

THE SEX ORGANS OF *PHYTOPHTHORA* *HIMALAYENSIS* DASTUR

THE genus *Phytophthora* de Bary has been given, in spite of the unique mode of sexual reproduction in a section of its members—the amphigynous group—scant cytological attention in comparison with several other genera of the Peronosporales. The only thorough study of an amphigynous *Phytophthora* made so far is that of Murphy¹ on *P. erythroseptica* Pethyb. who advanced arguments to show that there is a piercing of the antheridium by an oogonial incept during copulation.

It has been claimed by some workers, however, that the amphigynous relation of the sex organs is an illusion resulting from an encircling of the female by the male gametangium, and that there is no actual penetration of the antheridium.

In an investigation into the morphology and cytology of development of the sex organs of a new species of *Phytophthora*, *P. himalayensis* Dastur,² I have observed that amphigyny, as the term is generally understood, is no artefact and that the oogonial incept does actually penetrate the antheridium.

Nuclear behaviour in *P. himalayensis* follows essentially the same sequence of events as that recorded by Murphy for *P. erythroseptica*. A stage in nuclear development, unique in the Oomycetæ and first described in *P. erythroseptica*, has also been observed in *P. himalayensis*. This particular stage of development has the basal region of the oogonial cytoplasm stratified in arcs of concentric circles whose centre lies somewhere in the oogonial stipe, while the cytoplasm at the distal (apical) region of the oogonium is non-stratified. The nuclei in the stratified region of the cytoplasm are linear or bow-shaped and oriented tangentially in relation to the stratifications, and occur in invariable association with the latter. The nuclei at the distal, non-stratified region are spherical like the nuclei at all other stages of development of the sex organs (Fig. 1).

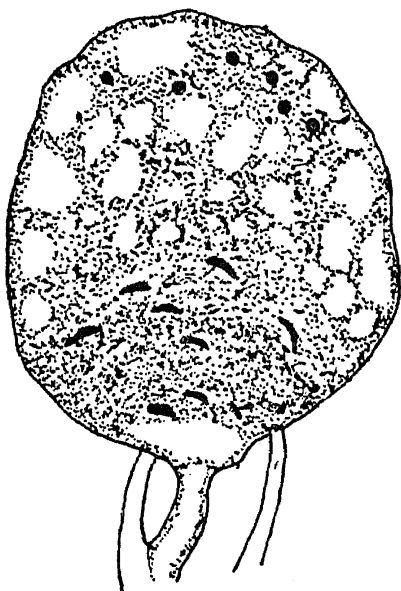


FIG. 1

Murphy regarded the elongate nuclei as eventually transforming into the spherical. In my opinion, the linear form of the oogonial nuclei is due to the pressure exerted on them owing to their characteristic association with cytoplasmic strata which result from regular differences in density of the proximal oogonial cytoplasm.

A curious feature in the morphology of *P. himalayensis* is the development of short, tubular protrusions from antheridia.

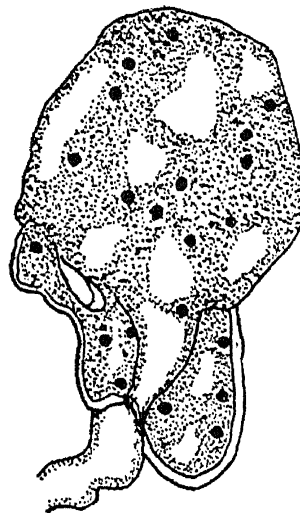


FIG. 2

These antheridial papillæ have not been observed in all copulating gametangia. Each antheridium, in which such papillæ have been observed, generally puts out one protrusion, rarely two or three at a time. Similar papillæ, also observed in *P. erythroseptica* by Murphy were believed by him to function in easing the pressure developed within the antheridium as a result of penetration of the latter by an oogonial incept. My observations do not bear out the function ascribed to them by Murphy. Rather, they serve as fertilization tubes much as the antheridia of paragynous *Phytophthoras*; owing to the origin of such papillæ from amphigynous antheridia and their homology with paragynous antheridia, such a type of gametangial copulation demonstrates the fundamental similarity of paragyny and amphigyny.

A detailed discussion of the ontogeny of the sex organs of *P. himalayensis* will be published later.

I am grateful to Prof. J. F. Dastur for help in the preparation of this note.

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September 1, 1947.

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A XENOSTELE ON *NEOLITSEA* *-ZEYLANICA*

COLLECTIONS of rusted branches and leaves of *Neolitsea zeylanica* Merr. were collected from near Ootacamund, South India. Field observations indicated that the rust had broken out in an epiphytotic form. A detailed examination revealed that the rust is a species of *Xeno-*

stele Syd. and agreed in all features with *X. neolitseæ* Ramak. and Ramak., described recently by Ramakrishnan and Ramakrishnan¹ on the same host species from the same locality. The rust forms conspicuous galls on the leaves and young twigs. Only telia were noticed for the rust. Most of the morphological details have been given by the above authors. It might be mentioned that the teliospores are pedicellate, developing in clusters.

Ramakrishnan and Ramakrishnan state, "two species of this genus have been recorded—*X. echinacea* (Berk.) Syd. on *Actinodaphne molochina* in Ceylon, and *X. litseæ* (Pat.) Syd. on *Litsea glauca* in Japan". They were evidently unaware of the fact that *X. Neolitseæ* Teng was described by Teng² on *Neolitsea* and that Hiratsuka and Yoshinaga³ reported *X. nakanoi* (Kusano and Yoshinaga) Hiratsuka and Yoshinaga on three Lauraceous hosts including *Neolitsea aciculata*. The latter is an opis rust with peridiate æcia and telia.

Only telia are known for *X. neolitseæ* Teng., where the sori are 144-180 μ broad as against 350-400 μ of the present rust. The teliospores are slightly shorter and broader in the Indian species (40-55 \times 24-30 μ as against 45-55 \times 19-24 μ in *X. neolitseæ* Teng.). The comparatively large telia taken along with the slight differences in the sizes of the teliospores in the *Xenosteles* species under study might be used to separate it from *X. neolitseæ* Teng. Since the specific epithet, *Neolitseæ*, has been used by Teng for a rust distinctly separate from the one under study, the name *Xenosteles indica* Thirumalachar nom. nov. is proposed for the Indian species.

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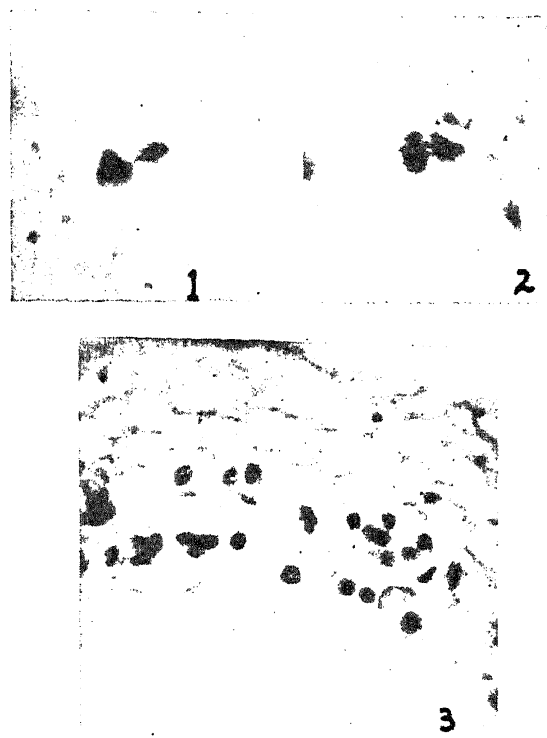
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A CASE OF CYTOMIXIS IN *CROTALARIA MEDICAGINEA* LAMK.

THE chromosome number of *Crotalaria medicaginea* Lamk. only has been reported by Sundar Rao,¹ as $2n = 16$. For further details, a cytological study of *C. medicaginea* has been undertaken.

In some root tips, with periblem cells 2-3 thick, situated 3 or 4 layers below the dermatogen remain more deeply stained even after prolonged destaining. In such cells the chromatin material has migrated into the adjacent cells through protoplasmic connections (Figs. 1, 2) resulting in uninucleate cells (Fig. 3). The migrated chromatin material is more deeply stained than the rest of the cell. Cytomixis,² as it is termed, is not peculiar to any particular stage, but is reported to occur in all stages of division of p.m.c., viz., in interkinesis³ both divisions,⁴ and in the resting stage.⁵ In root tips, however, only two cases have been reported so far by Jacob in *Clitoria ternata*⁶ and in cotton.⁷

Gates² considers that the conspicuous openings or connections between p.m.c., allow an equalisation of pressure in the mother-cells



FIGS. 1-2 Extrusion of chromatin material.

1. Through one protoplasmic connection, 2. two connections.

FIG. 3. Multinucleate cells in periblem region, a result of cytomixis.

from one end of the anther to the other. The movement of the nuclei towards the periphery and the nuclear extrusion are believed to occur in connection with this pressure-equalisation. This process is observed more frequently in the chloralised cells than in the normal p.m.c. of *Vicia faba*.⁸ Cytomixis is reported to result in abnormalities like increased chromosome number, as in rice⁹ and in disintegration of *Triticum* and *Aegilops*,¹⁰ and disintegration of cells.

Though the continuity of affected cells as a ring in the root tip of *C. medicaginea* supports the idea of pressure-equalisation, this 'pressure' seems to arise as an abnormality, as is evidenced by the presence of isolated single or groups of cells in the plerome. In this case cytomixis appears to be pathological, leading to disintegration of cells.

The chromosome number is also determined in mitosis and meiosis and is found to be 16 and 8 respectively as reported previously.¹

I am thankful to Prof. N. K. Tiwari for his helpful suggestions in preparing this note.

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December 6, 1947.

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