# A CONIDIAL STAGE OF THECAPHORA DEFORMANS TUL.

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The presence of conidial stages in the life cycle of many smut fungi is well-known and in a few instances they are the chief means of dispersal of pathogenic species, as is the case in *Entyloma dahliae*. The first clear account of conidia was given by Woronin (1882), who described plants of *Trientalis europaea* infected with *Tuburcinia trientalis*. Similar conidial forms have been described for species of *Entyloma* and *Doassansia* (Ainsworth & Sampson, 1950) and it has also been suggested that *Gloeosporium antherarum* Oud. is a conidial stage of *Thecaphora seminis-convolvuli* (Duby) Liro. In Britain a conidial stage has been reported associated with chlamydospores on *Ulex minor* (Brett, 1940). However, all detailed accounts have dealt with conidial stages of smuts belonging to the *Tilletiaceae*. This present note deals with the conidia of a member of the Ustilaginaceae, *Thecaphora deformans*.

*Thecaphora deformans* has been recorded twice in Britain, in both cases from the neighbourhood of Edinburgh on *Lathyrus pratensis*.

In July 1954, slightly distorted flowers were noted at Dalmahoy Estate, Midlothian. The keel and wings were slightly discoloured, the keel rather swollen and the wings slightly crumpled at the apex. On depressing the keel a dirty white mass of conidia was extruded. As a rule all the flowers on any one plant were infected but at least half the plants in the neighbourhood were healthy. Infected flowers were often slightly shorter than the healthy ones and the anthers were distended and enveloped in a mass of conidia. The ovary appeared normal at this stage. After the corolla was shed and the young pod had elongated, infected seeds, which later became masses of dark chlamydospores, could be recognised as swollen and opaque in contrast to the translucent healthy ones.

## *Distribution of Mycelium*

The distribution of mycelium is best observed in longitudinal sections of the flowers and peduncles. In the early stages of flowering, before any chlamydospore production is evident in the ovules, mycelium is concentrated in the anthers. Small patches of mycelium are present in the filaments, the funicle, both dorsal and ventral tissues of the ovary and in the pedicel. Sections of the peduncle also revealed small patches of mycelium. The distribution of mycelium is sufficient to make it probable that a continuous mycelium extends from the peduncle to the young flower at an early stage of development.

## *Conidial Development*

Conidial production is almost confined to the anthers, although after liberation and germination of conidia from the anthers conidia may be produced secondarily in the flower, particularly on the surface of the

stamen filaments. The conidia are produced in the anthers from a clamped mycelium closely associated with young degenerating pollen cells. While still contained in the anther the conidia produce directly other, but smaller, conidia and by continuance of this process numerous small vacuolate conidia are formed. Thus one anther may contain conidia varying considerably in size. The mycelium only rarely penetrates the cells of the wall of the anther or of the fibrous layer, but becomes exposed by rupture of the anther along the normal line of dehiscence. On the mycelium thus exposed conidia develop freely.

The details of conidial production have been studied in culture, where observation is more satisfactory, but sufficient were observed in examination of anther material to establish that the processes were essentially the same.

The slender conidiophores (0·5 $\mu$ diam.) branch occasionally and irregularly. Each spore is produced at the apex on a single slender sterigma. Under favourable conditions acropetal chains of two or three conidia are observable, each spore joined to its neighbour by a very slender isthmus. Such chains readily fragment and hence are rarely seen. Successive spores in a chain tend to diminish in size acropetally. This diminution in size is similar to that observed in the anthers.

## *Notes on Cytology*

The preparations on which these notes of cytology are based were made primarily for observations on the distribution of the fungus in the host and on the mode of formation of conidia, hence they are necessarily

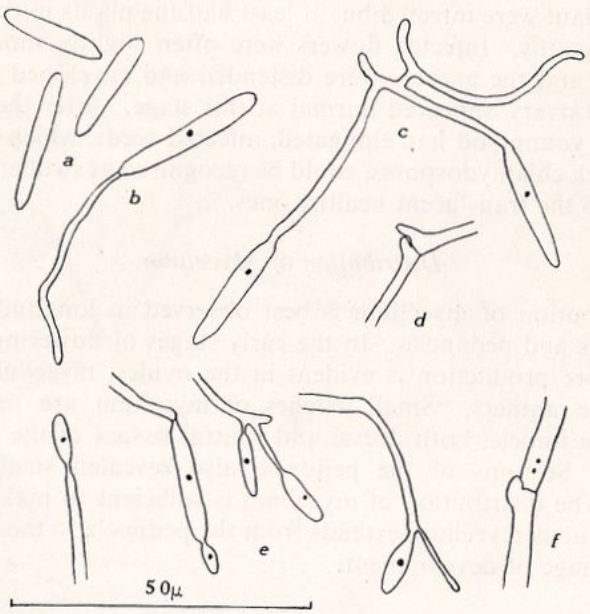


FIG. 1. *Thecaphora deformans* Tul. a, mature conidia. b, germinating conidium. c, germ tube fusion after 48 hours in culture. d, imperfect clamp connection on secondary mycelium in culture. e, stages of conidial formation in culture. f, clamped dicaryotic hypha in host tissue

incomplete. The conidia both in culture and on the host are uninucleate. The germ tube which is produced from the proximal end is slender (1 μ) uninucleate and tends to be straight. On agar coated slide cultures fusions between germ tubes are frequent after forty-eight hours culture, and after this period the presence of a second mycelial type becomes more frequent. This secondary mycelium is binucleate, broader than the primary (1·2–1·4 μ) and more compact in growth (Plate 4, lower figure). A few perfect clamp connections have been observed on it but most are imperfectly formed. (Fig. 1, *d*).

On slide cultures secondary mycelium predominates after six days. Malt agar slope cultures are covered after several days by a grey pruinose conidial mat. After ten weeks cultures consist almost entirely of fragmented secondary mycelium.

The mycelium in the host peduncle, anthers, filaments and young ovules is binucleate with clamp connections and similar to the secondary mycelium produced in culture.

From these observations it seems probable that fusion takes place between uninucleate conidia just as it occurs between sporidia from germinating chlamydospores. The plant is infected by a dicaryotic mycelium which appears in the peduncle and flowers at an early stage of flower development. This mycelium invades the anthers replacing the pollen by conidia and the young ovules which are transformed into a mass of chlamydospores. The mode of production of conidia is similar to Brefeld's figures [1883, Taf. XI] of sporidial production from germinating chlamydospores, except that the regular dichotomy of the conidiophore apex which Brefeld illustrates was not present and Brefeld does not refer to production of conidial chains.

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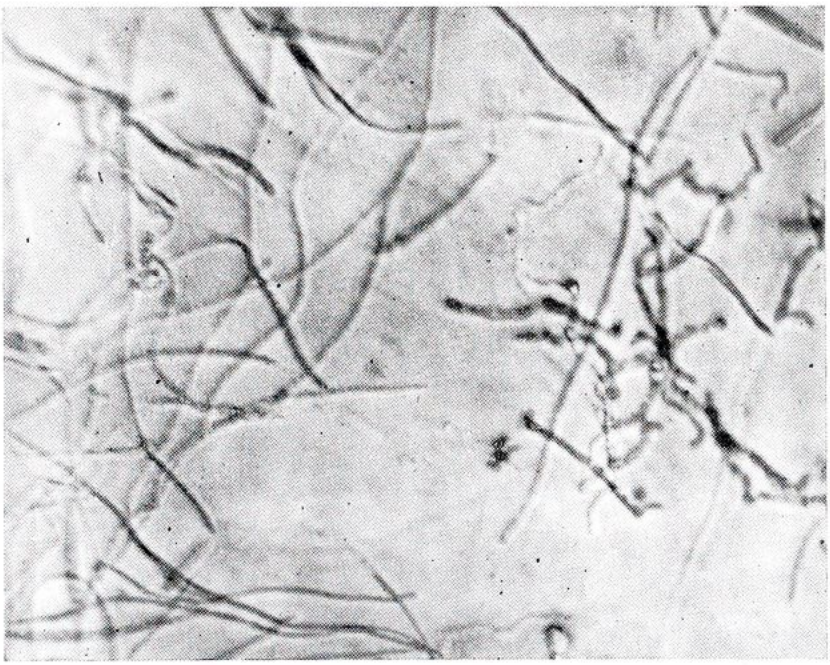

PLATE 5. *Thecaphora deformans.* Upper figure : above, infected flower of *Lathyrus pratensis*, corolla removed ; below, normal flower. Lower figure : primary and secondary mycelium after ten days' culture, × 330.

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