

FRUIT ROT OF TOMATOES CAUSED BY *PHYTOPHTHORA PALMIVORA* BUTL.

BY T. S. RAMAKRISHNAN AND C. K. SOUMINI

(Mycology Department, Agricultural Research Institute, Coimbatore)

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DURING the north-east monsoon period in 1944 and 1945, a fruit rot disease of tomatoes was in evidence at the vegetable production centre at Tudiyalur, Coimbatore district. The crop was raised in a field where the plants were not propped. The disease became evident soon after heavy rains in October. Since the propping was not done several branches were spreading on the ground and consequently some of the fruits borne on these branches were at times in contact with the wet soil. Such fruits were the first to be affected. Nearly 25 per cent. of the fruits were involved. The disease later on spread to fruits borne on higher branches also.

The disease was observed mainly on the fruits. In a few instances the young shoots touching the soil were also affected. The stem and the branches at this region were first discoloured with a dull green water-soaked appearance but later these turned dark brown and rotted. Fruits of all sizes were affected. On green fruits the disease commences at the blossom end or at the side which touches the soil in the form of small water-soaked spots. These increase rapidly in size and in the course of 3 to 4 days the entire fruit becomes involved. The fruit assumes a brownish colour, is soft to the touch and the skin easily peels off. In wet weather the fungus grows out and forms a white fluffy growth on the surface. Sometimes, concentric markings may be seen in the affected portions and the external fungal growth also assumes similar distribution (see photograph). The organism causing the disease was found to be a *Phytophthora* and numerous sporangia were detected in scrapings of the external growth.

Fruit rots of tomato caused by *Phytophthora* have been recorded from all over the world. Tucker (1933) has recorded a rot of fruits near or in contact with soil as the most common type of infection caused by *Phytophthora parasitica* Dast. Reddick (1920) has described the occurrence of a disease in glass houses in New York causing girdling of the stem and rapid rotting of fruits due to *P. parasitica* Dast. *P. infestans* de Bary has been known to infect fruits in various countries (Tucker, 1933). Buckeye rot of

tomatoes in California is ascribed to *P. dreschleri* Tucker and *P. capsici* Leonian (Tompkins and Tucker, 1941). Lavellée (1941) has recorded *P. parasitica* Dast. as responsible for buckeye rot. Thus tomato fruit rot is widespread and is reported to be caused by different species of *Phytophthora*.

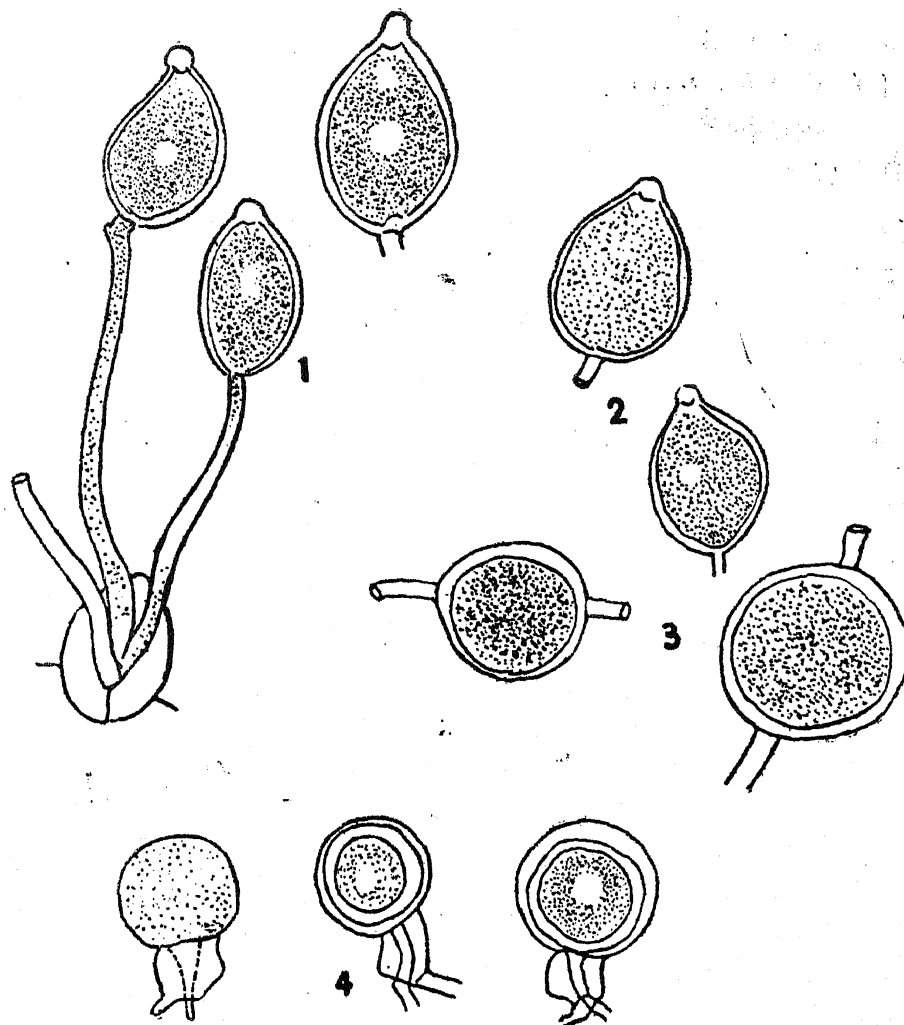


FIG. 1. Sporangia from tomato fruits ($\times 400$).

FIG. 2. Sporangia from culture ($\times 400$).

FIG. 3. Chlamydospores from culture ($\times 400$).

FIG. 4. Oospores formed in combination with another strain ($\times 400$).

The organism causing the disease at Coimbatore was isolated into pure culture from a single sporangium. It grew well on oat and french-bean agar media. Numerous characteristic sporangia and chlamydospores were produced. The sporangia are oval or pear-shaped, papillate, mainly terminal and measure $33.4 \times 22.6 \mu$ ($18.6-46.5 \times 15.5-37.2 \mu$) (Figs. 1 and 2). The chlamydospores are spherical, hyaline or light yellowish brown in

colour. The colour is developed in the wall of the older chlamydospores. They were formed terminally or more often intercalary and measured $23.4 \times 20.5 \mu$ ($15.5-31 \mu$) (Fig. 3). Oospores were not formed.

The pathogenicity of the organism was established by inoculation experiments of the fruits on growing plants and detached fruits kept in sterilized moist chambers. The plants with the fruits (grown in pots) were placed in glazed cages kept moist by having a layer of moist sand at the bottom and frequent sprayings with sterile distilled water. The fruits were young and green. All the inoculated fruits were infected and in 5 days they rotted completely. The detached fruits were green, bigger and more mature. These were infected in 3 days and completely rotted in 6 days. In both cases the same fungus was recovered from the infected fruits. The controls remained healthy throughout.

The organism is able to infect young branches and leaves of tomato. These become involved in a blackish green wet rot and the rotten portions fall off or the stem breaks at the point of infection. With the severance of the infected branch or stem the spread of infection is arrested.

The organism infects the fruits through unwounded surfaces. Inoculation experiments showed that infection can take place through any part of the fruit. Bits of culture were placed on the fruit near the stalk, styler end and other portions of the fruit and in all cases infection occurred. The hyphæ ramify through the tissues of the fruit being both inter-cellular and intra-cellular. The affected tissues became soft and discoloured.

The average dimensions of the sporangia and chlamydospores of this *Phytophthora* agree with those of *P. arecae* (Coleman) Pethybridge, *P. palmivora* Butler, *P. meadii* Mc Rae, and *P. parasitica* Dastur. Tucker (1931) is of opinion that "the dimensions of sporangia considered independently of other characters cannot be accorded much importance taxonomically". The same may be said to apply to the dimensions of chlamydospores also.

The fungus was grown in paired culture with two strains of *Phytophthora* isolated from arecanut and kindly supplied by Dr. Uppal, Plant Pathologist, Bombay. Oospores were produced with one of these strains but not with the other. The oospores were spherical yellowish in colour and measured 20.0μ in diameter (range $15.5-24.8 \mu$) (Fig. 4).

The isolate from tomato closely resembles one of the strains isolated by Uppal and Desai (1939) from arecanuts (Nilekani strain) and is similar to the strain found on arecanut in South Kanara. A more detailed study including all the South Indian isolates of *Phytophthora* and others obtained

from elsewhere is being carried out in this laboratory and will form the subject of a further communication.

CONTROL

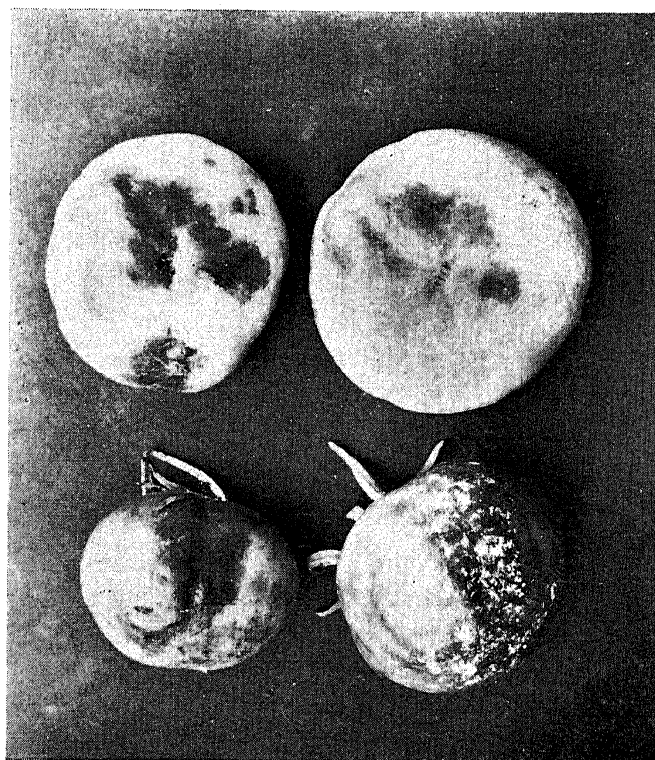
Experience in other parts of the world has shown that when the tomato plants are sprayed with Bordeaux mixture the fruit rot disease is controlled. Further it is noticed that the disease commences on the fruits lying in contact with the soil. If it is possible to prevent this, the incidence of the disease can be lowered. This can be accomplished by staking the plants or tying them to frames and thus prevent them from trailing on the ground. Further the plants and fruits must be sprayed with Bordeaux mixture.

SUMMARY

A fruit rot of tomatoes was prevalent in Coimbatore during the rainy season. Fruits in contact with the soil were the first to be affected. *Phytophthora* was isolated from these fruits. The fungus was found to resemble *P. palmivora* Butl. (areca strain from S. Kanara).

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Diseased tomato fruits