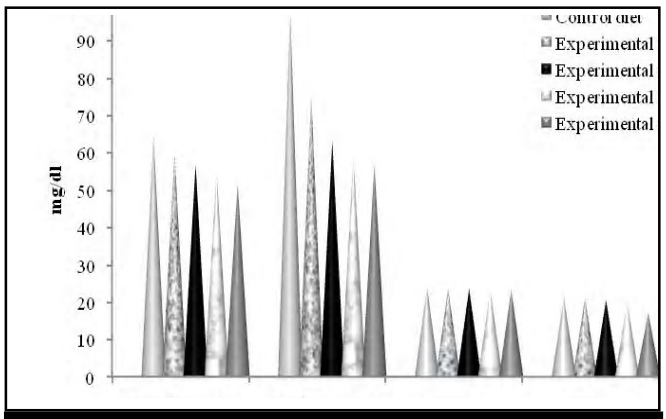

Fig. 5: 5 Serum lipid levels (mg/dl) of albino rats fed on control and experimental diets

probability. The significant difference was also found in the control and experimental diet 3 and 4 (between immature mycelium doses) at 1% level of probability. F-ratio between the rows *i.e.* control and experimental diets (between matured and immature mycelium doses) were found to be highly significant (P<0.01) in respect of lipid levels.

Chang and Buswell (1996) opined that B-glucans present in mushroom has cholesterol lowering property. Serum cholesterol level was found higher in rats because of ingestion of casein which has been reported by Srinivasan and Shanmugasundaran (1989). Chen and Anderson (1986) found that ingestion of soluble dietary fibre present in mushrooms increases small intestinal viscosity resulting in reduced bile acid and cholesterol absorption thus lowering serum cholesterol. Gunde and Plemenitas (2001) stated that *Pleurotus* spp. modulate the immune system, have hypoglycemic activity, antithrombotic effect and lower blood pressure and plasma lipid concentration. Thus, these studies lend support to the present investigation.

A pronounced hypocholesterimic effect of oyster

mushroom (*Pleurotus* species), combined with inhibition of lipid peroxidation was shown in rats and rabbits. Oyster mushroom diet (10% dried fruiting bodies) significantly reduced the incidence and size of atherosclerotic plaque in rabbits (Bobek and Galbavy, 1999). Koneda and Tokuda, (1966) stated that significant hypolipidemic and hypocholesterolemic effects of mushrooms have been reported in many mushrooms especially in *Lantinlus edodes* which has been shown to lower plasma cholesterol level in animals and man and effect was attributed to acceleration of cholesterol metabolism and increased cholesterol execution.

Present investigation showed that large dose of oyster mushroom nutraceutical gave better results than small dose. Matured and immature mycelium nutraceutical doses exhibited triglyceride lowering effect. In the present study, HDL-ch. concentrations, did not show significant difference between diets. LDL-ch. levels of rats were low which were kept on oyster mushroom nutraceutical. Boron (2000) stated that the higher the LDL-ch. the greater the atherosclerosis risk and conversely the higher the HDL-ch. the lower the risk.

Oyster mushroom matured mycelium and immature nutraceutical had lipid lowering effect due to presence of polyunsaturated fatty acids, polysaccharides like B-glucans, fibre (chitin) and good potassium and sodium ratio. On the basis of review, it is assumed that oyster mushroom works to show lipid lowering effect.

Conclusions:

The present study has identified the lipid lowering property of mushroom nutraceuticals. Immature mycelium showed better lipid lowering property than matured mycelium. Large doses of mushroom mycelium nutraceutical gave better lipid lowering effect than small doses.

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