

A FUSARIUM DISEASE OF THE PANSY

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(WITH PLATE 18, CONTAINING 4 FIGURES)

The pansy, *Viola tricolor* L., seems to be affected by only a few widely distributed fungi. According to Saccardo's "Sylloge Fungorum," the following fungi are known to occur on the pansy in various parts of the world: *Asteroma latebrarum* Grogn., France; *Catharinia americana* (Ell. and Ev.) Sacc., America; *Cercospora Violae-tricoloris* Br. and Cav., Italy; *Oidium Violae* Pass., Italy; *Peronospora Violae* De Bary, Germany, Britain, America; *Phyllosticta Violae* Desm., Germany, Hungary, Italy, Britain, France; *Puccinia Violae* (Schum.) DC., Europe, Asia, America; *Ramularia agrestis* Sacc., Germany, Italy; *Ramularia lactea* (Desm.) Sacc., Germany, Hungary, Italy, France, Britain; *Synchytrium aureum* Schroet., Europe, America; *Urocystis Violae* (Sow.) Fisch., Germany, Britain, Holland, Italy, France; *Phoma Violae-tricoloris* Diedicke, Germany; *Cladochytrium Violae* Berlese, Italy; *Colletotrichum Violae-tricoloris* Smith, America.

Most of these fungi occur on the leaves, several of them being saprophytic or else appearing only on languid or dying leaves. The violet rust, *Puccinia Violae*, which is parasitic on all of the aërial parts of the plant, is perhaps the most common. The violet smut, *Urocystis Violae*, appears on the petioles and leaves and has been generally reported from Europe. *Colletotrichum Violae-tricoloris* causes a spotting of the leaves very similar in appearance to the common leaf-spot of the violet and also affects the petals, causing them to die along the margins and often inhibiting their development so that the flowers are malformed. *Cladochytrium Violae*, one of the Chytridineae, is parasitic on the roots of pansies in Italy, forming its spores within the tissue of the host. It is only in extreme cases that the entire plant or entire beds are killed by the ravages of any of these forms, although some parts of the plants are often badly affected.

During the past two years a stem and root disease has been

observed at Lincoln, Nebraska, which has been found to be due to a hitherto undescribed fungus. The disease has proved very destructive, hence its consideration is of economic importance.

The disease is characterized by the sudden dying of the plants. Individuals which are apparently healthy will in a few days be dry and dead. When one of these is pulled up, a dark, slightly sunken area on the stem just at the surface of the ground is apparent. The root-system is destroyed so that only stubs of the main roots are left, the smaller parts having been disintegrated. Several entire beds were observed to be thus destroyed, the dying occurring in the month of July.

On July 12, 1907, plants from a bed which was then almost completely lost, were brought into the laboratory. The stems were first washed in tap-water and then dipped for a moment in a mercuric chloride solution 1:1000. The outer parts were then removed with a sterile scalpel and a portion of the inner tissue from one of the diseased areas was placed on glucose agar plates. When proper precautions were observed to prevent contamination, these plates gave in every instance pure cultures of a *Fusarium*.

The species of *Fusarium* have been generally regarded as saprophytic. Within the last few years, quite a number have been found to be truly parasitic during part of their life, or at least facultative saprophytes. Among these are a flax wilt* reported from North Dakota; a species which destroys green tomatoes† in the field; and another which attacks cultivated peas.‡

In order to determine the mode of life of this species of *Fusarium*, inoculations were made during the summer of 1908. A small portion of the agar with the hyphae and spores was placed just beneath the surface of the ground near the plants, care being taken to inflict no injury to them. In a month these plants had developed the characteristic brown areas on the stems and died, while the check plants remained normal. Planted plates made from the diseased places, using the same care as before to prevent contamination, gave in turn pure cultures of the *Fusarium*. Microscopic examination revealed the presence of fungus fila-

* Bolley, Bull. N. D. Exp. Sta. 50. 1901.

† Smith, Tech. Bull. Mass. Exp. Sta. 3. 1907.

‡ Schikora, Dissertation Berlin, 1-34. 1906.

ments in the stem tissue, and the presence of spores in the center of the stem.

At the same time, a large bed was noticed in which the plants were all killed, which on examination and by cultures proved to be due to the same *Fusarium*.

Since no species of *Fusarium* have been described as occurring on the pansy or other members of the violet family, the name *Fusarium Violae* is proposed for this species, which is characterized as follows:

***Fusarium Violae* sp. nov.**

Parasitic on the stems and roots of *Viola tricolor*, causing the formation of dark, sunken areas on the stems and the destruction of the root-system. Macrospores hyaline, fusiform-falcate, 28-38 μ long and 4-6 μ wide, 3-5-septate. Sporodochia borne within the stems. In cultures, the hyphae are white and cottony, and the microspores, which are 8.5-12.5 \times 2-3.5 μ , are formed profusely from short side branches. In hanging drop cultures, these spores are capable of very vigorous growth, forming much-branched hyphae.

Hyphis mycelii hyalinis, 4-7 μ diam., irregulariter ramosis, matricem truncorum et radicium penetrantibus; sporodochiis intus, forma indefinita. Macroconidiis hyalinis, fusiformibus falcatis, 28-38 \times 4-6 μ , 3-5 septatis; microconidiis continuis, 8.5-12.5 \times 2-3.5 μ , e conidiophorum ramulis brevibus oriundis.

Hab. in truncis vivis et radicibus *Violae tricoloris*, quam destruit; in truncis maculis brunneis vel nigris factis, et radicibus destructis.

One factor was observed in connection with this fungus which might lead to its control. The pansies were destroyed only in those beds which had been fertilized with barnyard manure just previous to planting. Other beds which were not thus enriched before planting were normal. If due precaution is taken that the fertilizers are perfectly decomposed and mixed with the soil before the plot is used for a pansy bed, no injury may be expected. This can, perhaps, be best accomplished by applying the fertilizers in the season previous to the one in which the ground it to be used for pansies.

EXPLANATION OF PLATE XVIII

- Fig. 1. Germination of microconidia.
- Fig. 2. Formation of microconidia as shown in hanging-drop cultures.
- Fig. 3. Germination of macroconidia.
- Fig. 4. Various forms of macroconidia.