structure of the mouthparts it falls clearly within the Chironomidae and shows affinities with the Podonominae.

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GENETICS

Genetics and Cytology of *Phytophthora*

Genetic data concerning the important plant pathogen *Phytophthora* have been lacking because of the difficulty in germinating oospores of this fungal genus. The discovery of mating types in *Phytophthora infestans*[1] and in other species of the genus has permitted the examination of segregation of various factors if the sexual spores can be germinated. This report concerns inheritance and the condition of the nucleus in *Phytophthora drechsleri*.

We used two sexually compatible strains of the pathogen isolated from diseased pepper plants in Chapingo, Mexico (culture 6500-A1 mating type and culture 6503-A2 mating type). The cultures are classified tentatively as *P. drechsleri*, because they do not fit all the characteristics for this species as considered by Waterhouse[2] and may be subject to taxonomic revision later.

Genetic markers which we selected for use were mating type, self-repulsion (*R*) and self-stimulation (*S*) reactions produced when two or more colonies of the same strain were grown in the same plate, type of mycelial branching and ability or failure to produce a brown pigment on peptone–beef extract medium.

Oospores were obtained by pairing the two compatible strains on plates of *V*-8 agar—300 ml. of Campbell *V*-8 juice plus 4 g of calcium carbonate centrifuged at 3,000 r.p.m. for 15 min. To the supernatant, 800 ml. of water and 20 g of agar were added, and the oospores were incubated at about 21° C with alternating light and dark. When oospores were 14 days old or more, agar cultures were blended in a Waring blender, oospores were separated from mycelium by filtration and were transferred into demineralized water. Germination in these conditions usually occurred within 24–48 h; most oospores germinated directly.

No phenotypic segregation seemed to appear from single oospores. Each oospore that germinated by formation of a sporangium produced monozoosporic cultures of the same phenotype. Each oospore that germinated directly produced a mycelium from which single zoospores produced colonies of the same phenotype. Evidence of genetic recombination, however, was found among the phenotypes of the single oospore colonies. Of 126 single oospore colonies, twenty-one were like one of the parents with A1 mating type and self-stimulation reaction, forty-three were like the other parent (A2 mating type, self-repulsion reaction) and sixty-two were recombinants (forty with A1/R and twenty-two with A2/S). The frequency of recombination between mating type and repulsion/stimulation was 49 per cent.

In addition to the phenotypic recombinants, new types were also observed in colonies derived from the germinated oospores. These included a colourless colony from a cross between two brown strains, some neuter and some homothallic colonies from the cross between the two heterothallic strains, and cultures forming papillate sporangia from a cross between two non-papillate strains.

Cytological observations in conjunction with these genetic investigations of pairing the two strains showed that features of the nuclear division in the gametangia were different from those of nuclei in the mycelium. There was indication of pairing of chromosomes, chiasmata formation and reduction in chromosome number suggesting that meiotic divisions might be occurring in the gametangia. The most frequent number of chromosomes observed was eight, arranged usually in four pairs.

The cytological and genetic data could indicate either diploidy in the vegetative thallus or a haploid condition in which all but one of the nuclei disintegrate after the first meiotic division in the oospore, resulting in lack of segregation. The first hypothesis follows that of Sansome, who presented cytological evidence of diploidy in *Pythium debaryanum* and *Phytophthora cactorum*[3]. Further data are needed in order to determine the haploid or diploid condition of the thallus of *Phytophthora*, so that it will be possible to understand the mechanism which inhibits the segregation of progeny derived from single oospores.

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CYTOLOGY

Cytolysomes in Long-dormant Plant Embryo Cells

During an investigation of the ultrastructure and physiology of dormant plant embryos, it was thought of interest to examine the fine structure of embryos maintained in a dormant state for an abnormally long period by withholding the necessary stimulus for resumption of growth, in this particular case by chilling for a period at 5° C.

Seeds of *Fraxinus excelsior* require a period of moist storage at about 20° C while the embryo completes its growth to full size within the seed. Even after full size is attained the seeds remain completely dormant unless chilled at approximately 5° C for 4 months[1]. The embryos used in the experiment reported here were excised from seeds held fully imbibed with water at about 20° C for 22 months, an abnormally long period, during which time none of the seeds germinated. That the seeds were still viable was shown by the resumption of growth of the excised embryos after thorough leaching in water[1]. Specimens were prepared for electron microscopy by removing 0·5 mm from the radicle tips and fixing for 2 h in 3 per cent glutaraldehyde buffered at *p*H 7·2. After post-fixing for 2 h at 0° C in 1 per cent osmium tetroxide, also buffered at *p*H 7·2, the specimens were embedded in 'Araldite', sectioned and stained with lead hydroxide.

Compared with similar sections from embryos which had just attained maturity before chilling in the normal