Grasas y Aceites
Vol. 50. Fasc. 5 (1999), 392-394

Short Paper

Effects of sesame and bitter almond seed oils on mycelium growth of *Agaricus bisporus* (Lange) Sing.

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RESUMEN

Efectos de los aceites de semillas de almendras amargas y sésamo en el crecimiento de micelios de *Agaricus bisporus* (Lange) Sing.

El crecimiento secundario de micelios de *Agaricus bisporus* del Centro de Investigación de Hongos de la Universidad de Nigde (Aksaray-Nigde) se siguió en agar con extracto de malta conteniendo aceites de semillas de almendra amarga o sésamo. El mayor crecimiento se obtuvo con aceite de sésamo al 1%, y el periodo más corto para dicho crecimiento se estableció en 27.4 días. Todas las muestras con aceite de sésamo mostraron mejor crecimiento que el control, siendo el efecto estimulante del aceite de sésamo mayor que el del aceite de almendra amarga.

PALABRAS-CLAVE: Aceite de semilla de almendra amarga - Aceite de sésamo - Agaricus bisporus - Crecimiento de micelio.

SUMMARY

Effects of sesame and bitter almond seed oils on mycelium growth of *Agaricus bisporus* (Lange) Sing.

Secondary mycelium growth of *Agaricus bisporus* from Nigde University Mushroom Research Centre (Aksaray-Nigde) was monitored in malt extract agar medium containing sesame or bitter almond seed oils. With 1% sesame oil, highest growth was established and less growth period was determined as 27.4 days. All of the samples with sesame oil showed better growth according to the control, being the stimulative effect of sesame oil higher than that of bitter almond oil.

KEY-WORDS: Agaricus bisporus - Bitter almond oil - Mycelium growth - Sesame oil.

1. INTRODUCTION

Production of mushrooms are made by mycelia. Secondary mycelia grown on different matters such as wheat or ricegrains in mushroom culture are used. These mycelia in English, French and German are known as «spawn», «blanco» and «burt» respectively. There is not still a settled down word like this in Turkish. But terms like «mycelium, ball mycelium, seed mycelium and mushroom seed» exist. The most common of these terms is seed mycelium. Wheat covered with mycelia for seed mycelium production are known as «secondary mycelium» (Günay *et al.* 1984). Purity and quality of seed mycelium are extremely important for mushroom cultivation.

The culture of *Agaricus bisporus* begins by spores increase, and the growth of vegetative mycelium is secured by spore germination in the media.

Seed mycelia are obtained from vegetative ones on wheat. Mycelia mixed with wheat are seed mycelia (Günay *et al.* 1984, Lambert 1960). Seed mycelium is inoculated to specific media or compost in suitable conditions. Mycelia grown in compost are covered by humus and sand mixing soil. By nitrogen addition compost into media as component during secondary mycelia growth, the production had increased (Schisler and Sinden 1966, Schroeder and Schisler 1981). Moreover, raw or refined plants oils added into mushroom compost increased the product output (Schisler 1967). In lipid metabolism studies concerned with *A. bisporus* showed that mushroom yield was increased by the oils (Schisler 1967, Lehrian *et al.*, 1976, Holtz and Schisler 1986, Mau *et al.*, 1991).

The objective of this work was to give the mycelium of *A. bisporus* a better growth in short time. The study made regard as effect of sesame and bitter almond oils on mycelium growth of *A. bisporus* had not been come across. The rapid growth in a short time of *A. bisporus* spores is profitable for mushroom cultivation.

2. MATERIALS AND METHODS

Agaricus bisporus used in this study (as material) was obtained from Nigde University Mushroom Research Centre (Aksaray). *A. bisporus* was extremely

mature, and its inside cover had not been opened. Sesame and bitter almond seed oils were used. The oils were extracted with dietyl ether by Soxhlet apparatus (Doğan and Başoğlu 1985).

The spore dusts by opining of its inside cover were obtained under sterile conditions. Spores were diluted with 2 ml distilled water and inoculated into prepared malt extract agar (composition = 0.5 g malt extract, 0.5 g agar and 25 ml distilled water) (Günay *et al.*, 1984, Booth 1971). Secondary mycelia obtained from spores grown on the medium were vegetative mycelia. Both oils at concentration of 0.1, 0.3, 0.5 and 1% concentrations were added into malt extract agar medium. Mixtures were sterilized in autoclave (at 121 °C, 1.5 atm, 20 min). On the other hand, petri plates (9 cm diameter) covered with paper were sterilized at 180 °C for one hour. The 20 ml mixture was added into petri plate at 90 °C and allowed to cool. Then, secondary vegetative mycelium pieces of 0.7 x 0.7 cm size were deposited in the centre of plate with mixed media and settled in a medium contained 80-90% moisture and incubated at 23-25 °C.

Mycelium growth was observed daily and determined as regional growth by designed with KP-80N digital planimeter (Kalyoncu 1996). Treatments were carried out as three replications and control.

Results were analysed for statistical significans by analysis of variance, and differences among groups were established by Duncan methods (Düzgünes *et al.*, 1987). Three petri plates were used at each replication. Determinations were completed when secondary mycelium growth covered all of the petri plate surface.

3. RESULTS AND DISCUSSION

Average days values of development for *A. bisporus* secondary mycelium in malt-extract agar with sesame oil or bitter almond oil and the control are given in Table I. In addition scope development of mycelium in media containing sesame oil or bitter almond oil and in the control are shown in Tables II and III.

Mycelium growth of *A. bisporus* in media contained at all (0.1, 0.3, 0.5 and 1.0)% concentration of sesame oil was lower than other concentrations (Table I). The lowest development period (27.4 days) of mycelium at 1.0% sesame oil was established. However, the highest duration (45.8 days) at 0.1 and 1.0% bitter almond oils was determined (Tables II and III). Development at control was obtained in 38 days as mean.

Average values among different oil concentration and days were statistically significant ($p < 0.05$). Effects of oils on mycelium growth were different according to the control. The growth with sesame oil was lower than the control and thus sesame oil showed inhibitory effect. But, bitter almond oil stimulated the growth according to control. The scope growth of mycelium was established as the highest with 0.5% sesame oil in 20-28 days, and lowest with 1.0% bitter almond oil in 0-28 days (Tables II and III). While media containing about 0.3% sesame oil completely covered the plate for 27.4 days as the earliest, the times at 0.1% and 1.0% bitter almond oils were on 34.2 and 45.8 days, respectively. This situation at control sample was determined as 38 days (Tables I, II and III).

Results were similar to those in the literature (Schisler 1966, Schisler and Patton 1971, Wardle and Schisler 1969, Schisler and Patton 1970a, Schisler and Patton 1970b). All the sesame oil concentrations decreased development period with regard to the control (Table I). However, bitter almond oil concentrations (except for 0.3%) also increased. The growth in media containing about 0.1 and 1.0% bitter almond oils extend to 40-50 days.

From these results, sesame oil more encouraged the mycelium growth of *A. bisporus* than bitter almond oil. The supplementation such as sesame or bitter almond oils inclined to increase mycelium growth and quality.

Table I

Average covering time to the petri plate of mycelium (days)

Concentration (%)	Sesame oil	Bitter almond oil	Control
0.1	30.6	45.8	38
0.3	29.1	34.2	38
0.5	29.2	39.3	38
1.0	27.4	45.8	38

Table II
Scope growth of control and sesame oil (cm^2)

Concentration (%)		Days							
		0	0-10	10-13	13-16	16-20	20-28	28-40	40-45
Sesame oil	0.1	2.033	5.266bc	14.300ab	22.733	32.833	52.666ab	66.500	—
	0.3	1.300	4.700bc	11.000bc	17.933	27.600	49.066ab	66.500	—
	0.5	2.033	7.166a	15.566a	21.733	34.933	59.533a	66.500	—
	1	1.833	5.966ab	13.666ab	19.000	33.933	58.033a	66.500	—
Control		1.800	4.000c	7.300c	21.433	29.500	43.466b	66.500	—
LSD*		0.816	1.715	3.958	6.823	8.108	12.740	6.868	

a, b, c: Differences among means indicated with minuscules are significant ($p < 0.05$).
*: Least significant difference.

Table III
Scope growth of control and bitter almond oil (cm^2)

Concentration (%)		Days							
		0	0-10	10-13	13-16	16-20	20-28	28-40	40-45
Bitter almond oil	0.1	1.166	4.366	7.300	10.700bc	15.566bc	24.500b	43.766b	56.266
	0.3	1.233	4.033	9.333	13.633bc	23.366ab	39.400a	66.500a	—
	0.5	1.500	3.866	7.166	16.033ab	21.333ab	39.000a	66.500a	—
	1.0	1.500	3.866	5.733	8.600c	10.733c	16.800b	45.700b	54.466
Control		1.800	4.000	7.300	21.433a	29.500a	43.466a	66.500a	—
LSD*		0.816	1.715	3.958	6.823	8.108	12.740	6.868	

a, b, c: Differences among means indicated with minuscules are significant ($p < 0.05$).
*: Least significant difference.

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Recibido: Julio 1998
Aceptado: Enero 1999