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Studies on the Effect of Vinyl Mulching on *Pleurotus* Cultivation
- Control of Mushroom Diseases on *Pleurotus ostreatus* (II) -

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Perforated vinyl mulching technique was performed on oyster mushroom beds for controlling mushroom diseases. Mycelium under vinyl sheets were safely protected from outside undesirable microorganisms. One of two mushroom farms showed 75% of disease incidence, the other 40% and National Institute of Agricultural Science and Technology (NIAST) 13% in the conventional growing method, whereas 12%, 14%, and 5% in the vinyl mulching cultivation method. Waterlogging caused mushroom bed worse, and *Trichoderma* spp. were infested on the conventional mushroom bed. Disease incidence investigated in other case was 25% to 30% in the conventional growing method, whereas 5 to 9% in the vinyl mulching cultivation method. Yields in conventional method were 6.5 to 7.2 kg/m^2 and those in vinyl mulching method were 7.6 to 8.1 kg/m^2. So it was suggested that vinyl mulching technique was good for prevention from disease and elevation of productivity.

KEYWORDS: Conventional growing method, Oyster mushroom, Vinyl mulching cultivation method, Waterlogging

Oyster mushroom had been artificially grown using agricultural by-product such as banana pseudostems and chopped paddy straw, and it was found that casing soil in *Pleurotus* cultivation was unnecessary for production of sporophores, and light did not affect the production of sporophores (Jandaik and Kapoor, 1974; Park, 1975). *Pleurotus ostreatus* grew normally when the relative humidity was 75~85%, but abnormal sporophore was developed when the relative humidity was over 95% (Block *et al.*, 1958; Jandaik and Kapoor, 1974). Optimum pH value for fruiting of *Pleurotus ostreatus* was about 5.5 (Hashimoto and Takahashi, 1974). *Pleurotus* cultivation using cotton waste which was cheap and readily available was developed (Tan, 1981). *Trichoderma*, *Aspergillus* and *Rhizopus* on oyster mushroom bed were predominant microorganisms, and especially occurrence of these was severe in summer and spring seasons than autumn and winter (Shin, 1987). So far, oyster mushroom cultivation system has been developed by substituting the substrates. However, any attempt has not been made upon controlling mushroom diseases by using modified cultivation system. It was reported that oyster mushroom cultivation had advantages of producing quality mushroom and reducing labor input by using perforated vinyl sheet mulching technique (Oh *et al.*, 1999, 2000). Here we present the effect of vinyl mulching on oyster mushroom cultivation.

Disease incidence at mushroom farms and growing room of NIAST. Disease incidence showed a big difference depending on cultivation method between mushroom farm A and B. Especially, farm B suffered from diseases which caused 75% in the conventional growing method, whereas 12% in the vinyl mulching method. This farm had picked a few mushroom products during three years from 1996 to 1998 owing to bacterial blotch and fungal disease. Farm A had been under poor mushroom products for years before applying vinyl mulching method. It was also demonstrated that mushroom diseases were effectively controlled by up to 14% in the treatment of vinyl mulching compared to conventional growing method. The result of NIAST data showed reduced infection as 13% for conventional and 5% for vinyl mulching (Table 1). It was thought that disease incidence may be differentiated among mushroom farms depending on scale of cultivation area and growers' cultivation skill. Perforated vinyl mulching sheet was designed to play a role in protecting mushroom bed which consisted of 80% mulched area and 20% inoculation area (Oh *et al.*, 1999, 2000). At present, mushroom growers are trying to apply mulching technique for enhancing mushroom quality for market

Table 1. Disease incidence of oyster mushroom according to the cultivation method

	Disease incidence (%)	
	Conventional	Vinyl mulching
NIAST	13±3.2	5±2.5
Farm A*	40±12.6	14±7.6
Farm B	75±15.3	12±5.3

*Farm A and B were 24 m^2/bed×4 in conventional and vinyl mulching respectively; NIAST was 5.6 m^2/bed×3 in conventional and vinyl mulching respectively.

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rather than preventing diseases on mushroom beds since it has additional effects for mushroom qualities such as color, long stipe and bunch formation etc. In *Pleurotus sajor-caju* cultivation, Oh *et al.* used this method for the purpose of making bunch formation such as *Pleurotus ostreatus*.

Occurrence of mushroom disease on the bed. When water was applied on cultivation bed, it was hard to manage the bed effectively due to waterlogging in the dented points on the surface of conventional growing bed. Waterlogging caused mushroom mycelium to turn white into yellow or brown on the conventional bed (Fig. 1a and c). Mycelium was maintained safely owing to no dent and no waterlogging on the surface of the vinyl mulching bed (Fig. 1b and d). Mushroom diseases were infested on the conventional growing bed in the middle of growing mushroom (Fig. 2). Valueless mushroom caused by environmental limiting factors showed symptoms of remarkable decreasing or malformation of fruitbody (Fig. 2c and d). Epidemic fungal disease was prevalent on the conventinal bed without any means of control, whereas it was efficiently controlled on vinyl mulching bed with a little infection on non-mulched site (Fig. 2e and f). Occurrence of fungal or bacterial disease after completion of mycelial growth on the bed might be derived from the poor environmental control in the mushroom house, and bacterial blotch symptoms on fruitbody that were artificially induced by the inoculation of *Pseudomonas tolaasii* suspension at the concentration of 10^8 were cured under the

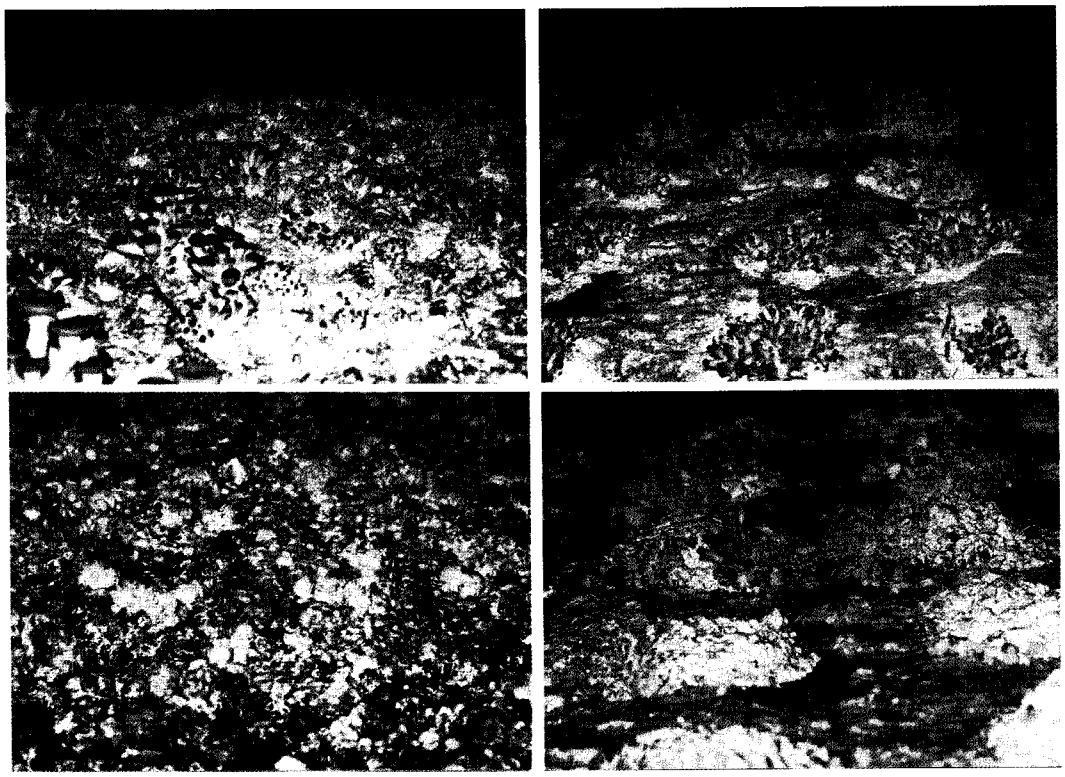

Fig. 1. Comparison of bed condition between conventional and vinyl mulching bed. a, Mushroom growth on conventional bed in 1st flush; b, Mushroom growth on vinyl mulching bed in 1st flush; c, Affected mushroom mycelium by waterlogging on conventional bed in 2nd flush; d, Healthy mushroom mycelium without waterlogging on vinyl mulching bed in 2nd flush.

Table 2. Survey on disease incidence in oyster mushroom farms from 2000 to 2001

		Surveyed areas		
		Chunla	Kyeongsang	Chungcheong
No. of farm	Conventional	10	12	7
	Vinyl mulching	7	3	5
Disease incidence (%)	Conventional	30±12.2	27±10.5	25±10.7
	Vinyl mulching	9±4.5	7±4.5	5±2.2
Yield (kg/m^2)	Conventional	6.5	6.8	7.2
	Vinyl mulching	7.8	7.6	8.1

Standard yield from Ministry of Agriculture and Forestry; 9.3 kg/km^2.

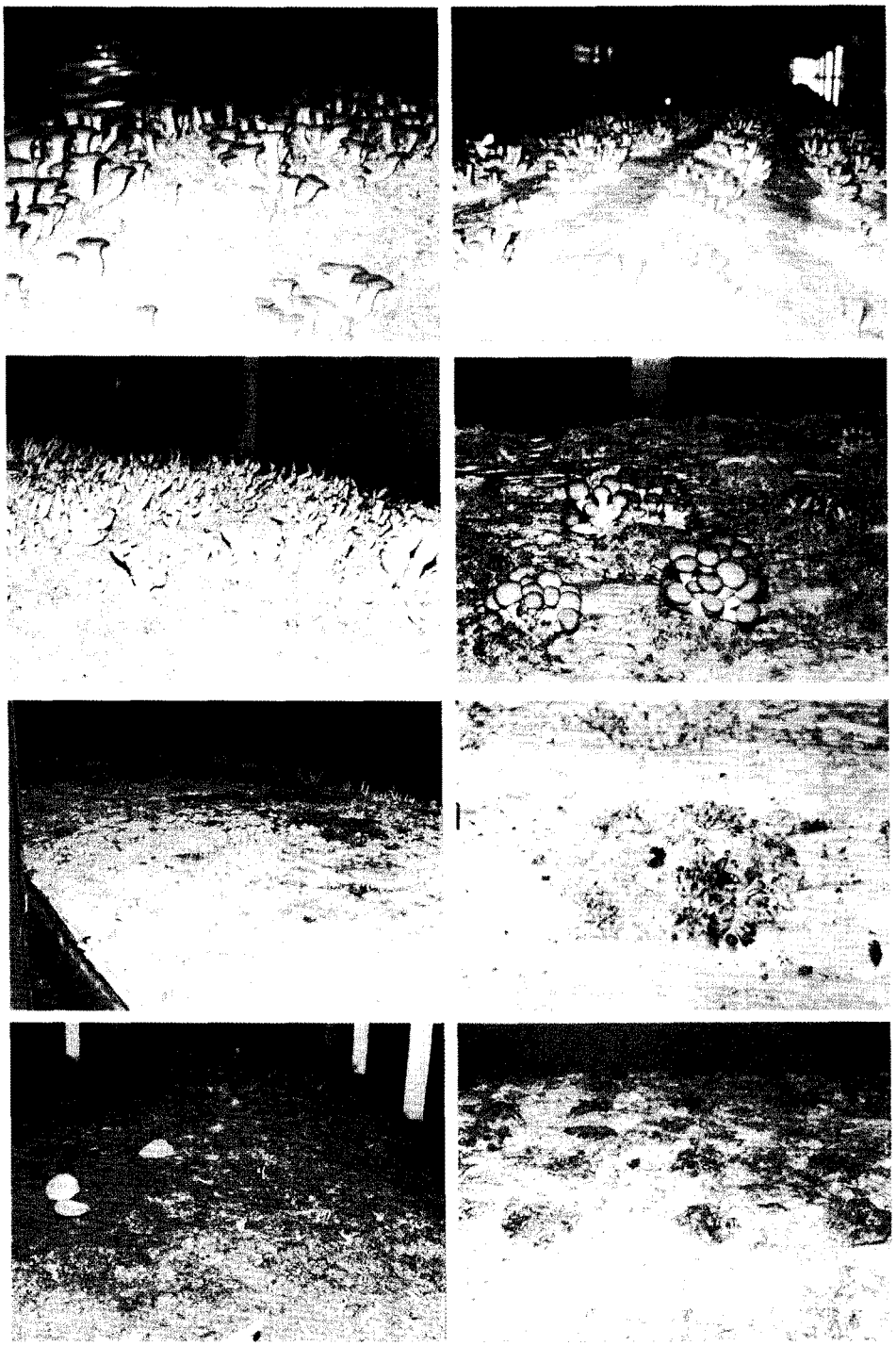

Fig. 2. Comparison of the bed conditions between conventional and vinyl mulching cultivation method. a. Normal mushroom grown on conventional bed; b, Normal mushroom grown on vinyl mulching bed; c, Diseased mushroom by environmental factors on conventional bed; d. Diseased mushroom by environmental factors on vinyl mulching bed; e, Infested mushroom mycelium by Trichoderma spp. on conventional bed; f, Partially infected mushroom mycelium by Trichoderma spp. on vinyl mulching bed; g, Conventional bed surface after finishing 5th flush; h, Vinyl mulching bed surface after finishing 5th flush.

standard environment condition in three days (Oh, unpublished). Therefore, it was suggested that vectors of mushroom diseases have to be studied further for more fundamental sources of infection in the field of mushroom.

Survey on disease incidence. Disease incidence in another experiment was 25 to 30% in the conventional growing method, whereas 5 to 9% in the vinyl mulching cultivation method. There was no statistical data on disease incidence for oyster mushroom in domestic, so it was

difficult to estimate the investigated value whether it is high or not. Yields were a little low level as 6.5 to 7.2 kg/m^2 for conventional method and 7.6 to 8.1 kg/m^2 for vinyl mulching technique compared to the statistical value of 9.3 kg/m^2 from Ministry of Agriculture & Forestry (Table 2). It was supposed that the differences of yields between experimental value and statistical value might be caused from the scales or numbers of mushroom farms. For more detailed studies, it was suggested that more accessible statistical data on disease incidence should have been acquired. In this study, experiment was somewhat delayed because a few mushroom growers applied this technique at the early stage in 1999. So the survey was executed in the restricted areas from 2000 to 2001.

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