NOTE.

MORPHOLOGY AND CYTOLOGY OF THE SEXUAL ORGANS OF *PHYTOPHTHORA ERYTHROSEPTICA*, PETHYB. (PRELIMINARY NOTE).

—The Fungus which forms the subject of this study, as first recorded and described by Pethybridge¹ (1913), has a peculiar arrangement of the sexual organs in that the antheridium, instead of growing up by and becoming laterally adpressed to the oogonium, is pierced by the developing female organ, which then grows through it and, rupturing the wall at the opposite side, emerges and assumes a spherical form.

These observations have been confirmed and amplified, and the cytology has been worked out.

The antheridia arise first as intercalary swellings, rarely terminally, and they are cut off by septa. The hypha in the act of giving rise to an oogonium may be seen not infrequently while still within the antheridium, having pierced one wall, but before it emerges at the opposite side. When it emerges it is at first club-shaped, but it quickly becomes spherical and grows to full size. In every case in which the connexions could be traced the male and female organs are borne on separate hyphae but the Fungus is homothallic.

When the organs are full grown the stalk or lower part of the oogonium lies within the antheridium. A section in the direction of the long axis of the stalk shows the latter in or on the antheridium, and a section at right angles to this direction shows the stalk lying free within it—a small circle within a larger one. There is no trace of the antheridium growing around the base of the female organ when the latter is fully grown or nearly so.

The oogonium, when mature, is filled with dense protoplasm in which are distributed a number of nuclei, which are first elongated and irregular in shape, but afterwards round off and appear to increase in size. About two-thirds of them then gradually disintegrate and disappear. At this time a thick plug is formed in the stalk of the oogonium.

Meantime the protoplasm of the oogonium has become less dense and less deeply staining, and the remaining nuclei, now larger and in the prophase of division, arrange themselves in the form of a hollow sphere with one in the centre. In this position all pass through a normal mitosis. The stages of the prophase, origin of the spireme, chromosome formation, and migration to the nuclear plate, are very clear. The spindle is intranuclear, but the membrane soon disappears. Centrosomes are present. The chromosome number is small but is very difficult to estimate with certainty, though it is probably about five. The oogonial nuclei undergo but a single simultaneous division.

¹ Pethybridge, G. H.: On the Rotting of Potato Tubers by a New Species of *Phytophthora* having a Method of Sexual Reproduction hitherto undescribed. Sc. Proc. R. Dublin Soc., vol. xiii (N.S.), 1913, No. 35, p. 529.

During and after the division there is no differentiation of the protoplasm within and without the sphere of nuclei into oospheric and periplasmic regions respectively. As soon as the daughter nuclei are reformed all but one in the centre wander out towards the periphery, beginning to disintegrate rapidly at the same time; and simultaneously practically the whole of the protoplasm contracts away from the oogonium wall and forms the uninucleate oosphere. The remaining nuclei, now scarcely recognizable as such, lie just outside the oosphere, scattered over its periphery. Between them and the oogonium wall is an empty space. The nucleus of the oosphere is still small and stains very faintly. It lies in the centre in an irregular mass of cytoplasm which stains somewhat deeply with orange G.

The nuclei of the antheridium divide once, but whether this is preceded by a disintegration of a portion of them is not certain. A very large outgrowth pushes its way from the upper part of the stalk of the oogonium into the antheridium (the so-called 'receptive papilla'). At about the period when mitosis is complete this has been entirely withdrawn, and a movement in the opposite direction begins, the fertilization tube, with a nucleus at the tip, growing into the oogonium. The tube may pursue a somewhat devious course before penetrating the oosphere, and it may contain more than one nucleus. Only one, however, passes into the oosphere, which then ejects the tube and surrounds itself with a wall. The sexual nuclei, having increased enormously in size, appear to come together at first and then separate widely. When the spore wall is mature they approach again and fuse.

The further stages have not been followed. The spore appears to rest in a uninucleate condition, and the behaviour on germination is not yet known.

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