Journal of Phytology 2010, 2(10): 60–65
An Open Access Journal

ISSN: 2075-6240
Available Online: www.journal-phytology.com

REGULAR ARTICLE

INFLUENCE OF SUPPLEMENTS ON THE QUALITY PARAMETERS OF *PLEUROTUS SAJOR-CAJU* (FR.) SINGER

P.A. Sheikh*, Shaheen Kauser, M.Y. Ghani, N. A. Munshi, K. A. Bhat and Fahim Amin
Division of Plant Pathology Sher-e-Kashmir, University of Agricultural Sciences and Technology of Kashmir, Shalimar, Srinagar – 191121, J & K, India

SUMMARY

Various supplements viz., *Artemisia*, soybean, '*baisen*'(*Cicer arietinum*) rice bran, apple pomace, wheat bran, '*moong dal*' (*Vigna radiate*), maize flour at different concentrations (0.5, 1.0 and 1.5%) to a single base material i.e, paddy straw were evaluated for their influence on total number of flushes, average number and weight of fruit bodies and diameter of stipe and pileus. *Artemisia* recorded lowest average number (51.4) and highest weight (16.33g) of a fruit body. Whereas the highest average number (68.8) and lowest average weight (12.88) was registered in apple pomace. The average maximum diameter of pileus (12.33cm) was observed in *Artemisia* and lowest in apple pomace (10.89cm). Similarly, average maximum diameter of stipe (0.98cm) was recorded on soybean and lowest in maize flour (0.71cm).

Key words: *Pleurotus* sajor-caju, Quality parameters, Supplements

P.A. Sheikh et al. Influence of Supplements on the Quality Parameters of *Pleurotus sajor-caju* (Fr.) Singer. J Phytol 2/10 (2010) 60-65
*Corresponding Author, Email: sheikh.spa786@gmail.com

1. Introduction

Most of the fungi have strong enzyme system and are capable of utilizing complex organic compounds which occur as agricultural wastes and industrial by-products. Mushroom fungi also belong to this group. Thus agricultural wastes can also be used as bedding material for mushroom cultivation (Khan and Chaudhry, 1989). The oyster mushroom *Pleurotus* sp. is cultivated in many countries both in sub-tropical and temperate regions of the world (Leong, 1980). An attractive feature of this group of mushroom is that they can utilize a large variety of agricultural waste products and transform the lignocellulosic biomass into food of high quality, flavor and nutritive value (Quimio, 1978). Cultivation of edible mushrooms combines both skill and scientific technology in which agricultural wastes are recycled to produce a protein rich but cheap human food. So far, about 25 species of more than 2,000 edible fungi are widely accepted for human consumption but only a few of them are being cultivated commercially. In genus *Pleurotus*, more number of species have been reported as cultivated than in any other edible fungus. Interestingly, among commercially cultivated mushrooms, *Pleurotus* is well known edible fungi appreciated for their culinary properties and broader adaptability under varied agro-climatic conditions. It contributes about 24.1 percent (0.909 million metric tones) of the total mushroom production of 3.772 million metric tones (Munshi and Ghani, 2003).

The genus *Pleurotus,* though relatively new to mushroom industry, has gained much popularity world over and is presently believed to be potential rival of commonly cultivated button mushroom (*Agaricus bisporus*). Almost all species of genus *Pleurotus* occur commonly as wood decomposers in forests throughout the world. In many countries *Pleurotus* spp. are collected and cultivated as choice edibles (Chang *et al*., 1981). The nutritional requirement and the limits of physical environment for mycelial growth and fruiting have been investigated for many *Pleurotus sp.* (Krishnamoorthy, 1997). In addition several practical aspects of cultivation using cereal straw, sawdust and rice husk have been summarized (Zadrazil, 1978). Recent studies have indicated that cotton waste is also good substrate for the cultivation of *Pleurotus* sp. (Leong, 1980). For the cultivation of *P. ostreatus* cotton waste (Leong, 1980), paddy straw (Khanna and Garcha, 1982), sawdust and rice bran (Qiumio, 1978), wheat straw (Zadrazil, 1976) and waste paper (Hashimoto and Takahashi, 1976), were used. Dubey (1999) reported that out of six locally available substrates (paddy straw, wheat straw, maize stalks, ragi straw, sugarcane leaves and groundnut shells) evaluated for improving yield of four species of *Pleurotus* viz., *P.sajur-caju, P. flabellatus, P. ostreatus* and *P. cystidiosus* under laboratory conditions, paddy straw produced the highest number of sporophores and highest biological efficiency in all the species of *Pleurotus* followed by wheat straw for *P. flabellatus* and *P. ostreatus* and ragi straw in the case of *P. sajor-caju* and *P. cystidiosus*. Supplementation of the best substrate (paddy straw) with pigeon pea '*dal*' powder at 5 per cent on a dry weight basis during spawning gave the highest number of sporophores and yielded maximum biological efficiency during three flushes in all four species of *Pleurotus* followed by gram '*dal*' powder and karanj cake. However, wheat and rice bran inhibited the yield. The oyster mushroom *Pleurotus sajor-caju* (Fr.) Singer has gained considerable popularity in its artificial cultivation due to its rapid mycelial growth, high saprophytic colonization ability, simple and cheap cultivation techniques and easy post harvest storage. Number of substrates have been evaluated under Kashmir conditions for the production of *Pleurotus* sp. and maximum yield has been obtained on paddy straw (Anonymous, 2005). However, no work has been done on the effect of different supplements on the improvement of yield and quality characters.

2. Materials and Method

The pure culture of *Pleurotus sajor–caju (*Fr.) Singer used in present investigation was procured from Mushroom Research & Training Centre, Division of Plant Pathology, SKUAST-K, Shalimar, Srinagar. The mass culture multiplied on potato dextrose agar medium. Spawn preparation procedure as described by Munjal (1973) was adopted. During the present investigation locally available cheap agricultural by product namely paddy straw was used as base material for cultivation of *Pleurotus sajor-caju*. The chopping of paddy straw was done manually into bits of 3-5 cm in length and were cleaned thoroughly 5-6 times with tap water and then soaked in water for 12 hours. These were then dipped in boiling water for 30 minutes, taken out, cooled in wooden basket and kept there till excess water was drained off. The desired moisture content of the straw was tested by squeezing the straw in between the palms and seeing that droplets of water do not trickle out from the straw.

The supplements *Artemisia*, soyabean, '*baisen' (Cicer arietinum)*, rice-bran, apple pomace, wheat brawn, '*moong dal*' (*Vigna radiate)* flour, maize flour were pre-treated with .Carbendazim 50 WP @ 0.05%. Paddy straw as base material alone (control) and mixed with *Artemisia*, soyabean, '*baisen*', rice bran, apple pomace, wheat bran, '*moong dal*' flour, maize flour each at 0.5, 1.0 and 1.5 percent concentrations. During present investigations bag method of cultivation was adopted. Seventy five polythene bags measuring 75 x 45 cm with 6 holes were used. Filling and spawning of substrates was done simultaneously. Filling of substrate in the polythene bags was done in layers. The polythene bags were filled at the rate of 4 kg dry substrate. These bags were then incubated inside the cropping room for 15-19 days at room temperature (20 to 28^{o}C) and relative humidity 80 percent for colonization. The walls and floor of cropping room were watered once daily to maintain requisite humidity. The polythene bags were cut open when the substrates were completely colonized with mycelium. The inward curling of margins of pilus of fruiting bodies was considered as the sign of their maturity. These fresh mushrooms were harvested for 31 days after the start of fruiting.

3. Results and Discussion

The data pertaining to influence of different concentrations of supplements viz-a-viz (control) on different quality parameters is presented and discussed below.

Number of cropping flushes

During the present investigation there was no significant effect of different concentrations of supplements tested on number of cropping flushes. Three cropping flushes were recorded in all the treatments including control (without supplement) during one month cropping period.

Number of fruit bodies per kg mushroom

The data recorded with regard to influence of supplement on the number of fruit bodies/kg mushroom presented in Table 1 revealed that there was a significant difference between the effect of supplements and their concentrations on the number of fruiting bodies. Minimum number of fruit bodies kg^{-1} substrate (51.4) was recorded in *Artemisia.* It was followed by soybean (52.3), maize flour (54.4) which varied non-significantly with each other. Maximum number of fruit bodies (68.8) was obtained in the treatment which received apple pomace as a supplement which was statistically also identical with Rice bran (67.3), wheat bran (66.1). With the increase in concentration of supplements from 0.5 to 1.5 percent number of fruit bodies kg^{-1} mushroom also increased. Maximum number of fruit bodies (64.9) was obtained at a concentration of 1.5 percent and minimum (56.8) was recorded at 0.5 percent concentration. Interaction between the supplement and their concentrations was also statistically significant. However, minimum number of fruit bodies (49.00) was recorded in treatment which received *Artemisia* (0.5%) as supplement and maximum number of fruit bodies (72.3) were in treatment with supplementation of wheat bran (1.5 %).

Table 1: Influence of supplements on the number of fruiting bodies per kg mushroom [*Pleurotus sajor-caju* (Fr.) Singer]

Supplements \ Conc. (%)	No. of fruit bodies kg^{-1} mushroom 0.5	1.0	1.5	Mean
Artemisia	49.00	49.30	56.00	51.40
Soybean	49.60	51.30	56.00	52.30
Baisen	57.30	59.60	65.00	60.60
Rice bran	62.00	68.00	72.00	67.30
Apple pomace	67.60	68.60	70.30	68.80
Wheat bran	62.00	64.00	72.30	66.10
Moong dal	55.00	61.00	69.30	61.70
Maize flour	52.00	52.60	58.67	54.4 0
Mean	56.80	59.30	64.90	

	$(SE)_{diff}$	CD (P = 0.05)
Supplement	2.02	4.06
Concentration	1.23	2.47
Supplement x Concentration	3.50	7.00

Control (Paddy straw without supplement) = 47.3 fruit bodies kg^{-1} mushroom

Weight of single fruit body (g)

It is evident from the Table 2 that there was significant difference between the effect of supplements on the weight of fruit bodies. Maximum weight of fruit body (16.33 g) was recorded in the treatment with supplementation of *Artemisia*. It was followed by soybean (15.44 g) wheat bran (15.33 g) and maize flour (15.33 g) which were statistically identical with each other. Minimum weight (12.88 g) was recorded in the treatment receiving apple pomace as supplement which was found statistically identical with '*moong dal*' (13.11 g), rice bran (13.33 g), '*baisen*' (13.44 g). There was significant difference between the concentrations of supplements. With the increase in concentration of supplements weight of fruit body also increased. Maximum weight of fruit body (15.04 g) was recorded at a concentration of 1.5 percent and minimum (13.79) was recorded at 0.5 percent. Interaction between supplements and their concentrations were recorded as significant. However, maximum weight (19.33 g) of fruit body was recorded in *Artemisia* at a concentration of 1.5 percent and minimum weight of 11 g recorded in case of '*baisen*' at a concentration of 0.5 percent.

The minimum number with maximum weight of fruit bodies (51.4 and 16.33 g) was registered from the treatment which received *Artemisia* as supplementation followed by soybean (52.3, 15.44g), maize flour (54.4, 15.33g), '*baisen*' (60.6, 13.44), rice bran (67.3, 13.33 g), apple pomace (68.8, 12.88 g), wheat bran (66.1, 15.33 g) and moong '*dal*' (61.7, 13.11 g).

Table 2: Influence of supplements on the weight of single fruit body [*Pleurotus sajor-caju* (Fr.) Singer]

Supplements \ Conc. (%)	Weight of single fruit body (g)			Mean
	0.5	1.0	1.5	
Artemisia	14.67	15.00	19.33	16.33
Soybean	13.00	15.33	18.00	15.44
Baisen	11.00	13.00	16.33	13.44
Rice bran	12.33	14.33	13.33	13.33
Apple pomace	13.00	11.33	14.33	12.88
Wheat bran	14.67	17.67	13.67	15.33
Moong dal	13.67	13.33	12.33	13.11
Maize flour	18.00	15.00	13.00	15.33
Mean	13.79	14.37	15.04	

	$(SE)_{diff}$	CD (P = 0.05)
Supplement	0.54	1.09
Concentration	0.33	0.67
Supplement x Concentration	0.94	1.90

Control (Paddy straw without supplement) = 11 g of single fruit body

Diameter of pileus (cm)

As evident from the Table 3, there were significant differences between the influence of supplements on diameter of pileus of *Pleurotus sajor-caju*. Maximum diameter (12.33 cm) was recorded in treatment which received the *Artemisia* as supplement. It was followed by soybean (12.22 cm), maize flour (12.11 cm), '*baisen'* (12.00 cm), wheat bran (11.77 cm) and rice bran (11.55 cm) which were found statistically identical with each other in their influence of diameter on pileus. Minimum diameter (10.89 cm) was recorded in treatment which received apple pomace as supplement. There was significant difference between the concentrations of supplements also in their influence on diameter of pileus. With the increase in supplement concentration, the diameter of pileus increased. Interaction between supplements and their concentrations were also recorded as significant. However, maximum diameter (13.67 cm) of pileus was recorded in treatment with *Artemisia* (0.5 %) and minimum diameter (10.67 cm) was recorded in treatment which received Apple pomace (1.0%).

Table 3: Influence of supplements on the diameter of pileus [*Pleurotus sajor-caju* (Fr.) Singer]

Supplements \ Conc. (%)	Diameter of pileus (cm)			Mean
	0.5	1.0	1.5	
Artemisia	13.67	12.33	11.00	12.33
Soybean	12.00	11.33	13.33	12.22
Baisen	13.00	10.33	12.67	12.00
Rice bran	10.33	12.00	12.33	11.55
Apple pomace	10.67	10.67	11.33	10.89
Wheat bran	12.00	11.00	12.33	11.77
Moong dal	11.33	11.00	12.00	11.44
Maize flour	11.67	12.33	12.33	12.11
Mean	11.85	11.37	12.16	

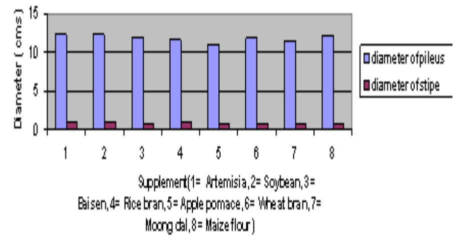
	$(SE)_{diff}$	CD (P = 0.05)
Supplement	0.53	1.08
Concentration	0.32	0.66
Supplement x Concentration	0.93	1.87

Control (paddy straw without supplement) = 11.33 diameter of pileus

Diameter of stipe (cm)

Table 4 revealed that there was significant difference between the effects of supplements on the diameter of stipe of *Pleurotus sajor-caju*. Maximum diameter of stipe 0.98 cm was recorded in treatment which received soybean as a supplement. It was followed by *Artemisia* (0.94 cm), rice bran (0.93 cm), '*baisen*' (0.90 cm) and '*moong dal*' (0.89 cm). They were found statistically identical with each other. Minimum diameter of 0.71cm was recorded in treatment with maize flour which was lesser than apple pomace (0.72 cm), wheat bran (0.82 cm) and is statistically identical with each other. There was significant difference between the concentrations of supplements also. With the increase in concentration diameter of stipe also increased. Interaction between the supplements and their concentrations was also recorded significant. The maximum diameter of 1.06 cm was recorded in the treatment with soybean supplement and the minimum diameter of 0.28 cm was recorded in the treatment which received wheat bran as a supplement

Fig: Influence of supplements on the diameter of pileus and stip of *Pleurotus sajor-caju* (Fr.) Singer



The present finding pertaining to quality parameters viz, time taken for first fruiting, number and weight of fruit body, diameter of pileus, diameter of stipe which contribute to over all yield of the mushroom are in agreement to findings of various workers viz Domondon *et al.* (2000), Dubey (1999) and Krishnamoorthy (1977).

Table 4 : Influence of supplements on the diameter of stipe [*Pleurotus sajor-caju* (Fr.) Singer]

Supplement \ Conc. (%)	Diameter of stipe (cm)			Mean
	0.5	1.0	1.5	
Artemisia	0.86	0.96	1.00	0.94
Soybean	0.96	0.93	1.06	0.98
Baisen	0.86	0.83	1.03	0.90
Rice bran	0.86	0.9	1.03	0.93
Apple pomace	0.90	0.28	1.00	0.72
Wheat bran	0.83	0.8	0.83	0.82
Moong dal	0.83	0.86	1.00	0.89
Maize flour	0.83	0.28	1.03	0.71
Mean	0.86	0.73	0.99	

	$(SE)_{diff}$	CD (P = 0.05)
Supplement	0.08	0.16
Concentration	0.052	0.10
Supplement x Concentration	0.14	0.28

Control (paddy straw without supplement) = 0.8 cm diameter of stipe

4. Conclusion

The Artemisia and soyabean were found promising supplements for improving quality characters viz, number of flushs, weight of single fruit body, diameter of pilus and stipe of *Pleurotus sajor-caju*.

References

Anonymous, 2005. Horticulture Technology Mission. Standardization of low-cost technology for commercial cultivation of button (*Agaricus bisporus*) and dhingi (*Pleurotus* sp.) mushrooms. Technical Report, MRTC, SKUAST. p. 9

*Chang, S. T., Lan, D. W. and Cho, K. Y. 1981. The cultivation and nutritional value of *Pleurotus sajor-caju Eurapean Journal of Applied* Microbiology & Biotechnology

12 : 58-62.

Domondon, D., Temmerman, F., Hofte, M. and Poppe, J. 2000. Influence of grass chaff as a substrate supplement for the cultivation of king stropharia and oyster mushroom. Proceedings of 6th Symposium, Ghent, Belgium, 11 OCT., 2000.

Dubey, S. C. 1999. Effect of different substrate and amendments on yield of *Pleurotus* species. Journal of Mycology and Plant Pathology 29 : 209-213.

Hashimoto, K. and Takahashi, Z. 1976. An Alternate to waste paper. Recycling. Mushroom Science 9 : 621-652.

Khan, S. M. and Chaudhary, I. A. 1989. Some studies on oyster mushroom *(Pleurotus* spp) on the waste material of corn industry in Pakistan. Mushroom Science 12 : 23-29.

Khanna, P. K. and Garcha, H. S. 1982. Utilization of paddy straw for the cultivation of *Pleurotus* spp. Mushroom Newsletter for Tropics 2 (3) : 5-9

Krishnamoorthy, A.S. 1997. Influence of organic supplements on yield and protein content of oyster mushroom. Madras Agricultural Journal 84 : 604-606.

Leong, P. C. 1980. Utilization of cotton waste substrate with treatment for the cultivation of oyster mushroom (*Pleurotus*) in Singapore. Singapore Journal 6 : 63-68.

Munjal, R. L. 1973. Production of quality spawn of *Agaricus bisporus* and *Volvariella* spp. Indian Journal of Mushrooms 1 : 1-4.

Munshi, N.A. and Ghani, M.Y. 2003. Mushroom Industry in Kashmir Valley – Present status, Future prospects and problems. SKUAST Journal of Research 5 : 1-19

Quimio, T. H. 1978. Introducing *Pleurotus flabellatus* for your dinner table. The Mushroom Journal 69 : 282-83.

Zadrazil, F. 1976. The ecology and industrial production of *Pleurotus ostreatus, Pleurotus florida, Pleurotus cornucopiae* and *Pleurotus eryngii.* Mushroom Science 9 (1) : 651-52.

Zadrazil, F. 1978. Cultivation of *Pleurotus* **In** : The Biology and cultivation of *Edible Mushrooms* Ed. By Chang, S.T. and Hayes, W.A. pp 521-527. Acadeemic Press, New York.

Zadrazil, F. and Kurtzman, T. R H. 1982. The Biology of *Pleurotus* cultivation in the tropics. In: Tropical Mushrooms, Biological Nature and cultivation methods, ed. Chang, S T. and Quimio, T.H. pp 277-298. The Chinese University Press, Hong Kong, 493 pp.