

insects. In many species a conidial form of reproduction, not produced on the surface of the compact stroma as in *Claviceps*, but borne on an erect, branched structure, appears first, being followed by the higher form of reproduction, the globose or club-shaped head bearing the perithecia being supported on a stem varying in length in the different species from one-sixth of an inch to six inches in length, the entire fungus being often eight inches high, as in *Cordyceps Robertsii*, Hook., parasitic on a large caterpillar in New Zealand. As a rule the larva is attacked by the fungus, the conidial fructification being produced on the active pupa, which often succumbs to the parasite, the higher fructification appearing after death. In other cases both forms of fruit mature on the still living caterpillar, or in other species one or both forms of fruit appear on the living imago state, as in some species of Lepidoptera. The great advantage to the fungus, from the point of view of spore-dissemination, of having the mature fruit raised on a long stalk and carried about, especially by a winged insect, is obvious.

The number of species included in the above-named genera are as follows: *Oomyces*, 1; *Epichloe*, 3; *Claviceps*, 5; *Cordyceps*, 47, and the genus is cosmopolitan.

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ON THE OCCURRENCE OF DIASTASE IN POLLEN¹.—

The germination of the pollen-grain and the formation of the pollen-tube involve questions similar to those which arise in connection with the germination of the seed. In both cases we have to deal with the utilisation of certain reserve materials which in the case of the pollen-grain are stored within it. As the pollen-tube has to attain a certain length before it can avail itself of any external nutriment which it may find in the tissue of the style, it is evident that the material which it uses in the early period of its growth must be the result of the transformation of the starch, sugar, &c., which are part of the contents of the grain.

In these processes ferment-action plays a definite part. Some years ago, Van Tieghem found that he could demonstrate in the pollen-grain the presence of invertase which converts cane-sugar into glucose. In the present paper an account is given of certain experi-

¹ Abstract of paper read at the meeting of the British Association, August, 1891.

ments made during the present summer on the occurrence of diastase in pollen.

The experiments so far are only preliminary, but they establish the existence of the ferment in the pollen of *Lilium*, *Helianthus*, *Gladiolus*, *Anemone*, *Antirrhinum*, and *Pelargonium*. The method of preparation was to collect the pollen from freshly dehisced anthers, and to grind it up carefully between plates of glass with a little water or dilute glycerine until the microscope showed the grains disintegrated. So prepared it was mixed with very dilute starch-paste, containing about 1% of starch. Half the mixture was then boiled for a short time and both the boiled and the unboiled halves were set aside at a temperature of about 20·23°C. After a few hours traces of diastatic action became evident. The unboiled tube lost its opalescence, and the addition of iodine to samples taken from it at intervals showed the starch undergoing the ordinary stages of conversion into dextrin and sugar. Simultaneously with the changes indicated by the iodine, the use of Fehling's fluid showed a continuous accumulation of grape-sugar, the reduction of the copper oxide becoming more and more marked as time went on. The boiled controls showed no change. The blue colour on the addition of iodine remained constant and no copper-oxide-reducing body was formed.

Further experiments showed that the diastatic power was not associated with the protoplasm of the disintegrated pollen-grain. The contents of several anthers of the Lily were ground up with diluted glycerine, allowed to stand for some hours and then filtered. The solution so made was clear, transparent, and free from the debris of the pollen. This solution when mixed with the same starch-paste caused it to go through the same series of changes, soluble starch, dextrin, and sugar, appearing as the action went on. As in the former case the activity of this extract was destroyed by boiling. We find consequently that the pollen-grains of many plants contain diastase which can be extracted from them as readily as from other parts of the plant.

Further experiments are in progress, which will deal with the nitrogenous and fatty reserve materials, and with the power of the pollen-tube to avail itself of the nutriment obtainable from the tissue of the style as germination proceeds through its later stages.

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