Production trial of *Pleurotus sajor-caju* (Indian oyster or phoenix) oyster mushroom

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Summary: Our experiments aimed at comparing the yields of the oyster mushroom hybrid *Pleurotus* HK 35 with those of the species *Pleurotus sajor-caju* on wheat straw. No data concerning the yields of the "Indian oyster" has so far been published in Hungary. The objective was, on the one hand, to discover what "phoenix" yields could be expected on 100 kg substrate, and on the other hand, to compare the yields with those of *Pleurotus* HK 35 which plays a dominant role in commercial production. We were also curious to know the amounts of harvest losses with the two mushrooms when picked with cut stems. It would be advisable to make progresses in developing production technology, especially in increasing yields. Considering that in its native place this species is able to provide yields even at temperatures of 22–28 °C, it seems possible that in hot summer months, as a shift from the hybrid HK 35, the production of the "Indian oyster" could be more economical.

Key words: *Pleurotus sajor-caju*, indian oyster, phoenix, oyster mushroom, wheat straw, flushes, bunch form, stem cut, oyster substrate

Introduction

Commercial production of different oyster mushroom species in Europe goes back only to two decades. Production seems to be dominated on the Continent mostly by the various hybrids from the crossings of pearl mushroom = *Pleorotus ostreatus* (Jacq. ex Fr./Kummer) and white oyster = *Pleurotus florida*. The variety now already sold as Duna HK 35 seems to emerge even from these hybrids and is produced all over Europe. Being a hybrid variety, the favourable characteristics of the parents are intrinsic to it: short growing time (does not require a 3–4 week maturing period after spawn run), does not require an exposure to cold for fruit body formation (is productive in warmer periods), high yields, and because spore maturation and dispersal are late, it can be cultivated also by people who are allergic to spores. It tolerates storing, cooling and transport relatively well. The breeder of the outstanding hybrid is Gyurkó P., researcher of the University of Forestry and Wood Technology in Sopron, who has bred more than 200 varieties. Many of them have been awarded official approval *(Győrfi,* 2001).

Dry matter content of oyster mushrooms is composed as follows: proteins constitute almost one fourth, carbohydrates one half, while various minerals constitute 6–10 percent, the majority of which are potash and phosphorous *(Lelley,* 1999). Besides vitamin C, thiamin, riboflavin, niacin and folic acid of the vitamin B group have also been detected in them. These mushroom species/varieties have been found also to contain an antibiotic, named pleurotin. Homeopathy recommends their consumption chiefly to reduce cholesterol level, to strengthen the veins and to loosen the tendons.

In Asia and in sub-tropical regions of the other continents several oyster mushroom species are grown which are scarcely known here in Europe. Among them, the "Indian oyster" *(Pleurotus sajor caju* (Fr.) Singer) deserves particular remark, which grows wildly on different woody euphorbias (mainly on *Euphorbia royleans)* at the foot of the Himalaya Mountains in India *(Singh,* 2000). In Hungary, the production of this species is not significant at the present moment, because its production technology in the national conditions is very little known and there is no demand because customers do not know it.

The experiment, in the first step, aimed at comparing the yields of *Pleurotus* HK 35 which is the most widely used variety in commercial production and those of *Pleurotus sajor-caju* on chopped wheat straw, on a substrate produced by dry heat treatment. According to the literature, in Europe, and in Spain in particular, the "Indian oyster" is cultivated on wheat straw after blending it with different supplements (maize cobs, maize stems, rye straw etc.). These supplements are mixed, humidified with water, than pasteurised for 4–5 days at a temperature of 72–73 °C *(Győrfi,* 2002).

Material and method

The experiment was arranged in a 5 x 12 m plastic tunnel, which was separately set up in a Filclair plastic house at the Experimental Station of the Faculty of Horticultural Sciences of SZIE in Soroksár.

The company Borotai Laska Kft. provided the straw chopped for 1.5–2 cm for the experiment, at the Station it was treated by dry heat at a temperature of 100°C then humidified. The substrate thus prepared was analysed for moisture content and total N content in the laboratory of the Department of Vegetable and Mushroom Growing. The following results were obtained from 3 parallel average samples: moisture content 69.5% and total N content 0.35%.

Inoculation was carried out as follows: 10–10 kg units of substrate were measured individually and 300 mg spawn was mixed in each unit. Each production trial contained 5 x 10 kg substrate (1 block 10 kg), 2 parallel tests were arranged in all. After inoculation the substrate was compressed in perforated polythene plastic bags and the openings of the bags were tied together as tight as possible. Finally, blocks were placed in the plastic tunnel set up for the experiment.

For measuring core temperatures, special compost thermometers were placed in every treatment.

The two types of mushroom were signed as below:

1st Treatment *(Pleurotus* HK 35 hybrid)

2nd Treatment *(Pleurotus* HK 35 hybrid)

3rd Treatment *(Pleurotus sajor-caju)*

4th Treatment *(Pleurotus sajor-caju)*

In the spawn run period, daily maximum and minimum temperatures were read every day at the same time (8.00 hours a.m.) in the spawn run site, which changed with outdoor temperatures between 16 and 21 °C over the whole spawn run period. Core temperatures of the blocks were also recorded every day. In the case of *Pleurotus* HK 35 core temperatures changed between 22 and 25 °C, while in the case of "Indian oyster" (being originally productive at higher temperatures) between 23 and 28 °C. During the pinning period and in the fruiting period both mushrooms had core temperatures of 20–21 °C. Spawn run period lasted for 22 days with both mushrooms, and pinning took 5–6 days. The first fruit bodies ready for being picked appeared on the same day with both mushrooms.

Results and discussion

In both test series, fruit bodies were picked separately from the 5–5 bags, and weights in bunch form and with cut stems were measured. Two flushes were harvested as common in practice. *Tables 1* and *2* show the yields of the two mushrooms, while Table 3 shows the yield results of the two mushrooms as compared to one another, as well as the amounts in bunch form and with the stems cut.

In this trial on the 50 kg substrate the yields of *Pleurotus* HK 35 were about 2 kg higher than those of *Pleurotus sajor-caju*. If the yield results of HK 35 are adapted to 100 kg substrate which is common in practice, it will be seen that very good yields have been obtained, that is about 24 kg mushroom/100 kg substrate when picked in bunch form. (Commercial producers calculate that 20–25 kg mushroom in bunch form must be produced on 100 substrate.)

Table 1 Yield results of *Pleurotus* HK 35 (in kg)

Days of picking	1st Treatment		2nd Treatment	
	Bunch form	Stems cut	Bunch form	Stems cut
1.	3.81	3.31	1.95	1.64
2.	1.77	1.50	2.30	1.97
3.	2.83	2.45	1.16	1.12
4.	1.30	1.21	1.41	1.25
5.	1.42	1.36	2.20	1.94
6.	0.98	0.97	1.51	1.37
7.	–	–	1.42	1.33
Total	12.11	10.8	12.11	10.80

Out of the treatment number 1 and 2, the number 2 is illustrated in *Figure 1*, which shows yield amounts and flushes. HK 35 gave 2 distinct flushes, which confirmed former experiences. In the first flush almost 57% of total fruit body amount was harvested.

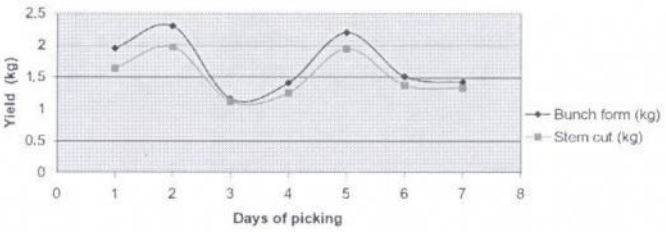

Figure 1 Yield amounts and flushes with HK 35 (2nd Treatment)

Considering, that no national data about the yields of the "Indian oyster" had been published, we must say that the first results (almost 20 kg mushroom/100 kg substrate) seem to be promising for the future. Out of the treatment number 3 and 4, the number 4 is illustrated in *Figure 2*, which shows yield amounts and flushes.

Table 2 Yield results of *Pleurotus sajor-caju* (in kg)

Days of picking	3rd Treatment		4th Treatment	
	Bunch form	Stems cut	Bunch form	Stems cut
1.	1.47	1.28	1.23	1.04
2.	1.34	1.23	2.35	2.16
3.	4.82	4.26	3.22	3.00
4.	1.08	1.04	1.54	1.34
5.	0.91	0.87	1.21	1.08
6.	–	–	0.67	0.55
Total	9.62	8.68	10.22	9.17

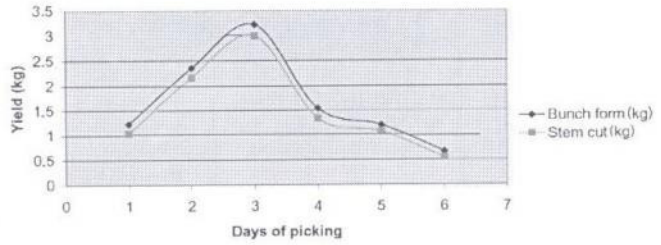

Figure 2 Yield amounts and flushes with *Pleurotus sajor-caju* (4th Treatment)

In the case of *Pleurotus sajor-caju* the first flush was protracted and the biggest yield was obtained on the 3rd day of picking, then, as shown by the form of the graph, the amounts picked reduced day by day, resulting in a protracted second flush. In the first flush 66% of total fruit body amount was harvested.

Table 3 Yields of the oyster mushrooms *Pleurotus* HK 35 and *Pleurotus sajor-caju* (in kg)

	Bunch-form	Stem cut	In % of stem cut
1st Treatment*	12.11	10.80	89.18%
2nd Treatment*	11.95	10.62	88.87%
3rd Treatment**	9.62	8.68	90.23%
4th Treatment **	10.22	9.17	89.73%

**Pleurotus* HK 35 hybrid
** *Pleurotus sajor caju*

As indicated by the figures of *Table 3* and by *Figure 3*, harvest losses are 10–12% in the case of the two mushrooms with no significant difference to be observed between them.

The appearance of the fruit bodies of the two mushrooms was also visually tested at picking. It is worth to note that the fruit bodies picked were appealing in the case of both

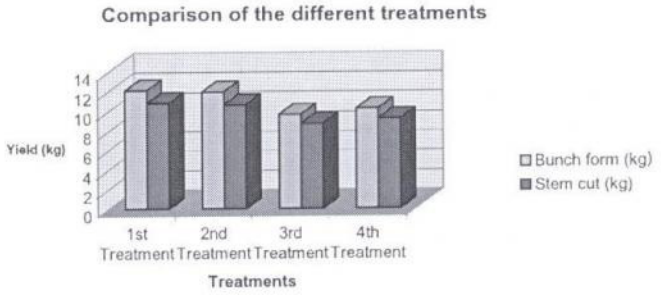

Figure 3 Yield results of the two mushrooms as compared to one another, as well as the ratio of mushroom in bunch form and with the stems cut

mushrooms. It seems that the edges of the caps of HK 35 are much liable to break and split than those of the "Indian oyster". This factor is a very important point in marketing. Perhaps, it is not per chance that in Mediterranean countries (Spain, South-Italy) it is the phoenix whose production is preferred, because of better tolerance to heat? Perhaps, in hot summer months will become general in our national oyster mushroom production? These series of experiments did not provide, were not suitable to provide a definite answer. Our future objective is to obtain further data in connection with the above-mentioned questions by means of different experiments and also for practical applications.

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