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CULTIVATION OF MUSHROOM USING THE ENVIRONMENT RESIDUES AT HOME AND MAXIMIZING THE UTILIZATION OF NUTRITION AND HEALTH

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ABSTRACT

This study included in the first part the cultivation of two species of the mushroom, namely *Pleurotus ostreatus* and *Pleurotus sajour caju* on agrowastes. *P. ostreatus* showed the highest productivity in media composed of 25% rice straw + 75% sugarcane bagasse. The mushroom yield reached 378 g fruiting bodies / kg waste. The species *P. sajour caju* showed the highest productivity in media composed of 50% rice straw + 50 % sugarcane bagasse. The yield reached 356 g mushroom / kg waste. The second part was the biological assessment has been to the best of the breed in terms of productivity on the rats. The obtained data revealed that significant decrease in the level of cholesterol with the ratio of 5% mushroom better than 10%, while, showed that significant decrease in the level of triglycerides with the ratio of 10% mushroom better than 5%. Therefore, results showed that significant decrease in the level of GPT and glucose blood with the ratio of 10% mushroom better than 5%. These results suggest the utilization of agricultural residues available in Egypt for the production of mushrooms, which reduces the pollution of the environment and assist in the production of vital high value protein.

INTRODUCTION

In fact, mushrooms were known since the period of Ancient Egyptian who used it to make best dishes offered to Gods, and it was known as Gods Food. Mushrooms have a long history of use in Oriental and Traditional Chinese Medicine (OTCM), their legendary effects as an adaptive and on promoting good health and vitality have supported by recent studies (Armstrong and Jonathan, 2005). Therefore, it approved that quantity of proteins in mushroom is higher than in vegetables and equal to those in milk and legumes. In addition, they are twice as much proteins in leaf and nodules vegetables and fruits, but they are little than proteins in meats and eggs (Elian, 1997).

The real values of mushroom related to capacity for growing on cheap carbohydrates elements and transfer them to valuable proteins. Mushroom is easy for production in rural regions where there are huge quantities of environment-pollutant residues. It produced depending on the agricultural residues and we get high protein with lower prices. In addition, it called as vegetable meat for its nutritional farming and growing tonal position between meat and vegetables (El-Sawah, 2000). Sawdust were recommended as the best substrate for Oyster mushroom cultivation (Shah *et al*., 2004). There, also the following substrates: soybean straw, sunflower husks, wheat straw 50% + sunflower husks 50%, soybean straw 50% + sunflower husks 50% and wheat straw as a control. The substrate combinations with sunflower husks gave significantly higher yield and

incubated the substrate more rapidly with respect to the control (Bugarski *et al*., 2006). The three types of Oyster mushroom; *P. eryngii*, *P. ostreatus* and *P. sajour-caju* cultivated on wheat stalk. The total fresh mushroom yields obtained with 100 g material (70% moisture) after the three harvests and the total harvest time were calculated. *P. sajour-caju* gave the highest yield as 20.2 g. The yield of *P. ostreatus* was 17.9 g and the lowest yield was *P. eryngii*, 4.5 g. Total harvest time of mushrooms were determined. As the *P. sajour-caju* was harvested in 67.46 days, *P. ostreatus* was harvested in 82.64 days and *P. eryngii* was harvested in 85.27 days (Hilal and Abdunnasir, 2008).

Dried mushrooms (Boletus group) after cooking show the highest nutritional value, essentially due to insufficient rehydration dietary fiber, chitin and β-glucans, all functional constituents of mushrooms, are present in variable amounts (Manzi *et al*., 2001). The powder of mushroom "*Pleurotus and Agaricus*" both white and brown has been added in value of 2.5% to support semolina to produce spaghetti and this process has increased the size to the maximum and decreased loss value of spaghetti during cooking (Ragab, 2002). Therefore, over the last few decades the science of nutrition has progressed from being largely epidemiologically based to the greater understanding of the physiological and genetic mechanisms by which diet and individual food components influence health and disease (Hasler, 2003). Mushroom extracts as dietary supplements based on theories that they enhance immune function and promote health. To some extent, select mushrooms have been show to have stimulatory action on immune (Eric, 2008). Some animal studies have shown that Maitake mushroom may have an antidiabetic effect. Glucans from reishi mushroom and a glucanprotein from turkey tails have also shown antidiabetic promise in animal and in vitro tests (Hawksworth, 2001). Many of the medicinal mushrooms have been highly valued for other medicinal properties including high blood pressure, diabetes, antiviral, antibacterial, antioxidant, and free radical scavenging. Mushrooms containing anti-fungal substances, are particularly beneficial because they also stimulate the immune system (Jonathan, 2002). There also, is significant interest in the use of mushrooms and/or mushroom extracts as dietary supplements based on theories that they enhance immune function and promote health. To some extent, select mushrooms have been show to have stimulatory action on immune responsiveness (Andrea *et al*., 2005). The ethanol administration markedly increased the activities of GPT and GOT. Both mycelium and sporocarp of *A. camphorata* significantly decreased the activity of GOT and GPT, but the effects were not dose-dependent (Dai-Yu *et al*., 2003). Additionally, Mair (2007) found that the oyster mushroom lowers blood glucose and cholesterol. Therefore, he showed that the oyster mushroom significantly reduced the patients' systolic and diastolic blood pressure, glucose, total cholesterol, and triglycerides. However, Ohtsuki *et al*. (2006) concluded that intake of these four edible mushrooms can suppress TG accumulation in the liver, and can lower blood lipid levels. The implications of these findings highlight the hypolipidemic properties of the two tropical edible mushrooms (Oyetayo, 2006). While, in other study, the decreased levels of cholesterol in the blood

with Parallel reductions of cholesterol also occurred in very low-density lipoproteins (VLDL) by 53% and in low density lipoproteins (LDL) by 47% (Gardner, 2007). So, that the administration of polysaccharides from L. edodes significantly reduced serum total cholesterol (TC), triglyceride (TG), low density lipoprotein cholesterol (LDL-c) and enhanced serum antioxidant enzyme activity and thymus and liver index in high-fat rats (Chen *et al*., 2008).

The aim of studies: cultivation types of mushroom by using various wastes that are available in Damietta governorate. Then, innoval methods for cooking mushroom and biological evaluation of product mushroom.

MATERIALS AND METHODS

Materials:

Cultivated materials:

Fresh mushroom oyster mushroom *Pleurotus ostreatus* and *Pleurotus sajur caju* cultivated in research lab Faculty of Specific Education (Damietta), Home Economics Department, by using various media, *e.g.,* rice straw, which was stored immediately after harvest. Rice straw has been prepared by cutting to equal pieces 10-20 cm length. Sugarcane fibers which remaining from squeezing machine which have been cut, then soaked in water basin for 2 days, and soft saw dust remaining from furniture manufacturing in Damietta. Spawn brought from Faculty of Agriculture, Mansoura University.

Experimental mushroom:

Oyster mushroom *Pleurotus ostreatus* that obtained from mushroom research lab., Faculty of Specific Education (Damietta), Home Economics Department, whole mushroom was dried.

Experimental animals:

Male albino rats (Sprague–Dawley rats) purchased from Abo–Rawash farm. Weighting 100±12 g and used as experimental animals for the evaluation of oyster mushroom *Pleurotus ostruatus* as food.

Chemicals:

The chemicals were purchased from El-Gomohoreia Co. for Chem. and Drugs, Egypt. Kits for determination of Glucose, Triglycerides, GOT, GPT and Cholesterol obtained from Sci. Office Co., Damietta.

Methods:

Mushroom cultivation media:

Mushroom cultivation media was determined according to the method of El-Sawah (2000).

Mushroom:

1- Pleurotus ostreatus 2- Pleurotus sajur caju

Media:

Exp 1: material used was 100 % rice straw.
Exp 2: materials used were 50% rice straw + 50% sugarcane bagasse.
Exp 3: materials used were 75% rice straw +25 % sugarcane bagasse.
Exp 4: materials used were 25% rice straw + 75% sugarcane bagasse.

Exp 5: material used were 40% rice straw +40% sugarcane bagasse+ 20% saw dust.

Analytical methods:

Food Intake Analysis program has been used to analysis and define the nutritional value of most kinds of recipes.

Food intake analysis system:

The Food Intake Analysis System (FIAS) was used by Food Safety Department (Food Technology Research Institute, Agriculture Research Center, Giza) the (FIAS) is user microcomputer nutritional analysis software package designed to assist in the collection, entry, maintenance, storage, retrieval and analysis of food intake data from food records or recalls. The FIAS system includes nutritional analysis programs, nutrient data files, a sample food intake form and sample recipe form, and camera-ready copies of two-dimensional food models. The Food Intake Analysis System was developed by the University of Texas School of Public Health, Human Nutritional Center to assist researchers in obtaining and analyzing food intake data. The Food Intake Analysis System is appropriate for use in research, clinical and educational settings.

Biological Evaluation:

Feeding experiment:

Male albino rats were housed in cages in animal house lab in Faculty of Specific Education Damietta. Rats were adapted for two weeks by feeding normal synthetic diet (Table 1). After the adaptation period, rats were divided into 4 groups each group composed of 11 rats as follows:-The 1^{st} group feed on normal diet (control group). The 2^{nd} group was diabetic and fed on a normal diet (pos. control group). The 3^{rd} group was diabetic and fed on a diet contain 5% mushroom. The 4^{th} group was diabetic and fed on a diet contain 10% mushroom on various experimental diets for 6 weeks. Each rat was weighted biweekly and the food consumption was determined daily. At the end of the experimental period, rats were silenced without anesthetizing and blood was obtained immediately after decapitation by inverting rats over heparinized in a dry clean centrifuge tube. The blood samples were centrifuged at 400 rpm for 10 min. The clear plasma was carefully withdrawn and stored at -20°C until analysis.

Analysis of Serum

Total carbohydrate:

Determination of total cholesterol: was determined according to the method of Chaurchami *et al*. (1979). The absorbance of the developed color was measured spectrophotometerically at 550 nm.

Determination of Tri-glyceride:

Enzymatic calorimetric determination of triglyceride was carried out according to Fassati and Principe (1982).

The salt mixture (Table 1b) and vitamin mixture (Table 1c) were proposed by Hegested *et al.* (1941).

Table (1a): Composition of normal diet.

Component	Percentage of ingredient
Protein source	20.2%
a-Soy protein 6.6%	
b-protein concentration 7.2%	
c-cotton seed extract 4%	
d-corn protein 1.2%	
e-wheat bran 1.2%	
Carbohydrate source	62.3%
whole wheat 40%	
yellow corn 10%	
solid non fat milk 12.3%	
Fat source	
unhydrogenated cotton seed oil	12.5%
mineral source	1%
vitamin source	4%

Table (1b): Composition of salt mixture.

Component	g	Component	g
K_2HPO_4	640	$MgSO4.7H_2O$	204
NaCl	334	$ZnCl_2$	0.5
$CaHPO4.2H_2O$	150	KI	1.6
$MnSO_4.4H_2O$	10	$CuSO_4.5\ H_2O$	0.6
$CaCO_3$	600		

Table (1c): Composition of vitamin mixture.

Component	Amount	Component	Amount
Coline chloride	200gm	Riboflavin	1.0 mg
Para amino benzoic acid	10 gm	Inositol	25 mg
Pantothenic acid	4.0gm	Pyridoxine	0.4 mg
Thiamine	0.5	Biotin	0.02 mg
Folic acid	0.2gm	Niacin	4.0 mg
Vitamin D	100 IU	Vitamin K	0.5 mg
Vitamin A	200 IU	Vitamin B12	2.0 mg
Vitamin E	10 IU		

Determination of serum GOT and GPT activities

GOT and GPT activities were calorimetrically determined using a pye unicam spectrophotometer according to the method of Reitman and Frankel (1957).

Determination of glucose:

The determination of plasma glucose was carried out according to the method of Asatoor and King (1974).

Statistical analysis:

Analysis has been made by using SPSS version 11055 to analyze the variation according to EL Abasy (1992).

RESULT AND DISCUSSION

Cultivation of mushroom:

Different methods of cultivating *P. ostreatus:*

The data in Table (2) show that high productivity was in experiment 4 (25% straw + 75% sugarcane bagasse), 378 gm /kg compost, while, lower productivity was in experiment 5 (40% straw + 40 % sugarcane bagasse + 20% soft sawdust).

Table (2): Cultivating mushroom *P. osteruatus.**

Exp.	1st harvest	2nd harvest	3rd harvest	4th harvest	5th harvest	Total g/6kg medium
Exp 1-B	800	380	175	120	nil	1475
Exp 2-B	830	495	230	100	25	1680
Exp 3-B	800	310	150	25	nil	1285
Exp 4-B	970	500	250	120	50	1890
Exp 5-B	620	250	160	50	nil	1080

*** (5 Mars 2008 to 25 June 2008)**

Different methods of cultivating *P. sajour caju*:

The data are shown in Table (3) show that high productivity was in Exp.2 (50% rice straw + 50% sugarcane bagasse),356 gm / kg compost. However lower productivity was in Exp. 4, (25% straw + 75 % sugarcane bagasse).

Table (3): cultivating mushroom *P. sajour caju**

Exp.	1st harvest	2nd harvest	3rd harvest	4th harvest	5th harvest	Total g/6kg medium
Exp 1-A	600	180	130	150	25	1085
Exp 2-A	720	550	310	200	nil	1780
Exp 3-A	580	160	60	20	nil	820
Exp 4-A	320	170	110	45	nil	645
Exp 5-A	490	220	130	60	nil	900

*** (5 Mars 2008 to 25 June 2008)**

Total production (g) / Kg compost for two kinds of Oyster mushroom:

a) For *P. osteruatus* mushroom:

The data in Table (4) show that high productivity was in experiment 4 (25% straw + 75% sugarcane bagasse), 378 g /kg compost. While lower productivity was in experiment 5 (40% straw + 40 % sugarcane bagasse + 20% soft sawdust). These results are in agreement with those reported by Baysal *et al*. (2003) they found that the higher yield of oyster mushroom (*P. ostreatus*) on waste paper supplemented with peat, chicken manure and husk rice (350.2 g) were realized with the substrate composed of 20% rice husk in weight. In general, increasing the ratio of rice husk within the substrate accelerated spawn running, pin head and fruit body formation, and resulted in increased mushroom yields, while more peat and chicken manure had a negative effect on growing.

b) For *P. sajor caju* mushroom:

Data in the same Table show the productivity was high in Exp.2 (356 g/kg compost). However lower productivity was (129 g/kg compost) in Exp. 4. These results are higher with those reported Hilal and Abdunnasir (2008) they conducted to determine nutritive value and yield performance of the three types of oyster mushroom; *P. eryngii* (Dc. Ex Fr.) quel), *P. ostreatus* (Jacq.: Fr.) Kumm.) and *P. sajor-caju* (Fr.) Singer, cultivated on wheat stalk. The total fresh mushroom yields obtained with 100 g material (70% moisture) after the three harvests and the total harvest time were calculated. *P.sajor-caju* gave the highest yield as 20.2 g. The yield of *P. ostreatus* was 17.9 g and the lowest yield was *P. eryngii*, 4.5 g. Total harvest time of mushrooms were determined. As the *P. sajor-caju* was harvested in 67.46 days, *P. ostreatus* was harvested in 82.64 days.

Table (4): Total production (g) per 1 Kg compost for two kinds of Oyster mushroom (g/kg compost).

Experiment	*Species*	
	P. ostreatus	***P. sajor caju***
Exp 1-A	295	217
Exp 2-A	336	356
Exp 3-A	257	146
Exp 4-A	378	129
Exp 5-A	216	180

Biological evaluation of *P. ostreatus* as food:

Data presented in Table (5) declared that all treatments entered into with mushrooms 5% or 10% caused an obviously decrease in the level of moral serum cholesterol and triglyceride in both groups of rats infected with diabetes. Therefore, Table (5) clears that are significant differences between SPos group and S+5%mushroom group for S+5% group in cholesterol level, where The difference between the means > LSD value, 41.4 >8.540 at significant level (0.05). There are significant differences between SPos group and S+10% mushroom group for S+10% mushroom group in cholesterol level, where the difference between the means > LSD value, 30.00 >8.540 at significant level (0.05). While, there are significant differences between S+5% mushroom group and S+10% mushroom group for S+5% mushroom group in cholesterol level, where The difference between the means > LSD value , 11.4. > 8.540 at significant level (0.05).

Data in the same Table are shown that significant differences between SPOS group and S + 5% mushroom group for S + 5% group in triglyceride level, where the difference between the means > LSD value, 87.2 >11.317 at significant level (0.05). There are significant differences between SPOS group and S+10% mushroom group for S + 10% mushroom group in triglyceride level, where the difference between the means > LSD value, 90.4 >11.317 at significant level (0.05). while, there are not significant differences between S + 5% mushroom group and S+10% mushroom group in triglyceride level, where the difference between the means< LSD value, 3.2 < 11.317 at significant level (0.05).

Table (5): Total Triglyceride and total cholesterol of serum of rats in different groups.

Groups	Component		
	Total triglyceride mg/100 ml	**Total cholesterol mg/100 ml**	**Glucose blood mg/dl**
Control (Ne)	140 ± 3.32	133.40 ± 10.01	111±3.00
S control (pos)	115.80±3.42	156.80 ±10.33	227.60 ±12.90
S + 5% mush.	74.40±5.86	69.60 ±3.65	126.20 ±8.23
S + 10% mush.	85.80±8.32	66.40±9.07	115 ±8.00
LSD at (0.05)	11.317	8.540	23.845

S groups=diabetic groups with (5,10%) mushroom(*)
Ne=negative control ,Values are means ± SD for 10 rats.,
***LSD means Least Significant Difference.**

These results are agreement with Mair (2007) who declared that the diabetic rats lost body weight, but mushroom diet (MD) lost less body weight than control diet (CD). Blood glucose and serum total cholesterol levels in MD were lower than those in CD ($P<0.05$). Also, they concluded that dietary mushroom reduces blood glucose and cholesterol levels and affects renal glutathione enzyme activity in Streptozotocin (STZ) -induced diabetic rats Young *et al*. (2002). The oyster mushroom diet effectively prevented the progress of hypercholester-olaemia (decrease by 38 %) and cholesterol accumulation in liver (decrease by 25 %) that were induced by the cholesterol diet obtained by Mikus (2004). These results are in agreement with Gardner (2007), he studied hypocholesterolemic effects (lowering cholesterol) lies with its ability to reduce cholesterol absorption and increase plasma cholesterol removal by reducing the production and secretion of very low-density lipoproteins (VLDL). Rats were fed with a semi synthetic diet with 0.3 % of cholesterol 5 % of powdered oyster mushroom was added to the diet for 8 weeks, the level of serum cholesterol dropped significantly by 36%; and the accumulation of cholesterol in the liver fell by 51%.

Also, data in Table (6) show that are significant differences between SPOS group and S + 5% mushroom group for S + 5% mushroom group in Glucose level, where The difference between the means > LSD value, 101.4 > 23.845 at significant level (0.05). There are significant differences between SPOS group and S + 10% mushroom group for S + 10% mushroom group in glucose level, where the difference between the means > LSD value, 112.6 > 23.845 at significant level (0.05), while, there are not significant differences between S + 5% mushroom group and S + 10% mushroom group in Glucose level, where The difference between the means< LSD value ,11.2<23.845 at significant level (0.05). These results are in agreement with Kim *et al*. (2001) they stated that the hypoglycemic effect of the polysaccharide, investigated in streptozotocin induced diabetic rats, decreased plasma glucose, total cholesterol and triacylglycerol concentrations by 49, 32, and 28%, respectively, and aspartate amino transferase activity by 20%. The results indicate the potential of this polysaccharide to prevent hyperglycemia in diabetic patients.

Table (6): Liver functions GOT, GPT and albumin of serum of rats in different groups.

Groups	Component		
	GPT	GOT	Albumin
Control (ne)	22.0 ±832.	33.60 +0.55	5.82+0.18
S control(pos)	30.80 ±4.76	55.80 +1.30	3.82+1.48
S+5% mush.	15.80 ±2.39	28.40 +4.67	3.48 +0.06
S+10% mush.	16.20 ±2.68	27.60 +5.08	3.69 +0.37
LSD at (0.05)	4.747	5.587	

S groups= diabetic groups, with (5, 10%) mushroom*
Ne = negative control, Values are means ± SD for 10 rats.
***** LSD means Least Significant Difference**

Data in Table (6) showed that all treatments entered with mushrooms 5% or 10% caused a significant decrease in the level of GPT serum in both groups of rats infected with diabetes. Additionally, data clears that are significant differences between SPOS group and S+5% mushroom group for S+5% group in GPT level, where the difference between the means > LSD value, 15.00 >4.747 at significant level (0.05). So, are significant differences between SPOS group and S+10% mushroom group for S+10% mushroom group in GPT level, where the difference between the means > LSD value, 14.6 >4.747 at significant level (0.05). But, there are not significant differences between S+5% mushroom group and S+10% mushroom group in GPT level, where the difference between the means < LSD value , 0.40 < 4.747 at significant level (0.05). Data in the same table clear that are significant differences between SPOS group and S+5% mushroom group for S+5% group in GOT level, where the difference between the means > LSD value, 27.4 >5.587 at significant level (0.05). Therefore, there are significant differences between SPOS group and S+10% mushroom group for S+10% mushroom group in GOT level, where the difference between the means > LSD value, 28.2 > 5.587 at significant level (0.05). But, there are not significant differences between S+5% mushroom group and S+10% mushroom group in GOT level, where the difference between the means< LSD value, 0.8 < 5.587 at significant level (0.05).

On the other hand, both groups of rats infected with diabetes were caused an obviously decrease in the level of albumin serum in all treatments entered into with mushrooms 5% or 10%. There are significant differences between SPOS group and S+5% mushroom group for S+5% group in albumin level, where the difference between the means > LSD value, 2.316 >1.218 at significant level (0.05). Therefore, there are significant differences between SPOS group and S+10% mushroom group for S+10% mushroom group in albumin level, where the difference between the means > LSD value, 2.11 >1.218 at significant level (0.05). On the other hand, there are not significant differences between S+5% mushroom group and S+10% mushroom group in albumin level, where the difference between the means < LSD value, 0.21 < 1.218 at significant level (0.05). The results are in agreement with Hwang et al. (2005) who studied the plasma glucose level in the EPS-fed rats (EPS) was substantially reduced by 52.3% as compared to the diabetic rats (STZ), which is the highest hypoglycemic effect among mushroom derived materials

documented in literature. The activities of alanine aminotransferase (ALT)=GPT and asparate aminotransferase (AST) = GOT were significantly decreased by administration of P. baumii EPS, role in liver function thereby exhibiting a remedial the significant increase in weights of liver, spleen and kidney was observed in diabetic groups (both STZ and EPS) compared to NC. They examined whether the mycelium and sporocarp of A. camphorata protect against acute liver damage induced by ethanol in rats. The results showed that mycelium of A. camphorata significantly decreased the activity of GOT and GPT, but the effects were not dose-dependent Dai-Yu et al. (2003).

REFERENCES

Andrea, T.; Borchers, L. and Eric, M. (2005). Mushrooms, Tumors and Immunity. Rheumatology, Allergy, and Clinical Immunology. University of California, Davis School of Medicine, California 95616.

Armstrong, M.; R. M. Jonathan (2005). The benefits of mushroom for the treatment of some cancers. The University of Liverpool, Department of medicine, Liverpool, L69 3 GA, U.K.

Asatoor, A.M and King, E.J. (1974). Simplified colorimetric blood sugar method. Biochem. j., 56: XIIV.

Baysal, E; Peker, H; Yalinkilic, M.K. and A. Temiz (2003). Cultivation of oyster mushroom on waste paper with some added supplementary Bioresource-Technology, Oxford, 89(1): 95-97.

Bugarski, D; Gvozdenovic, D and Jovicevic, L (2006). Influence of substrates on fructification of Oyster mushroom strain NS-77 (*Pleurotus ostreatus*). Acta Horticulturae, 579-585.

Chaurchami ,A.J.; Miller, W. and Stein, J. (1979). Determination of total and free cholesterol .clin.Chem., 500-609.

Chen, X.; Yan, H and Jing, G. (2008). The pharmacological effect of polysaccharides from *Lentinus edodes* on the oxidative status and expression of VCAM-1mRNA of thoracic aorta endothelial cell in high-fat-diet rats. A Pharmaceutical School, Guilin Medical College, 541000, PR China, b Central South University of Forestry and Technology, PR.

Dai-Yu, Y; Chuang, C; Tsai, C. and Huang, S (2003). The protection of *Antrodia camphorata* against acute hepatotoxicity of alcohol in rats. Department of Food Science, National Chung-Hsing University Taiwan, J. Food Drug Analysis, 11(3):177-185.

Davies, V.L. (2002) .Gourmet mushroom. Gourmet Food $cooking Resource.

EL Abasy, A (1992). Statistical analysis by using spss soft ware, Statistical Institute, Cairo University, P 136-142.

El-Sawah, M.M.A. (2000). How to cultivate mushroom (Champignon–Mushroom) ?. Dar El-Nile, Publishing and Press, El-Mansoura.

Elian, A.M. (1997). Modern technology of mushroom farming and using. Al Dar El Arabia for Publishing and Distribution, Edition 1, p 13.

Eric, M. (2008). Mushrooms, Tumors, and Immunity. University of California, Davis School of Medicine, California, 95616.

Fassati, P. and Prencipe, L. (1982). Triglyceride enzymatic colorimetric method.J.of Clin. Chem., (28): 2077.

Fugate, C. and Aime, M.C. (2002). Edible mushroom from Guyana. Mycologist .18(3):104-111.

Gardner,B (2007). Hypocholesterolemic effects of oyster mushroom. Chinese Medicine News, Mymensingh Med J, 16(1):94-9.

Hasler, C.M (2003). Functional food the Western perspective. Nutrition Reviews, 54, 506-510.

Hawksworth, L (2001). Immunomodulatory substances of fungal origin. J. Immunology and Immunopharmacology, 3:115-122.

Hilal, A and Abdunnasir, Y (2008). Yield performances and nutritional contents of three oyster mushroom species cultivated on wheat stalk. African J. Biotechnol., 7(19): 3497-3501.

Hwang, J; Sang, K; Lim, J and JiHoon, J (2005). Hypoglycemic effect of crude exopolysaccharides produced by a medicinal mushroom *Phellinus baumii* in streptozotocin-induced diabetic rats. Life Sci., 76:3069-3080.

Jonathan, R.M. (2002). The benefits of mushroom for the treatment of some cancers. The University of Liverpool, Department of medicine, Liverpool, L69 3 GA, U.K.

Kim, D.; Yang, B; Jeong, S.; Park , J and Cho-Sung, P. (2001). Production of a hypoglycemic extracellular polysaccharide from the submerged culture of the mushroom, *Phellinus linteus*. Biotechnology-Letters, 23: 513-517.

Mair, M.G. (2007). Diabetes Insulin Resistance. Nutrition & Health Chinese Medicine News, China.

Manzi, P.; A. Aguzzi and L. Pizzoferrato (2001). Nutritional value of mushrooms widely consumed in Italy. Food-Chemistry, Oxford, 73(3): 321-325.

Mikus, M. (2004). Dietary Oyster Mushroom (*Pleurotus ostreatus*) Accelerates Plasma Cholesterol Turnover in ypercholesterolaemic Rat. Experimental Biology and Medicine, 229:393-406.

Ohtsuki, M; Umeshita, K; Kokean, Y. and Nishii, T. (2006). The hypolipidemic effects of some edible mushrooms on growing rats. J. Japan. Soc. Food Sci. Technol., 53(12): 612-618.

Oyetayo, F. L and A. A. Akindahunsi (2004). Nutrient distribution in wild and cultivated edible mushroom, *Pleurotus sajor-caju*. J. Food, Agric. Environ., Helsinki, Finland, 2(2):166-168.

Oyetayo,l (2006). Responses of plasma lipids to edible mushroom diets in albino rats. African J. Biotechnol., 5(13): 1263-1266.

Ragab, F. (2002). Studies on the bioconversion of some agricultural wastes using *Pleurotus* and *Agaricus* mushroom..Ph.D. Thesis, Fac. Agric, Cairo Univ., Egypt.

Reitman, S. and Frankel, S. (1957). Colorimetric determination of glutamic oxalacetic transaminase (GOT) activity .Amer. J. Clin. Path., 28:56.

Shah, Z.A; M. Ashraf and C.H, M Ishtiaq (2004). Comparative study on cultivation and yield performance of oyster mushroom (*Pleurotus ostreatus*) on different substrates (wheat straw, leaves, saw dust). Pakistan J. Nutrition 3(3): 158-160.

Young, C; Kim, H.; Bang, M and Kim, E (2002). Effects of dietary mushroom on blood glucose levels, lipid concentrations and glutathione enzymes in streptozotocin-induced diabetic rats. Korean J.Nutrition, 35(2): 183-191.

زراعة عيش الغراب منزليا على مخلفات البيئة وتعظيم الاستفادة منه غذائيا وصحيا

طلعت سحلول ، حامد عمارة ، فضل الديب، إيهاب أبو العدب و دينا البشوتى
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تهدف هذه الدراسة فى جزئها الأول زراعةأنواع عيش الغراب المحارى *Pleurotus ostreatus* ، *Pleurotus sajour caju* على المخلفات البيئية المتاحة ، ولقد أظهرت النتائج أن النوع *P. ostreatus* كان أعلى إنتاجية فى البيئ ة التى كان تكوينها (25% قش الأرز + 75 مصاصة القصب) حيث بلغت الإنتاجية جرام 378 جم / كجم بيئة .

بينما النوع *P. sajor caju* كان أعلى إنتاجية فى البيئة التى تتكون من (50% قش الأرز+50 مصاصة القصب) ، حيث بلغت الإنتاجية 356 جم / كجم بيئة .

أما الجزء الثانى من الدراسة فقد تم عمل تقييم بيولوجى لعيش الغراب من النوع *P. ostreatus* (وهى السلالة الأفضل من حيث الإنتاجية) بعد تجفيفه شمسيا وطحنه وتم دراسة تأثير التغذية على هذه السلالة من عيش الغراب على وظائف الكبد ومستوى الكولسترول والجلسريدات الثلاثية وجلوكوز الدم فى سيرم فئران التجارب المصابة بالسكر .

كما بينت نتائج الدراسة على 44 فأر من الذكور من النوع ((Sprague–Dawely Strain) ذات أوزان 100جرام، تم تقسيمهم إلى 4مجموعات كل مجموعة تتكون من 11 فأر وتتكون من :- المجموعة الرئيسية الأولى مجموعة كنترول وهى غير مصابة وتتكون من 11 فأر تتغذى على الغذاء الأساسى فقط. المجموعة الرئيسية الثانية تتكون من (33 فأر) تم حقنهم بمادة الألوكسان لإصابتهم بمرض السكر ثم قسمت الى 3 مجموعات فرعية كل مجموعة 11 فأر (المجموعة الفرعية الأولى تتغذى على الغذاء الأساسى فقط المجموعة الفرعية الثانية و الثالثة تتغذى على الغذاء الأساسى مضافا اليه 5% و 10% مسحوق مجفف من سلالة عيش الغراب تحت الدراسة على التوالى.

سجلت النتائج أن أعلى قيم للمأخوذ الغذائى كان مجموعة الكنترول العام (غير المصابة)28جرام ، بينما أقل قيمة كانت لمجموعة كنترول السكر التى تغذت على الغذاء الأساسى فقط وكانت تمثل 20جرام يوميا. وأن متوسط الزيادة فى وزن الفئران كانت 5.57+ 84 جم بالنسبة للمجموعة الكونترول العام (غير المصابة) ،وكانت فى مجموعة كنترول السكر 11.40+16جم ، أما مجموعة الفئران المصابة بالسكر وتتغذى على الغذاء الأساسى الذى يحتوى على 5%من مسحوق عيش الغراب المجفف 7.48+84 جم ، بينما مجموعة الفئران المصابة بالسكر وتتغذى على الغذاء الأساسى الذى يحتوى على 10% من مسحوق عيش الغراب المجفف كانت 4.04+88 جم . كذلك سجلت النتائج تحسن فى وزن كلا من(الكبد- القلب- الكلى –الطحال) حيث لم تظهر أى فروق معنوية بين المجموعة الضابطة السالبة والمجموعات الأخرى. كما أظهرت النتائج أن جميع المعاملات التى يدخل معها عيش الغراب بنسبة 5% أو 10% أحدثت انخفاضا ذات دلالة معنوية فى مستوى كلا من الكولسترول، الجلسريدات الثلاثية، سكر الدم وإنزيمات الكبد (GOT, GPT) فى سيرم الفئران سواء فى المجموعات المصابة بالسكر. بينما أظهرت جميع المعاملات التى يدخل معها عيش الغراب بنسبة 5% أو 10% انخفاضا ذات دلالة معنوية فى مستوى كلا من الألبيومين حمض اليوريك و اليوريا فى سيرم الفئران فى المجموعات المصابة بالسكر.

من النتائج المتحصل عليها توصى هذه الدراسة بالاستفادة من المخلفات الزراعية المتوفرة فى مصر فى إنتاج عيش الغراب مما يقلل من تلوث البيئة ويساعد فى إنتاج بروتين عالى القيمة الحيوية ، وينصح بالاهتمام بتناول عيش الغراب لمرضى السكر وتصلب الشرايين والكبد حيث أنه يقلل سكر الدم والكولسترول والجلسريدات الثلاثية وكان له دوره فى تحسين وظائف الكبد حيث أدى إلى انخفاض مستوى GOT, GPT.

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