

Experimental cultivation of the silver-silk straw mushroom *Volvariella bombycina* (Per.ex.Fr) Sing. isolated in Vietnam

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Abstract. This is the first time that the silver-silk straw mushroom *Volvariella bombycina* (Per.ex.Fr) Sing. was isolated, preserved and tested for growth ability on various materials in Vietnam. Experimental cultivation showed that:

- Rice straw and fresh sawdust were not suitable as cultivation substrate for the mushroom.
- Using waste sawdust (after cultivation of *Pleurotus* or *Auricularia* mushroom) and waste cotton as substrate, the addition of 2‰ of urea increased 25% of harvesting and biological efficiency was 7.96%. On the other hand, the addition of DAP, Proconco feed bran and raw soya powder to the substrate could result in the highest biological efficiency of 27.41%.

In the last experiment for the productivity improvement, the results show: all 200 waste sawdust bags with the 2% rice bran and 2‰ urea gave many carpophore (100% of bags giving fruit bodies); the average yield of mushroom carpophores was $131,84 \pm 1,8$ g/bag, and the average biological efficiency was 33% (132 gr fresh carpophore/400 gr dry weight substrate).

1. Introduction

Silver- silk straw mushroom *Volvariella bombycina* (Pers. ex. Fr) Sing. is a natural and delicious mushroom. This mushroom is also distributed in Vietnam (Trịnh Tam Kiệt, 1981). However, it has been rarely studied and only cultivated in laboratory (TJ Elliot and MP Challen, 1985). Some of studies showed that silver-silk straw mushroom belongs to homothallic fungi and had two

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types of basidiospores, but only one of them has spawn which can develop to carpophore (NL Huang and SZ Wu, 1982).

Our experimental cultivation of *V. bombycina* started from 1990 until date to day. In this report, the results (1990 – 2000) as well as previous publication (Pham Thanh Ho, 2002, 2002) and those of new latest experiments are presented.

2. Materials and methods

The first strain *Volvariella bombycina*, (Pers.ex.Fr) Sing. was isolated from the natural carpophore of this mushroom, which occasionally appeared on the waste sawdust as substrate for *Pleurotus* cultivation.

The second strain was received in test tube from Mr. Co Duc Trong (Research Center of *Ganoderma* and Pharmaceutical mushrooms – Ho Chi Minh city).

The culture medium : PGA (or PDA) and Raper [peptone (2 g), yeast extract (2 g), MgSO₄. 7H₂O (0.5 g), K₂HPO₄ (0.46 g), KH₂PO₄ (1.0 g), glucose (20 g), agar (20 g), dist. water (1000 ml)]

Substrates for experiment: fresh sawdust, waste sawdust (after cultivation of *Pleurotus* or *Auricularia* mushroom), waste cotton and rice straw. All substrates were treated with 1% CaO solution to 65 – 70 humidity and inserted in PE sacs containing equivalent 400 gr dry weight. Additional supplements for substrates: urea (2‰), DAP (Diamonium Phosphate 1‰, 5‰, 10‰), rice bran (1‰, 5‰, 10‰), soybean powder (1‰, 5‰, 10‰). All the bags with substrate were sterilized at 85 – 95 °C in 6 hours.

Spawn making: from rice grain, waste sawdust. The proportion of spawn/substrate is 2%.

Experimental temperature: 28 – 32 °C

3. Results and discussion

3.1. Some biological characteristics of V. bombycina

In Vietnam, this is the first time the silver-silk straw mushroom *Volvariella bombycina* (Pers.ex.Fr) Sing. was isolated, preserved and described for some biological characteristics. The silver-silk mushroom isolated in Vietnam is typical in taxonomical and morphological characters for *Volvariella bombycina* as described by the foreign researchers (NL Huang and SZ Wu, 1982;

TJ Elliot and MP Challen, 1985). In comparison with the popular straw mushroom *Volvariella volvacea*, the volva and the pink color of basidiospores is similar to both of subfamilies *Plutaceae* mushrooms, but *Volvariella bombycina* is distinguished by the more long low part of stipe and the silver-silk color of the fruit body (fig. 1, 2).



Fig. 1. The *V. bombycina* carpophore with the long low part of stipe



Fig. 2. The spore collection from open carpophore of *V. bombycina*

This study showed that the basidiospores of the mushroom were germinated after 1 month preservation in room temperature. The rate of sprout depended on density of basidiospores. In the plate of 10 basidiospores/petri dish, 100 basidiospores/dish and 200 basidiospores/dish, the germination percentages were: 0% after 25 days, 5% after 10 days and 15% after 8 days respectively. Fifty germinated basidiospores were isolated and mycelia of 4 germinated basidiospores in there continuously grow to form a clone giving fruit bodies. This indicated that there were 2 types of germinated basidiospores. The chlamyospores were formed after 9 – 15 days in the mycelium on agar plates.

3.2. The results of preliminary experiment (1990 – 2002)

This is the first time that the silver-silk straw mushroom *Volvariella bombycina* (Per.ex.Fr) Sing. was isolated, preserved and tested for growth ability on various substrates in Vietnam. The time for the mushroom mycelia to fully occupy in the medium test-tube was 5 – 6 days and the petri dish 10 – 15 days, respectively. On cultural substrates for spawn making, the corresponding time on rice-bag and waste sawdust-bag was 9 – 10 and 10 – 12 days, respectively.

The mushroom productivity by composting pile in 6 days was higher on waste cotton than that of old sawdust. On the other hand, rice straw and fresh sawdust were not suitable as cultivation

substrates for the *V. bombycina*. There was the contrast with the popular straw mushroom *V. volvacea*, which uses the rice straw as main substrate.

The addition of 2‰ urea to waste cotton increased 25% of harvesting and biological efficiency was 7.96%. On the other hand, the addition of DAP, rice feed bran and raw soybean powder to the substrate could result in the highest biological efficiency of 27.41%. Thus the biological productivity *V. bombycina* was not lower than that of the rice straw mushroom *V. volvacea*.

3.3. The results of last experiment (2003 – 2009)



Fig. 3. All the bags gave carpophores



Fig. 4. The fruit bodies appeared on the surface of 100% bags



Fig. 5. In top part, the more mature mushrooms were opened; in the low part, the fruit bodies were suitable for commercial harvesting. Particularly, *V. bombycina* had the more long low part of carpophore in comparison with the popular straw mushroom (*V. volvacea*)

In the last experiments for the productivity improvement, the results showed:

- All 200 waste sawdust bags with the 2% rice brand and 2‰ urea gave many carpophore (100% of bags giving fruit bodies) (fig. 3, 4, 5).
- The average yield of mushroom carpophores was $131,84 \pm 1,8$ g/bag
- The average biological efficiency: 33% (132 gr fresh carpophore/400 gr dry weight substrate)

Thus the biological productivity *V. bombycina* was not lower, even higher than that of the rice straw mushroom *V. volvacea*. It must note that the waste sawdust substrate was exhausted significantly after cultivation of *Pleurotus* or *Auricularia* mushrooms. This indicated the possibility for large-scale production of *V. bombycina* for commercial purpose.

In contrast to *V. volvacea*, *V. bombycina* has two advantages for commercialization: long time (2 weeks) in cold (5 – 15 °C) conservation and slowly opening the mature carpophore.

4. Conclusion

- In Vietnam, this is the first time the silver-silk straw mushroom *Volvariella bombycina* (Pers.ex.Fr) Sing. was isolated, which is typical in taxonomical and morphological characters for *V. bombycina* as described by the foreign researchers.
- The experimental cultivation of silver-silk straw mushroom on waste sawdust substrate with the 2% rice brand and 2‰ urea gave carpophores on 100% of bags.
- There is the possibility for large-scale production of *V. bombycina* for commercial purpose.

References

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