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Production of *Pleurotus ostreatus* on Date Palm Residues

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It was observed that the mycelial growth of *Pleutrotus ostreatus* occurred on three different liquid media (Czapek' Dox; Starch Nitrate; Malt Extract), the maximum growth was on Malt Extract. Also, mycelial growth was tested on different proportion of seed + leaf media of date palms. Meanwhile, it was also found that the amount of lipid in seeds was higher than the leaves and also the ash content in the leaves was higher as compared to the seed. The maximum growth was found with 80% seed + 20% leaf in comparison to other media and best mycelial growth was recorded on the 8th day of incubation. The possibility of using date palm by-products (seeds and leaves) as a substrate for the production of fruiting bodies of *P. ostreatus* was investigated. The biological sufficiencies were 30.717% and 22.159% for 400gm and 200gm substrate bags, respectively. The obtained results were discussed from the agro-bio-ecological point of view. The results of chemical analysis showed that the fruiting bodies of *P. ostreatus* essentially contain 0.1gm lipids, 0.047 gm ash and 0.38 gms of fiber / 1 gm dry matter and 9.8 % nitrogen.

Key words: *Pleurotus ostreatus*, Date palm seeds and leaves, Mushroom production.

Environmental pollution is a major concern of many countries in the world because of the steady increase in population from the second half of the twentieth century, and this rise in population numbers offset by rising demand for agricultural products to meet the need of food and consequently increase the amount of waste put in the middle of the ocean. Part of the agricultural sector in Saudi Arabia (SA), we find palm cultivation, which can result in harmful residues of the surrounding environment. The genus *Pleurotus* (oyster mushroom) is widely cultivated as edible mushrooms due to their favorable organoleptic and medicinal properties, vigorous growth and to their simple and low cost production technology and higher biological efficiency[1,2]. *P. ostreatus* has been cultivated on many agricultural wastes such as cotton waste, cereal straw, corn cobs, sawdust, bagasse wood pulp, banana leaves, coconut husk, soybean baddy straw, tree bark and leaves etc[3,4].

The present study was undertaken to test the suitability of date palm seeds and leaves as substrata for the production of mushroom using different concentrations of date palm seeds and leaves.

MATERIALS AND METHODS

The Fungus

The strain of *Pleurotus ostreatus* was obtained from the Faculty of Agriculture, Alep University, Alep, Syria. The fungal growth study was carried out using three cultural growth media (Czapek'Dox; Starch nitrate; Malt extract) in order to choose the best medium for the growth. Erlenmeyer flasks (250 ml in capacity, with 100 ml culture medium) were inoculated with 0.5 cm disc of seven day old culture of the test mold

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and then incubated at a temperature of 25 °C for twelve days for the growth of the fungus and the dry weight of the mycelium was measured.

Preparation of date palm culture media

For inoculation of fungus both the selected test materials (date palm seeds and leaves; Fig 1) were mixed at different rations (zero to 100 %) as shown in Table 2. Chemical constitutes (total lipid, total nitrogen, total crude fiber and total ash) were determined by following the methods mentioned for determination of chemical composition of the fruit bodies.

The production of fruiting bodies

A cellophane bag (both of 400 and 200 grams) has been used in this work. The bags were filled with this mixture of date seeds and leaves (80 % seeds +20 % leaves), autoclaved and inoculated with 0.5 disc of *P. ostreatus*. The bags were incubated at 25°C for two weeks followed with changed the temperature to be 18 °C and the humidity to 90%. Fruiting bodies developed were collected and weighed, then preserved for chemical analysis. The calculated efficiency of the vital interest of the mushroom shellfish feeding calculates the percentage of fruiting bodies of fresh mixture to the dry farming used. The biological qualification was calculated.

Estimation of nutritional values of fruit bodies

The nutritional values (total lipid content, ash content, fiber content, and total nitrogen content) of all plant materials (fruiting bodies, date seeds and date leaves) were estimated according to AOAC[5].

Statistical Analysis

Treatment means were compared using least significant difference (LSD) analysis according to Daniel[6].

RESULTS AND DISCUSSION

The chemical constituents (ash content, fiber content, lipids content and nitrogen content) of both the substrata were determined. The palm seeds contained 0.0043 %, 0.5339 %, 0.0084 %, and 0.1850 %, of total ash, total crude fiber, total lipids, and total nitrogen, respectively and date palm leaves contained 0.0733, 0.4790, 0.0056, 0.3190 of total ash, total crude fiber, total lipid, and total nitrogen, respectively. The higher ash and nitrogen contents were recorded with date palm leaves, and higher crude fiber and lipids were found with date palm seeds. In all the cases significant differences were recorded. The chemical composition and nutritional value of date flesh have been reported by many authors; very few references are available on date palm seeds[7,8]. Because of high contents of all the mentioned material it may be considered as good substrata for mushroom production in SA.

The growth of the test fungus was measured in three different culture media (Table 1). The overall best growth was recorded with malt exact which was followed by starch nitrate and the

Table 1. Rate of growth of *Pleurotus ostreatus* on different cultural media

Incubation period (Day)	Growth on different cultural media (g/100 ml)		
	Malt extract	Starch nitrate	Chapeck-Dox
1	0.0217	ND	ND
2	0.0494	ND	ND
3	0.0732	ND	ND
4	0.1017	ND	ND
5	0.1299	ND	0.0092
6	0.1503	ND	0.0104
7	0.1571	0.0074	0.0132
8	0.1717	0.0098	0.0142
9	0.1886	0.0118	0.1470
10	0.2253	0.0149	0.0148
11	0.2075	0.0131	0.0154
12	0.1998	0.0127	0.0155

ND: Not detected under the experimental condition.

lowest was found with Chapeck's Dox. With the increase of incubation period the growth was increased up to 10 days but it was decreased after that. Nasim et al.[9] found that malt extract agar (MEA) provided faster *P. ostreatus* mycelial growth rates than did Murashige and Skoog's (MS) medium and potato dextrose agar (PDA). It may be concluded that malt exact medium may be used for

Table 2. Rate of radial growth (mm/day) of *P. ostreatus* on different substrata

Treatments (growth medium)	Rate of growth (mm/day)	Total growth (mm)
T_1 (100% seeds)	11.02	79.9
T_2(90% seeds)	11.15	79.9
T_3(80% seeds)	11.30	81.4
T_4(70% seeds)	11.39	80.5
T_5(60% seeds)	11.15	80.2
T_6(50% seeds)	10.73	79.0
T_7(40% seeds)	11.12	80.0
T_8(30% seeds)	11.20	78.4
T_9(20% seeds)	10.55	77.2
T_{10}(10% seeds)	7.38	57.2
T_{11}(100% leaves)	5.68	45.2
LSD at 0.05	1.02	6.88

Table 3. Effect of amount of growth medium and incubation period on the productivity of fruiting bodies of *Pleurotus ostreatus*

Amount of growth medium (g)	Incubation period (week)	Production (g)	Accumulative production (g)	Percent total production	Biological qualification (%)
200 g/ bag	1	15.19	15.19	43.58	22.159
	2	13.07	28.26	29.75	
	3	6.76	35.02	15.39	
	4	4.73	39.75	10.77	
	5	4.18	43.93	9.52	
400 g/ bag	1	31.77	31.77	36.45	30.717
	2	20.82	52.59	23.89	
	3	13.89	66.48	15.94	
	4	10.79	77.27	12.38	
	5	9.897	87.167	11.35	

Table 4. Chemical composition of fruiting bodies of *P. ostreatus* collected after different growth periods

Growth period (week)	Chemical composition (%)			
	Total lipids	Ash content	Fiber content	Nitrogen content
1	0.105	0.047	0.384	9.818
2	0.074	0.048	0.382	7.033
3	0.058	0.049	0.368	6.773
4	0.022	0.048	0.315	2.757
5	0.009	0.047	0.206	0.767
LSD at 0.05	0.0199	0.0004	0.039	1.067

Fig. 1. Grind leaves (a) and seeds (b) of date palm tree

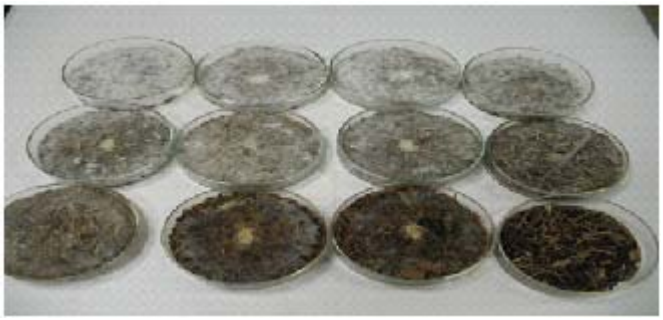

Fig. 2. The growth of *P. ostreatus* on date palm culture substrata

Fig. 3. Production of fruiting bodies of *Pleutrotus ostreatus* on date palm culture substratum in cellophane bags

growth of the fungus under laboratory conditions.

The growth of *P. ostreatus* on the selected test materials shown in Fig 2 and data presented in Table 2. Significantly higher growth of the fungus was recorded with treatments contained higher amount of seed materials as substratum. Many different types of substrata such as cotton waste, cereal straw, corn cobs, sawdust, bagasse wood pulp, banana leaves, coconut husk, soybean baddy straw, tree bark and leaves etc. were used for the production of mushroom but Date palm seeds and leaves were not used before for the production of mushroom. Different substrate combinations were evaluated for *P. ostreatus* mycelial growth and favorable combinations were *Tilia* spp. leaves with wheat bran and *Populus* spp. leaves with wheat straw[3]. The findings of the present experiment indicated that date palm seeds may be used as substratum for the production of mushroom in SA.

The effects of amount of growth medium and incubation period on the productivity of fruit bodies of *P. ostreatus* are presented in Table 3 and shown in Fig 3. The overall higher growth was found with 400 gms substratum then 200 gms. The accumulation production increased with increased of incubation periods, on the other hand the percent total production decreased with the increased of incubation periods for both the media. Significantly higher percent of biological qualifications were recorded in 400 gms medium. Diehle and Royse[10] studied the biological efficiency for the production of mushroom. Our work is similar to their work.

Percent chemical composition of fruiting bodies of *P. ostreatus* collected after different growth periods showed a wide range of variations (Table 4). Significant differences were recorded among the growth periods for all the parameters studied. Our results are more or less in agreement with the results obtained by many authors[11,12].

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