control (roots harvested from warm-dry soils) until much later in the storage life of the roots. After 83 days of storage, roots harvested from cold-dry soils rotted significantly more than the control which showed very little rotting throughout the storage period.

In conclusion, it appears that harvesting roots from warm-flooded soils will result in a high percentage of storage rots; however, harvesting from cold-flooded soils may be more detrimental economically. Rotting of roots from warm-flooded soils is readily apparent after harvest and curing, whereas roots harvested from cold-flooded soils may appear sound at harvest, after curing, and even well into the storage season. These roots may even be sold and begin to rot after the buyer has purchased them. The same is true of roots harvested from cold-dry soils although rotting would occur less frequently. Apparently sound roots which are harvested from warm-flooded, cold-flooded or cold-dry soils should be checked frequently during storage to maintain quality of the marketed product. Roots which appear sound after months of storage may be damaged and, even if rotting is not apparent, quality may be reduced.

Literature Cited

1. Kushman, L. J. and M. T. Deonier. 1958. Effects of weather, date of harvest, and curing treatments on keeping qualities of Porto Rico sweetpotatoes. *Proc. Amer. Soc. Hort. Sci.* 71:369-375.
2. ———— and ————. 1959. Relation of internal gas content and respiration to keeping quality of Porto Rico sweetpotatoes. *Proc. Amer. Soc. Hort. Sci.* 74:622-641.
3. Nielsen, L. W. 1965. Harvest practices that increase sweetpotato surface rot in storage. *Phytopathology* 55:640-644.
4. Paterson, D. R., D. E. Speights, and J. E. Larsen. 1970. Some effects of soil moisture and various mulch treatments on the growth and metabolism of sweetpotato roots. *J. Amer. Soc. Hort. Sci.* 95:42-45.

HortScience. 15(3):263–264. 1980

Increased Yield of the Cultivated Mushroom in Israel by Artificial Misting[1]

Yoav Bashan and Mark Platt[2]

Department of Plant Pathology and Microbiology, Faculty of Agriculture, The Hebrew University of Jerusalem, P.O. Box 12, Rehovot 76-100, Israel

Additional index words. Agaricus bisporus, Agaricus bitorquis, Pseudomonas tolaasii

Abstract. **Artificial misting before the first flush, and between all the flushes increased yield of *Agaricus bitorquis* (Quelet) by 33% and up to 75% in *A. bisporus* (Lange).**

Cultivated mushroom yields in Israel are lower than the yields in Western Europe, 12-15 as compared to 20 or more kg/m^2, respectively (3). Thus, mushroom production is an economically hazardous crop.

There are 2 possible explanations for these differences: a) The compost used in Israel may be less effective, it is so-called "synthetic" based on wheat straw and chicken manure instead of the traditionally used horse manure. b) Although most of the modern houses for mushroom production in Israel are fully environment controlled, mechanical failures in the complicated equipment may reduce yield.

The mushroom production procedures used in this investigation were carried out in a modern champignon farm in Zikhron-Ya'acov. Each growing room had an automatic control for cooling or heating and hand-controlled ventilation, circulation, CO_2 and misting. The compost used was the so-called "synthetic" composed of wheat straw, chicken manure, soybean meal and $CaSO_4$ (120 kg/m^2 growth). Growth treatments were similar to those used in Dutch mushrooms farms. Mushroom species used were *Agaricus bisporus* cv. 'Somycel 53' and *Agaricus bitorquis* cv. 'Somycel K-26' which grows best at higher temperature. The ventilation and misting systems are described in Fig. 1. Air regulated to the needed growth conditions was blown through polyethylene sleeves (3-60 cm in diameter) using a constant ventilator. The amount of fresh air that entered the room was hand controlled with a shutter according to the growth stage of the room (10-600 m^3 per 100 m^2

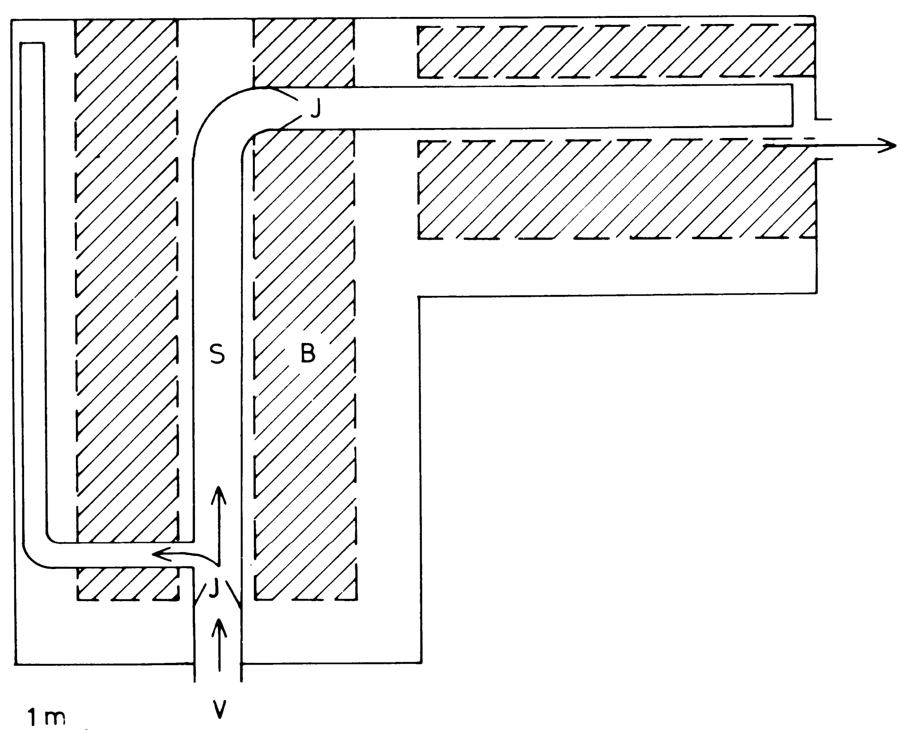

Fig. 1. Ventilation and misting systems inside controlled mushroom production room.
S = polyethylene sleeves V = ventilator
J = mist diffuser jets → entrance and exit of air
B = beds

[1]Received for publication November 30, 1979.
The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper must therefore be hereby marked *advertisement* solely to indicate this fact.
[2]We thank Mr. A. Bashan and Mr. U. Bashan for helpful assistance and financing of this research, Dr. Y. Okon from our department for criticism of the manuscript, and Mr. M. Volfovitch, Extension Service, Ministry of Agriculture, Israel, for helpful discussions.

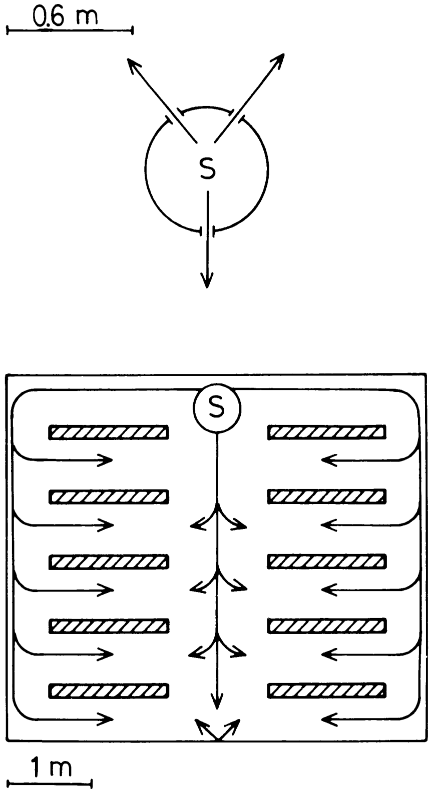

Fig. 2. Misting air current inside the room, and the exit of air from the sleeves.

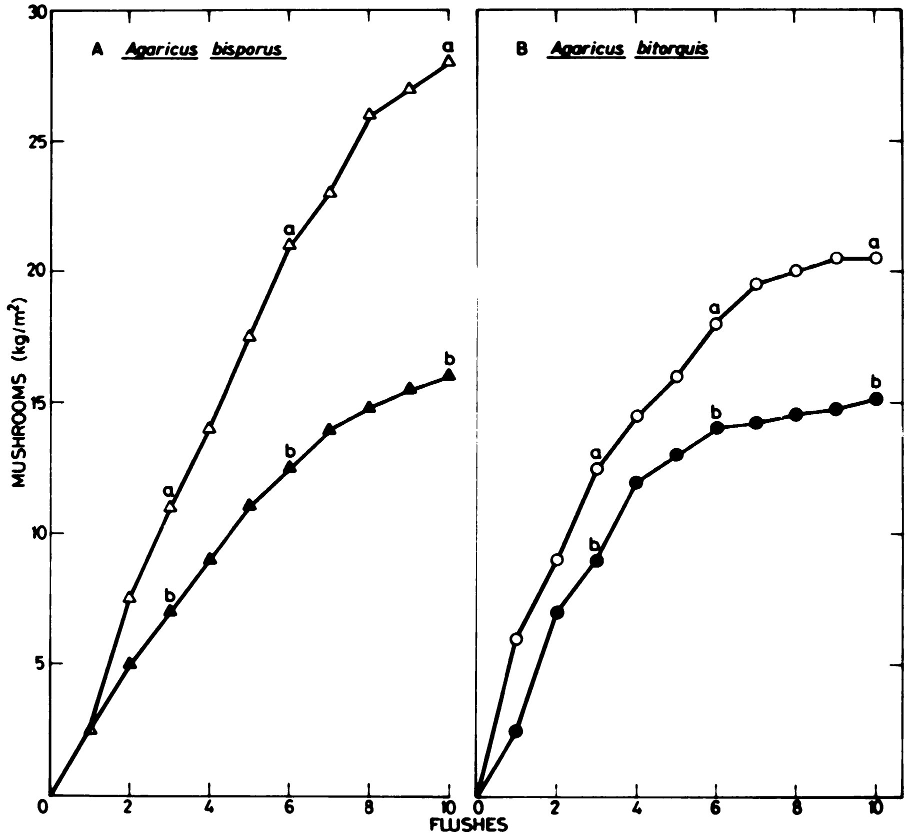

Fig. 3. Effect of misting on mushroom accumulated yield.
A. *Agaricus bisporus* misting rooms △——△
control rooms ▲——▲
B. *Agaricus bitorquis* misting rooms ○——○
control rooms ●——●
Yields are average of three rooms. Curves following different letters at the same flush show significant differences at P = 0.05.

"bed" surface per hr). Mist was obtained using 4 mist diffuser jets which were inside the main sleeve and were also hand controlled. Water droplets were spread through the room by the air current (Fig. 2). Direction and spreading of mist and air current inside the room were checked by blowing smoke through the ventilation system. During misting periods the heat-cooling-ventilation-circulation systems were operated according to the mushroom growth needs. Mushrooms were picked and weighed every day during the production period.

Experiments were repeated 3 times in 3 separate rooms (100±30 m^2 production area each). Rooms without mist were used as controls.

It is known that mushroom fruiting bodies develop into harvestable mushrooms mainly in flushes. Induction of mycelium to form fruit bodies occurs when the relative humidity (RH) in the growing room is near the saturation point (2). This high RH can be obtained before the first flush by slight manipulation of the irrigation and circulation procedures. The growth of the fruit body from pin head (0.5 cm in diameter) to a mature form needs only 80-85% RH, which is not optimum for induction of the next flush.

A steady water misting cloud inside a commercial house for mushroom production was used during induction periods between flushes. Its influence on yield was measured. The first mist treatment was given at the beginning of the first cooling, and afterwards during the periods between the end of one flush and the start of the next.

The accumulated yields are shown in Fig. 3. Misting between flushes clearly enhanced yield, 75% in *A, bisporus* and 33% in *A. bitorquis.* No damage to pin heads was observed in the control rooms containing only 80-85% RH.

Misting may increase damage caused by bacterial blotch. Control of *Psuedomonas tolaasii,* causal agent of this disease was accomplished by the integrated procedure described by Bashan and Okon (1), which included proper aeration together with a chlorine spray. Between flushes, misting did not cause a problem because there were no mushrooms on the "beds." The increase in yield obtained by this simple procedure of misting could make the growth of mushrooms in Israel economically feasible.

Literature Cited

1. Bashan, Y. and Y. Okon. 1979. Bacterial blotch, a new disease in the cultivated mushroom in Israel (in Hebrew, English summary). *Hassadeh* 60:182-185.
2. Tschierpe, H. J. 1972. Ueber Umweltfaktoren in der Champignonkultur. *Mushroom Sci.* 8:553-591.
3. Vedderm, P. J. C. 1972. Kulturmassnahmen nach der Abdecken. *Mushroom Sci.* 8:85-93.