

LIFE CYCLE OF PINK FUNGUS (*UPASIA SALMONICOLOR*) IN JAVA

DAUR HIDUP JAMUR UPAS (*UPASIA SALMONICOLOR*) DI JAWA

Ambarwati-Harsojo Tjokrosoedarmo

Faculty of Agriculture Gadjah Mada University, Yogyakarta, Indonesia

ABSTRACT

In the complete life cycle of pink fungus, in this study five stages were recognized as follows: stage I (cobweb stage), stage II (pseudonodular stage), stage III (teleomorph), stage IV (nodular stage), and stage V (anamorph). The five stages are arranged into a sexual cycle (I, II, and III) on shady side of a branch, and asexual cycle (I, IV, and V) on exposed side of a branch. Most of the pink fungus on the 23 plant species found in this study formed only two or three stages of the sexual cycle. Only on apple, lime, calliandra, cinchona, coffee, oleander, crotalaria, and tephrosia, may the fungus form the complete five stages.

Key words : life cycle, pink fungus, five stages

INTISARI

Dalam daur hidupnya yang lengkap, jamur upas membentuk lima stadium sebagai berikut: stadium I (stadium rumah laba-laba), stadium II (stadium bongkol semu), stadium III (teleomorf), stadium IV (stadium bongkol), dan stadium V (anamorf). Kelima stadium tersebut tersusun dalam daur seksual (I, II, dan III) di sisi cabang yang terlindung, dan daur aseksual (I, IV, dan V) di sisi atas cabang. Jamur upas pada 23 jenis tanaman inang yang diamati pada penelitian ini, kebanyakan hanya membentuk dua atau tiga stadium dari daur seksual, kecuali pada apel, jeruk, kaliandra, kina, kopi, oleander, orok-orok, dan tefrosia, jamur upas dapat membentuk lima stadium.

Kata kunci : daur hidup, jamur upas, lima stadium

INTRODUCTION

This paper reports the conclusion of the results of the pink fungus (*Upasia salmonicolor* (Berk. et Br.) Tjokr.), which previous author called *Corticium salmonicolor* (Berk. et Br.) (Rant, 1912). This fungus studied by Tjokrosoedarmo (1995, 1996), the material studied of which were the pink fungus on 23 living host species in Java, Indonesia.

Those studies have been published in: a. Indon. J. Plant Prot. 1(1):19-27, with the topic: Various stages of pink fungus (*Upasia salmonicolor*) in Java by Tjokrosoedarmo

(1995); b. Indon. J. Plant Prot. 2(2):51-59, with the topic: Development and maturation of pink fungus (*Upasia salmonicolor*) stages in Java, by Tjokrosoedarmo (1996).

Based on the results of those studies, this paper will outline the life cycle of pink fungus (*Upasia salmonicolor*) in Java.

SUMMARY OF THE PREVIOUS RESULT

Materials studied were the results of the pink fungus (*Upasia salmonicolor*) studies by Tjokrosoedarmo (1995 and 1996).

Tjokrosoedarmo (1995) found five developmental stages of *U. salmonicolor*, which are numbered for convenience. Those five stages are: I. Cobweb stage; II. Pseudonodular stage; III. Teleomorph which occurs in two morphological variants: a. Teleomorph incrustation; b. Teleomorph pustules; IV. Nodular stage; and V. Anamorph, as small, orange-red sporodochia.

The following study of Tjokrosoedarmo (1996) found the development and maturation of those stages as follows: I. **Cobweb stage** develops following the germination of basidiospores or conidia, both on shaded and exposed bark; II. **Pseudonodular stage** develops from symphogenous aggregation of cobweb stage mycelia (I) on shaded bark, on the surface of lenticels or cracks; III. **Teleomorph**, which occurs in two morphological variants, develops as follows: a. Teleomorph incrustation develops from cobweb stage mycelia (I) on shaded bark; b. Teleomorph pustule develops from pseudonodular pustule (II) on shaded bark. IV. **Nodular stage** develops from compound meristogenous aggregation of cobweb stage mycelia (I) on exposed bark; V. **Anamorph** as small orange-red sporodochia develops in two ways: a. Chiefly from nodular stage (IV); b. From cobweb stage mycelia (I) on exposed bark directly, without passing the nodular stage.

Those five stages are then outlined into life cycle by connecting the stages to each other, based on the order of the development and maturation of those stages.

RESULT AND DISCUSSION

The five stages of *U. salmonicolor* may occur: a. **On the shady side of a branch** (I. Cobweb stage; II. Pseudonodular stage; and III. Teleomorph); b. **On the exposed side of a branch** (I. Cobweb stage; IV. Nodular stage; and V. Anamorph).

Teleomorph, after karyogami and meiosis (which are not examined in this study) produces wind-dispersed basidiospores (Tjokrosoedarmo, 1995). That is why the cycle on the **shady side of a branch** is a **sexual cycle**.

Anamorph, at maturation produces basipetal chains of holothallic conidia (Tjokrosoedarmo, 1995), dispersed by water splashing or insect. So the cycle on the **exposed side of a branch** is an **asexual cycle**.

Cobweb stage is the only stage which may occur on both shady and exposed side of a branch, and that is why it may be part of sexual or asexual cycle, depends on the occurrence of a branch.

The complete life cycle of *Upasia salmonicolor* is as follows (Figure 1).

Sexual cycle (on the shady side of a branch). If **cobweb stage** mycelia (I) on shady side of a branch pass through lenticels or cracked epidermis accidentally, but are unable to penetrate into the host tissue, the mycelia will aggregate symphogenously inside, and the mycelial aggregations will develop into pustules of the **pseudonodular stage** (II) (Figure 2).

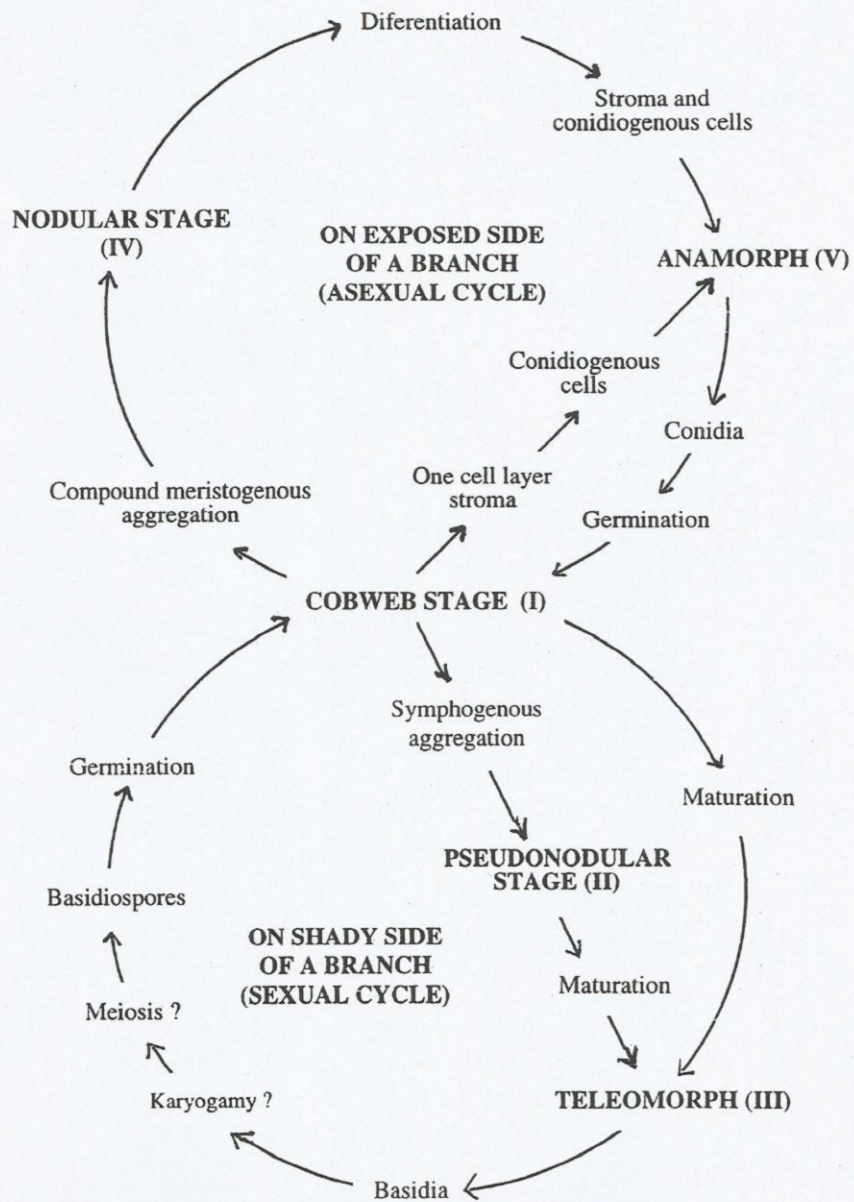


Figure 1. General life cycle of *Upasia salmonicolor* in Java

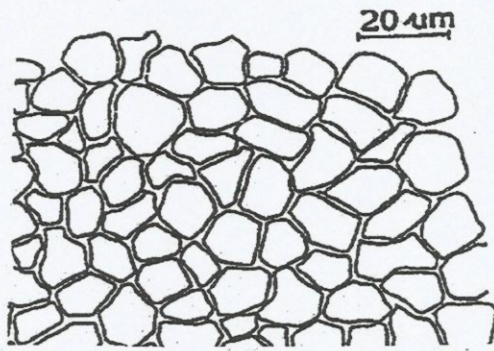


Figure 2. Development of pseudonodular stage from cobweb stage: by symphogenous aggregation of cobweb stage mycelia.

At maturity both cobweb and pseudonodular stage develop into **teleomorph** (III) (Figure

3), as teleomorph incrustation and teleomorph pustule respectively, which will produce wind-dispersed *basidiospores*. Basidiospores germinate on the host bark, and the germ tubes develop into mycelia of cobweb stage (I), may grow on both shady and exposed side of a branch.

Asexual cycle (on the exposed side of a branch). Cobweb stage mycelia (I) on the exposed side of a branch, apparently stimulated by a combination of sunlight and rain water in the rainy season, aggregate in a compound meristogenous manner on the surface of the bark. The aggregations develop into nodular pustules of the **nodular stage** (IV) (Figure 4).

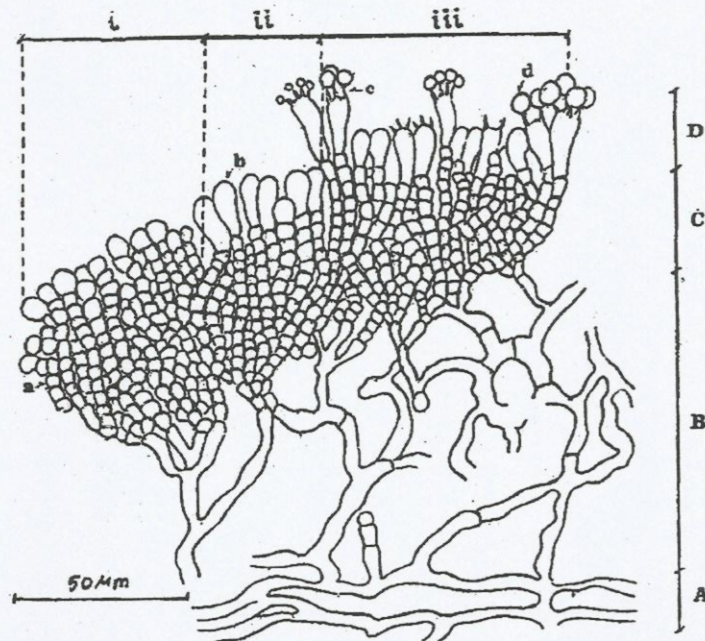


Figure 3. Development of teleomorph incrustation from cobweb stage:
 A. Basal layer; B. Intermediate layer; C. Subhymenial layer; D. Hymenial layer.
 i. subhymenial layer consists of sterile cell chains (a); ii. the tip cells enlarge to become basidia (b);
 iii. mature basidia producing sterigmata (c) and basidiospores (d).

The young nodular pustules is covered by a mantle of interwoven hyphae. At maturity its tissue differentiates into a *stroma*, the surface cells of which produce a layer of *conidiogenous cells*. These cells produce basipetal chains of holothallic conidia, which rupture the mantle and then the white nodular pustules become orange-red sporodochial **anamorph** (V) (Figure 5). On *Coffea arabica* the anamorph (V) sometimes develops from cobweb stage mycelia (I) directly without passing the nodular stage. The liberated conidia germinate on the host bark in the same manner as basidiospores, and the germ tubes develop into the cobweb stage (I) (Figure 6) on both exposed and shady side of a branch.

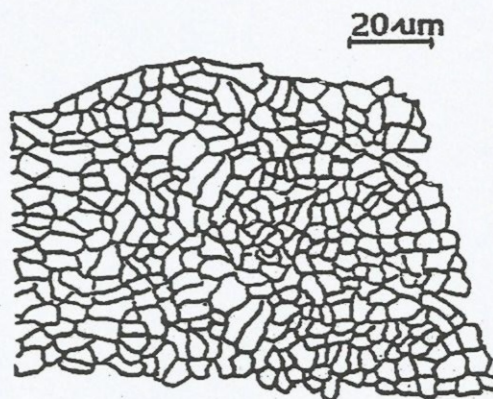


Figure 4. Development of nodular stage from cobweb stage: by compound meristogenous aggregation of cobweb stage mycelia.

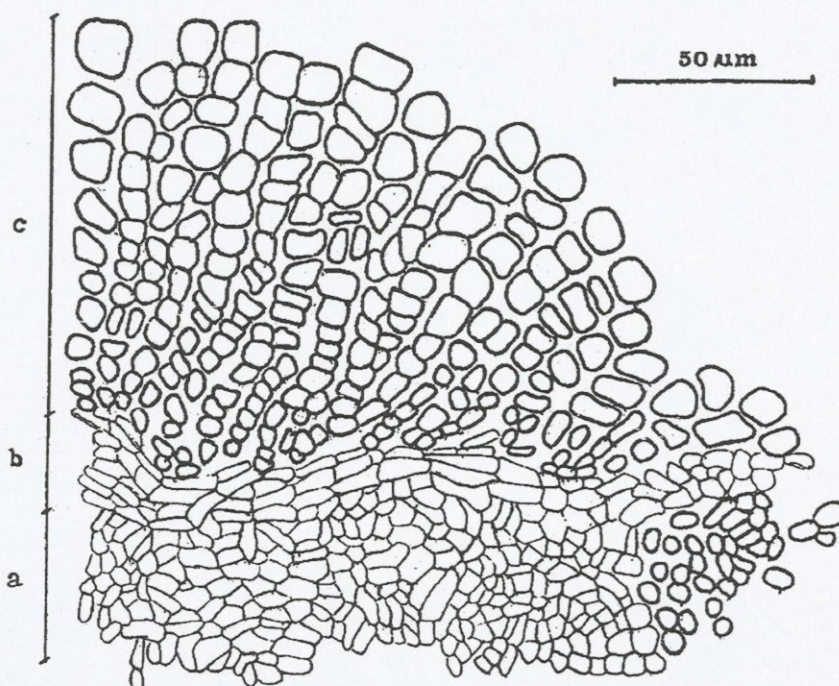


Figure 5. Development of sporodochial anamorph from nodular stage. a. stroma; b. conidiogenous cells; c. basipetal chains of holothallic conidia (Tjokrosoedarmo, 1996).

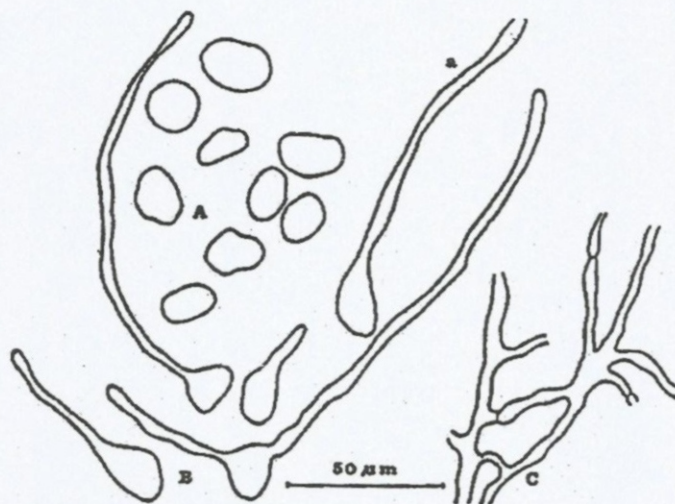


Figure 6. The development of cobweb stage following the germination of conidia. A. Conidia; B. Germinating conidia producing germ tubes (a). C. The development of cobweb stage mycelia from germ tube (Tjokrosoedarmo, 1996)

Depending on the host species and the environment, the pink fungus may complete its life cycle by producing five, or only some stages as follows :

1. On shaded bark (sexual cycle) and on exposed bark (asexual cycle) (I, II, III, and I, IV, V) or (I, II, III, and I, V) or (I, III, and I, IV, V) or (I, III, and I, V)
2. On shaded bark (sexual cycle only) (I, II, III) or (I, III)
3. On exposed bark (asexual cycle only) (I, IV, V) or (I, V)

On *Cinchona ledgeriana*, *C. succirubra*, and *Coffea arabica* all eight possible cycles have been observed. On *Theobroma cacao* only two cycles have been encountered (I, II, III) and (I, III). On most host species pink fungus produce only (I, II, III) or (I, III).

It is concluded that the complete life cycle of *U. salmonicolor* in Java consists of: a. **Sexual cycle** (on the shady side of a branch, includes: I. Cobweb stage; II. Pseudonodular stage; III. Teleomorph); b. **Asexual cycle** (on the exposed side of a

branch, includes: I. Cobweb stage; IV. Nodular stage; V. Anamorph).

Cobweb stage (I) is the only stage which may occur both on the shady side of a branch (sexual cycle) and on the exposed side of a branch (asexual cycle), and the only stage which may develop into the other four stages. Each of the other four stages, may only develop into one other stage.

REFERENCES

- Rant. A. 1912. Über die Djamoer-oepas-Krankheit und über das *Corticium javanicum* Zimm. Bull. Bot. Inst. Buitenzorg. 4:1-50.
- Tjokrosoedarmo Ambarwati-Harsojo. 1995. Various Stages of Pink Fungus (*Upasia salmonicolor*) in Java. *Indon. J. Plant. Prot.* 1(1):19-27
- _____. 1996. Development and Maturation of the Pink Fungus (*Upasia salmonicolor*) in Java. *Indon. J. Plant Prot.* 2(2):51-59