

Spores produced in pycnidia or perithecia may either ooze out, or be expelled with force through a hole at the apex of the fruiting bodies. Others again are freed by the collapse or decay of the conceptacles in which they are produced. When ripe the spores either pass through a period of rest, as winter spores, or they immediately germinate, when they may be regarded as summer spores. Germination can only be accomplished successfully when there is sufficient moisture available. Hence we all have had the experience of seeing some fungus disease spreading rapidly during moist warm weather (Apple and Pear Scab, Potato Disease, Mildews, and others). Under favourable conditions the spores take up a large quantity of water and begin to swell, often to double their original size. The next step in germination is a rupture in a cell wall and the protruding of a germinal hypha, which is pushed into the particular substratum (leaf, twig, etc.), where it quickly begins to ramify. We have considered previously the great variation of the fungus spores. The germination of the various spores is likewise very different and frequently an important factor for distinction of species. Conidiospores most generally germinate by producing directly one or more germinal tubes which are capable of infecting plant tissues. Smut spores, however, produce first a so-called short promycelium on which secondary and even tertiary spores may be formed which on germination produce the tube causing infection. The loose smuts of barley and wheat, however, produce infection tubes directly. Similar in behaviour are the teleutospores of our rust fungi. They also produce a promycelium and secondary spores when germinating.

Still more different is the germination of the spores of the common potato fungus. Here the contents of the conidia produced by segmentation of the branches breaks up into minute microscopic bodies, which for some time may be seen rapidly swarming about. After a very short period, however, these swarm spores become stationary and their walls thicken until they finally germinate by producing the typical infection tube.

There are numerous fungi which produce both summer and winter spores. The Black Knot of plums and cherries, the Powdery Mildew of grapes, Scab of pears and apples all produce two forms of spores. The ascospores are nearly always winter spores. The teleutospores of rusts, or egg spores of the *Peronosporae*, which cause the downy mildews are not ascospores, though typical winter spores. The summer spores serve the purpose of a rapid propagation of the fungus, while the winter spores are responsible for carrying diseases over the winter. Very rarely may summer spores be carried through the winter alive, owing to their feeble protection and short life. The winter