

WILT OF EGG-PLANT (*SOLANUM MELONGENA* L.)

Egg-plant (*Solanum melongena* L.), an important vegetable crop in the State of West Bengal, is grown in the months of June to November. The plant suffers from a wilt disease which appears in small groups of plants in the field in an irregular fashion and progresses along the rows. Plants are attacked in all stages of growth and die. The root system of the wilted plants is poorly developed and discoloured. The secondary and the tertiary roots are badly damaged and the taproot is also affected. The xylem vessels of the roots have been found to be filled up with fungal hyphae.

Records of wilt of egg-plant are very few in India. In recent years, Patel *et al* (1949) reported wilt of egg-plant caused by a species of *Verticillium*. Butler and Bishby (1931) report the occurrence of dry root-rot caused by *Macrophomina phaseoli* (Maubl.) Ashby. As this disease causes extensive damage in West Bengal, investigation was taken up to find out the cause of the disease.

ISOLATION AND IDENTIFICATION OF THE CAUSAL ORGANISM.—Small bits of affected roots, 0.5 c.m. in length, were surface sterilized with 0.1% Mercuric Chloride solution for one minute and transferred to sterile Petri dishes containing 2% plain agar. After 3-4 days' incubation at 26°—28°C. when good mycelial growth was obtained bits of mycelium were transferred to *potato-dextrose-agar* medium. In this way several isolations were made from the samples collected from different localities. The isolates sporulated within a few days and monoconidial cultures were made for the purpose of study. The isolates after careful study were found to be the same fungus in all cases. It was identified to be a species of *Fusarium*.

When superficially sterilized affected roots were incubated at 30°C. on sterile glass slides in a humid chamber, abundant mycelial growth appeared on their surface. Microscopic examination of the fungal growth also showed the presence of the same species of *Fusarium* in all cases. After careful study the fungus was identified as *Fusarium solani* (Mart.) App. and Wr. *Sensu* Snyder and Hansen.

PATHOGENECITY TESTS.—A number of experiments were conducted to test the pathogenicity of the fungus on egg-plant. Sutton's "Long Purple" variety was used in all the cases.

Experiment 1. Eleven sterile culture-tubes (8"×1"), each containing 2" layer of sand and 10 c.cm. of nutrient solution (Sachs), were inoculated with the conidial suspension from a 21-days-old culture of the fungus on *potato-dextrose-agar* medium, while four others were kept as controls. Four seeds, surface sterilized with 0.1% mercuric chloride, were then introduced into each culture-tube and the sand was regularly moistened with sterile nutrient solution.

Experiment 2. Seven jars (5"×4"), each containing sterilized (with formalin) garden soil, were inoculated in the usual way with the fungal culture grown in *sand-maize-medium* for three weeks. Two jars were left as controls. After 7 days of inoculation in each of the inoculated jars as well in the controls, 30 surface sterilized seeds were sown. The soil

was kept moist throughout the experiment. The results of experiments 1 and 2 are given below.

| | | Number of seedlings coming up after 12 days of sowing | Number of seedlings wilted after | | Total number of seedlings wilted |
|---------|------------|---|----------------------------------|----------------------|----------------------------------|
| | | | 7 days of emergence | 15 days of emergence | |
| Expt. 1 | Inoculated | 22 | 9 | 12 | 21 |
| | Control | 14 | nil | nil | nil |
| Expt. 2 | Inoculated | 60 | 35 | 14 | 49 |
| | Control | 22 | nil | nil | nil |

Experiment 3. A similar experiment was conducted in which instead of putting seeds, 2 to 3-weeks-old seedlings, raised in sterilized soil from the surface sterilized seeds, were transplanted in each of the five inoculated jars as well as in the two controls. Out of the ten seedlings in the inoculated jars one showed signs of wilting within 15 days of transplantation, whereas within a period of four weeks, altogether 8 seedlings wilted.

Experiment 4. Ten sterile conical flasks, each containing 100 c.c.m. of Sachs' nutrient solution were inoculated with the 3-weeks-old culture of the pathogen and incubated, and 4 were kept as controls. One 3-weeks-old seedling was put in each flask after 5 days and kept in position with the help of sterilized cotton plug. All the flasks were covered with black paper. Nutrient solution was added in each flask periodically. Within a week the seedlings in the inoculated flasks showed signs of gradual yellowing of leaves and wilting, whereas the plants in the control sets did not show any such symptoms. Wilted seedlings showed poor development of the root system. The growth of the tap root was arrested and the production of secondary and tertiary roots affected. Microscopic examination of the roots showed discolouration of the vascular zones.

The same fungus was, however, reisolated from all the diseased plants of different experiments. From these experiments it is evident that *Fusarium solani* (Mart.) App. and Wr. Ssensu Synder et Hansen is pathogenic to egg-plant, and it can affect the root system.

MORPHOLOGY OF THE FUNGUS.—Aerial mycelium scanty to moderate, colour white to pinkish or various shades of Pink to Pinkish cinnamon. Sporodochia present. Conidia either in sporodochia or in loosely arranged heads; both microconidia and macroconidia present. Conidia hyaline, in mass Pale Ochraceous to Ochraceous buff in colour. Microconidia oval, one-celled. Macroconidia thick-walled, almost straight but with both ends bent or curved, more or less of uniform diameter, 1-3 septate, rarely 4-septate, majority 3-septate. Chlamydospores few to abundant, warty, single or in chains, oval and intercalary ($8-19.2 \times 6.4-11.2\mu$) or spherical and terminal ($6.4-11.2\mu$).

MEASUREMENTS OF CONIDIA ON DIFFERENT MEDIA

Potato-dextrose agar (containing 2% dextrose): culture 21-days-old

CONIDIA

| | |
|--------------------------|---------------------------------------|
| 0-septate (18 per cent.) | 11.7 × 2.1 (8.16 - 1.6 - 3.2)μ |
| 1-septate (29 per cent.) | 16.7 × 3.4 (12.8 - 2.4 × 3.2 - 4)μ |
| 2-septate (3 per cent.) | 26.4 × 3.8 (22.4 - 30.4 × 3.2 - 4.2)μ |
| 3-septate (50 per cent.) | 34 × 4.3 (27.2 - 40 × 3.2 - 4.8)μ |

Potato-dextrose agar (containing 5% dextrose): culture 21-days-old

CONIDIA

| | |
|--------------------------|-------------------------------------|
| 0-septate (13 per cent.) | 10.8 × 1.9 (8 - 12.8 × 1.6 - 3.2)μ |
| 1-septate (26 per cent.) | 18.3 × 3.3 (12.8 - 25.6 × 2.4 - 4)μ |
| 2-septate (13 per cent.) | 25.5 × 3.8 (20.8 - 27.2 × 3.2 - 4)μ |
| 3-septate (48 per cent.) | 31.3 × 3.8 (25.6 - 36.8 × 3.2 - 4)μ |

Maize agar: culture 21-days-old

CONIDIA

| | |
|--------------------------|-------------------------------------|
| 0-septate (7 per cent.) | 11.5 × 2.6 (8 - 16 × 1.6 - 4)μ |
| 1-septate (17 per cent.) | 17.3 × 3.4 (11.2 - 20.8 × 3.2 - 4)μ |
| 2-septate (14 per cent.) | 28.5 × 3.4 (25.6 - 30.4 × 3.2 - 4)μ |
| 3-septate (62 per cent.) | 31.5 × 3.8 (25.6 - 38.4 × 3.2 - 4)μ |

Brown's synthetic agar: culture 21-days-old

CONIDIA.

| | |
|--------------------------|-------------------------------------|
| 0-septate (29 per cent.) | 9.7 × 1.8 (6.4 - 12.8 × 1.6 - 2.4)μ |
| 1-septate (13 per cent.) | 15.4 × 2.2 (8 - 24 × 1.6 - 2.4)μ |
| 2-septate (8 per cent.) | 22.4 × 3.0 (19.2 - 24 × 2.4 - 3.2)μ |
| 3-septate (47 per cent.) | 35.8 × 3.6 (22.4 - 40 × 3.2 - 4.8)μ |
| 4-septate (3 per cent.) | 36.8 × 4.2 (35.2 - 40 × 3.2 - 4.8)μ |

Steamed Rice: culture 21-days-old

CONIDIA

| | |
|--------------------------|--------------------------------------|
| 0-septate (44 per cent.) | 10.2 × 2.3 (6.4 - 14.4 × 1.6 - 3.2)μ |
| 1-septate (47 per cent.) | 17 × 3.1 (12.8 - 22.4 × 2.4 - 4)μ |
| 2-septate (8 per cent.) | 23 × 4 (17.6 - 25.6 × 4)μ |
| 3-septate (1 per cent.) | 28.8 × 4 (25 - 30 × 4)μ |

Potato plug: culture 21-days-old

CONIDIA

| | |
|--------------------------|-------------------------------------|
| 0-septate (18 per cent.) | 9.6 × 1.8 (6.4 - 16 × 1.6 - 2.4)μ |
| 1-septate (28 per cent.) | 20 × 2.9 (11.2 - 24 × 2.4 - 3.2)μ |
| 2-septate (13 per cent.) | 23.4 × 3.4 (17.6 - 28.8 × 2.4 - 4)μ |
| 3-septate (41 per cent.) | 30.3 × 3.4 (24 - 38.4 × 3.2 - 4)μ |

AVERAGE OF THE ABOVE MEASUREMENTS

CONIDIA

| | |
|----------------------------|---------------------------------------|
| 0-septate (21 per cent.) | 10.7 × 2.1 (9.6 - 11.7 × 1.8 - 2.6)μ |
| 1-septate (27 per cent.) | 17.5 × 3 (15.4 - 10 × 2.2 - 3.4)μ |
| 2-septate (10 per cent.) | 25 × 3.6 (22.4 - 28.5 × 3 - 4)μ |
| 3-septate (41.5 per cent.) | 33.6 × 3.8 (28.8 - 35.8 × 3.4 - 4.3)μ |
| 4-septate (0.5 per cent.) | 36.8 × 4.2 (35.2 - 40 × 3.2 - 4.8)μ |

CULTURAL CHARACTERS.—From the taxonomic point of view, cultural studies of *Fusaria* are by far the most important. Accordingly, the fungus

was grown on different solid media and sterilized plant tissues to study the nature of growth and pigmentation. Study on agar media was made in Petri dishes (4" diameter) into each of which 20 c.cm. of medium was poured. Inoculations in all the cases were made from 2-weeks-old culture on *potato-dextrose-agar*. All the cultures were kept at a temperature which varied from 26 C. to 28 C. They were exposed to diffused sunlight during the day and to the light of 60 watt electric bulb at night. The colour of mycelium has been expressed according to Ridgway (1912). The details of the cultural characteristics are presented in Table 1.

Table 1. *Cultural characters of the fungus on different media*

| Media | Habit of growth | Colour |
|--|---|---|
| <i>Potato-dextrose-agar</i> (2% Dextrose) | Mycelial growth poor to moderate; hyphae short, coarse; growth downy, after 10 days depressed and matted; in about 20 days innumerable slimy spore masses appear; spore masses scattered irregularly. | White |
| <i>Potato-dextrose-agar</i> (5% Dextrose) | Mycelial growth moderate; hyphae short, coarse; growth downy, may show tendencies of being floccose occasionally; after 10-12 days mycelial growth depressed and matted; numerous spore masses appear; spore masses smaller and less in number than those in 2% <i>potato-dextrose-agar</i> . | Pinkish white |
| <i>Maize-agar</i> | Mycelial growth moderate; hyphae short, coarse; growth felty to downy; soon becoming appressed and matted; in 20 days numerous spore masses appear scattered throughout the surface. | White touched with pinkish hue |
| <i>Brown's synthetic-agar</i> | Mycelial growth scanty; hyphae short, coarse; growth appressed, becoming matted in 10-12 days; abundant spore masses appear in three weeks' time; spore masses shiny in appearance and scattered. | White touched with very faint pinkish shade |
| <i>Steamed rice</i> | Mycelial growth moderate; hyphae coarse and short; spore masses not observed. | Pale Pinkish cinnamon |
| <i>Potato plug</i> | Mycelial growth thick; growth felty in the beginning, later on becoming appressed; numerous spore masses appear and scattered irregularly. | White with pinkish shade with pale Ochraceous buff spore pustules |

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