

appears to be rare, but in New Zealand it is quite common in cankers that are more than two years old. This fungus is a wound parasite, for it is apparently able to infect fruits and branches only through some injury of the epidermis or bark; but under certain conditions it is a true parasite, for in America it has frequently been demonstrated, by experiments in which spores (conidia) have been sprayed on to leaves, that the hyphæ of the fungus are able to penetrate directly through the epidermis into the underlying tissues.

Spores discharged in the early spring from fructifications embedded in the dead bark of cankers and the epidermis of mummified fruits are carried by wind or other agency to leaves and injured surfaces of branches, where if moisture conditions are suitable they germinate and produce a germ-tube (hypha). This penetrates into the tissues and there branches repeatedly, the hyphæ growing between the cells and absorbing from them the food substances necessary for their continued existence. As a result the host cells are killed, and turn brown. At this stage the hyphæ are colourless, but after a time they become dark-coloured, and it is these black masses of hyphæ that give the characteristic colour to infected fruits. After a time masses of hyphæ immediately beneath the dead epidermis become aggregated into little knots, which eventually develop into spore-bearing receptacles or pycnidia. These are flask-shaped or globose (Fig. 5), and contain numerous one-celled olive-coloured spores (Fig. 5, *d*, conidia†), which are borne on slender stalks (Fig. 5, *c*, conidiophores) produced from the inner surfaces of the lower portion of the pycnidia. The apices of the pycnidia at maturity pierce the epidermis; each is perforated by a small opening (ostiolum) through which the spores escape. The spores are embedded in mucilage, and as this readily absorbs moisture the spores are forced out through the opening by the swelling of the mucilage, when they appear on the surface in olive-coloured tendrils. The mucilage is dissolved away by rain, and the spores are released, when they may be washed by rain on to lower leaves and branches, or else carried by wind and insects to adjoining trees.

If a canker lives for more than one season, and the killed bark persists, the second or ascigerous form may appear. This consists of a flask-shaped perithecium containing numerous asci in which colourless one-celled spores are borne (Fig. 6).

These spores may be discharged on to the surface and carried to adjacent trees, where they are probably able to infect leaves and branches, and produce hyphæ, which in turn give rise to pycnidia.

whereas Hesler (1913), after carrying out similar experiments with ascospores of *Physalospora Cydoniæ* Arnaud, also obtained *Sphaeropsis malorum*. Hesler was able to infect apple-branches with ascospore material and produce typical black-rot cankers. On account of this, and the fact that the New Zealand ascigerous material agrees closely with his descriptions and figures, the name he used has been adopted. Our species obviously belongs to the Pleosporaceae, and not to the Melogrammataceae, so that Shear's claim would appear to be untenable in so far as the New Zealand organism is concerned.

† These spores are more correctly termed "pycnidiospores" or "pyncospores," as they are borne in pycnidia; but to save unnecessary use of terms they will in this and subsequent articles be termed "conidia."