

Mode of Development of the Sorus and Spores in *Jamesdicksonia obesa* inciting smut of *Dicanthium annulatum*

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With Plate V

The writer collected leaves of *Dicanthium annulatum* Stapf, badly affected by a smut fungus from Daulatabad (Maharashtra) in January 1966, which was identified as *Jamesdicksonia obesa* belonging to the monotypic genus *Jamesdicksonia* (Tilletiaceae) established by Thirumalachar et al. (1960). The smut was first collected by Butler in India and described by Sydow (1911) as *Entyloma obesum*. Zundel (1930) transferred the smut fungus to the genus *Tolyposporella* on account of tar spot like sori produced on the leaves and agglutinated spore masses resembling spore balls. Thirumalachar et al. (1960) established the new genus *Jamesdicksonia* to accomodate this smut fungus on the basis of the developmental pattern of the sorus and germination of the teliospores. The writer's observations on the morphology and mode of development of this smut sorus and spores differed markedly from the description of Thirumalachar et al. (1960) as well as earlier workers.

Material and Methods: Fresh material was fixed in Carnoy's fluid and then in F. A. A., embedded in wax and microtome sections of 10—15 μ thickness were stained with hematoxylin and counterstained with light green. Hand sections were mounted in lactophenol with cotton blue.

Symptoms: Infection appears as minute hypophyllous tarlike lesions which increase in diameter, coalesce with the neighbouring lesions and become black, slightly raised encrustations in the form of long stripes (Fig. 1) upto 5 mm. broad and variable in length with corresponding brown discoloured regions on the upper surface of the leaves. In the early morning dew, which is characteristic of the season, the sori appear raised and hemispherical. As the day advances, with the loss of moisture, the sori appear flat and closely appressed to the leaf surface and such sori obtained from old herbarium material (more than an year old) when soaked in water, swell up and regain their hemispherical appearance.

Development and morphology: Hyphal strands aggregate in the parenchymatous layer just below the lower epidermis tightly filling the intercellular spaces. The individual cells of these hyphae swell up and initiate sporogenesis. The intervening host cells collapse and disintegrate with the space above lower epidermis occupied by the developing spores. As the sporogenesis is in progress, the sorus increases in size through the aggregation of hyphae in the periphery of the sorus. Following the rapid growth of the hyphal mass and the differentiation of the individual spores, the epidermis is pushed upwards and ruptured resulting in the exposure of the black spore mass. The spores in this layer mature in basipetal succession, the entire stroma being converted into a spore mass (Fig. 2). Spores adhere en masse in virtue of their gelatinous outer layer of the episore and firm adpression. The spores are brown, subglobose to ellipsoidal and measure 14.3 to 34.7 μ in diameter. The episore is made up of two layers. The inner layer is hyaline and thin and the outer, brown, thick and gelatinous and shows a lamelated structure with the absorption of moisture swelling upto almost twice its thickness. With the maturation of the spores in progress, the spores already mature germinate in situ aided by the dew deposited over the leaves.

Identity: Thirumalachar et al. (1960) described the new genus mainly on the mode of soral development. According to them "in a young sorus strands of hyphae aggregate and develop into stromata beneath the epidermis at two or three places. The hyphae emerge at each site, coalesce with the neighbouring groups forming a small umbonate to spherical structure. Following the rapid growth of the hyphal mass and the differentiation of the spores from the outer layer of cells, a flabelliform crust soon develops. The outer layers of hyphae soon gelatinize and successively differentiate spores in basipetal succession so that the spore crust appears similar to that observed in the rust genus *Dasturella*. In a mature sorus strands of hyphae emerging from stomata at several points appear as foot-like connections burried in the host and supporting the flabelliform crust above the epidermis. Only the upper portion is sporiferous, while the remaining tissues gelatinize and collapse following the germination of spores and subsequent disintegration of the sori". The writer was unable to observe any such mode of development at any stage in the smut material collected by him. On the other hand the entire development of the sorus was typically subepidermal in origin (Fig. 3). Sections of even mature sori show the remnants of epidermal layer covering and adhering above the outermost layer of spores (Fig. 4). While according to Thirumalachar et al. only the upper layers of the sorus are sporiferous, it is evident from Fig. 2, that the entire sorus is sporiferous even with the lower most layer of the sorus capable of forming fertile spores. Such a mode of subepidermal development of the sorus and the habit of forming flabelli-

form crusts on the leaf producing firmly cemented spores provided with thick hygroscopic episore are characters which belong to the genus *Tolyposporella*. The mode of germination of the teliospores of this fungus which strictly conforms to that of Tilletiaceae however compels its segregation from the genus *Tolyposporella*. It is thus clear that the evidence obtained by the writer through a detailed study in fixed microtome sections of the developmental pattern of sori and spores would warrant a drastic redefinition and revision of the genus *Jamesdicksonia* as originally defined by Thirumalachar et al. (1960). The fungus is thus maintained in the genus *Jamesdicksoni* with *J. obesa* Thirum. Pavgi and Payak as type with the following amended and revised description.

Jamesdicksonia Thirumalachar, Pavgi & Payak emend. Raghunath.

Sori occurring as crusts on the leaves, subepidermal in origin, erumpent, rupturing through the epidermis at maturity, teliospores mature in basipetal succession and occur in firmly agglutinated masses. Teliospores brown, with thick concentrically lamellated episore (which swells up in water). Germination is by a single celled or rarely two celled promycelium with a terminal whorl of 2—4 sporidia.

Type *Jamesdicksonia obesa* Thirumalachar, Pavgi & Payak emend. Raghunath.

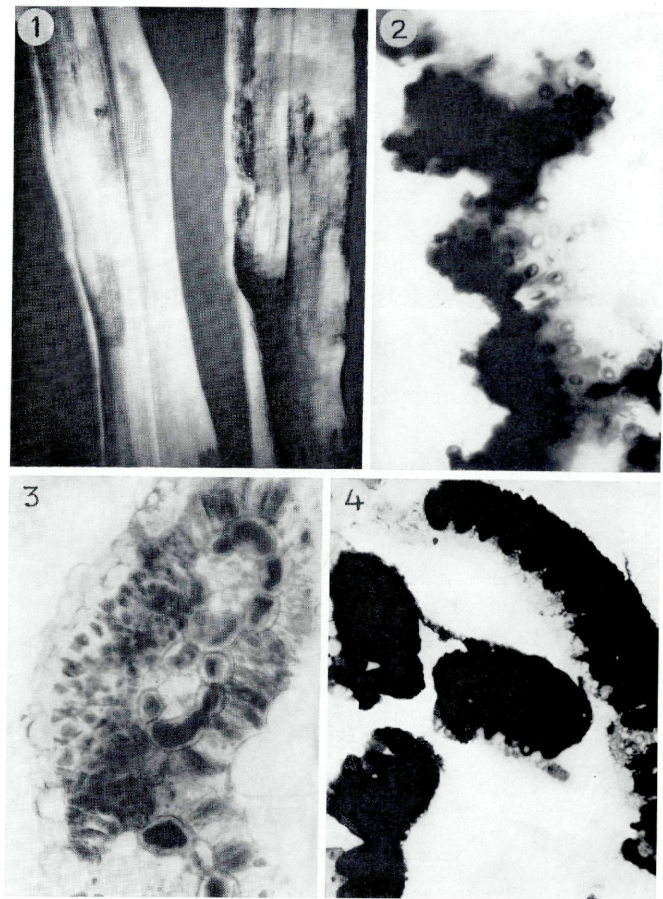
Sori in linear, erumpent, flabelliform hyphophyllous, tar-like encrustations formed by the coalescing of numerous lesions. Subepidermal sori rupture the epidermis at maturity exposing masses of spores which are firmly agglutinated. Teliospores brown, subglobose to ellipsoidal, mature in basipetal succession in the sorus and measure 14.3 to 34.7 μ . The episore is of two layers. The outer layer is gelatinous and swells up to almost twice its thickness in water and reveals a lamellated structure. Germination is by a single celled or rarely two celled promycelium with 2 to 4 sporidia which copulate in situ.

Summary: The morphology and development of the sorus and spores of *Jamesdicksonia obesa* belonging to the monotypic genus *Jamesdicksonia* Thirum. Pavgi & Payak is described. The writer's observations revealed that the original diagnostic characters of the new genus were inadequate leading to drastic revision and redefinition of the genus.

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Explanation of Plate IV

1. Hypophyllous encrustations on the leaves of X 5, the host.
2. Transverse section of the sorus showing the spores X 280.
3. Transection of the young sorus demonstrating the subepidermal development of the spores X 370.
4. Transection of mature sori showing the host epidermis still adhering above 9 115.

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