Morphology of the Spermogonium of *Gymnoconia peckiana*, A Rust Fungus[1]

Y. HIRATSUKA and G. B. CUMMINS, Purdue University

This paper describes the morphology of the spermogonium of *Gymnoconia peckiana* (Howe) Trott., the causal agent of the orange rust disease of *Rubus*. The material used was collected adjacent to the Purdue University campus during the spring of 1960 and was studied in stained and unstained free-hand sections.

Kursanov (6) and Buller (2) have illustrated the spermogonia of this fungus, but the descriptions in most taxonomic treatises still are either incorrect or insufficiently descriptive. Dietel (4) described them as ". . . subcuticular, kegelförmig . . .", Arthur (1) as ". . . abundant, columnar . . .", Gäumann (5) as ". . . kegelförmig vorstehend, subkuticular . . .", and Cummins (3) as ". . . subcuticular." Since the structure and position of the spermogonium is considered to be important in the definition of genera, we have restudied it in *Gymnoconia*.

Structure and Development

The spermogonia of this fungus are produced by a systemic and perennial mycelium and are uniformly distributed on both sides of the leaf. They are initiated by a layer of fused hyphae located just beneath the epidermis of the host plant. The spermogonial primordia push out between the epidermal cells (Fig. 1) causing them to separate but not

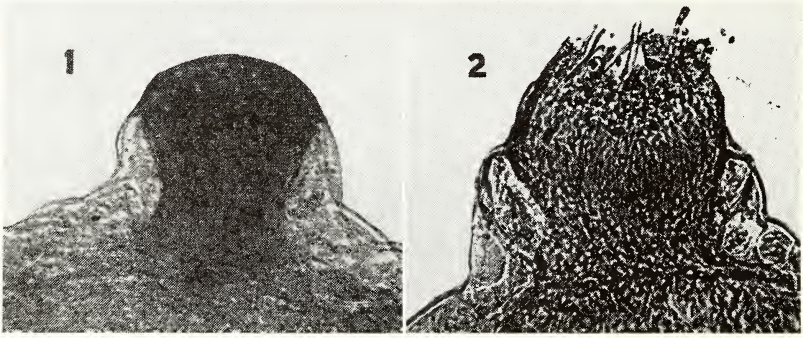

Fig. 1. Immature stage showing the columnar shape of the immature spermogonium of *Gymnoconia* and the bounding elevated epidermal cells of the host plant. The apex is still covered by the cuticle.

Fig. 2. A mature spermogonium; the cuticle has ruptured and the sporogenous layer is elevated to the level of the epidermis. The protruding hyphae are flexuous hyphae. X 240

rupture. Because the development vertically is both more rapid and greater than laterally, the maturing spermogonium assumes the shape of a truncated column (Fig. 1). The column is composed mainly of parallel

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and compacted spermatiophores with the spermatia produced at or slightly above the level of the epidermis of the host plant (Fig. 2). Until maturity is attained and spermatia are produced, the spermogonia are covered by the cuticle of the host.

The mature spermogonia average 100 μ in length and 99μ in width at the apex. They have neither a peridium nor paraphyses and are bounded only by a few upturned epidermal cells. Flexuous hyphae (Fig. 2) protrude from the apex of the spermogonia, as reported by Buller (2).

Discussion

The spermogonium of *Gymnoconia* is unique in some respects. It originates subepidermally but it differs markedly from the typical subepidermal spermogonium of *Puccisia* and *Gymnosporangium* in that the sporogenous layer is almost superficial at maturity rather than embedded in the mesophyll tissue. The apex of the spermogonium is covered only by the cuticle but typical subcuticular spermogonia, as those of *Prospodium, Pileolaria,* and *Diorchidium,* have a broad base that is seated upon the outer wall of the epidermis and there is no separation of the cells. A third type is called intraepidermal *(Gerwasia* and *Frommea)* because the spermogonium is initiated and largely or completely matures within the epidermal cells with the destruction of some of the anticlinal walls and rupture of the outer epidermal wall. The spermogonium of *Gymnoconia* has nothing in common with this type.

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