

Relative Parasitism of the Cotton Root-Rot
Organisms from Gujrat Soils.

AMONGST the organisms isolated from affected roots of cotton, the principal ones are: (1) *Fusarium vasinfectum* form, (2) *Macrophomina* sp. (*Rhizoctonia bataticola*), (3) a species of *Cephalosporium*, and lastly, (4) a *Cephalobus* species of nematodes. Of these the *Cephalosporium* occurs rarely and there is no evidence to show that it is a parasite. The *Fusarium vasinfectum* form has been shown to be non-pathogenic. Under any circumstances this form of *Fusarium* has not given any infection and this observation has been confirmed by another worker from a wilt research laboratory to whom this form was sent. *Fusarium* obtained from Jalgaon and Broach as also the one from Desan, a village in Baroda territory, where wilt exists, gave a high percentage of infection.

It may be noted from Fig. 1 that the Desan fungus was a fresh culture (pot Nos. 3-4), whereas the fungus used in pots 1-2, 5-6 was from Jalgaon and Broach wilt areas respectively and isolated from the *gorat* soils from Baroda infected for the third time.

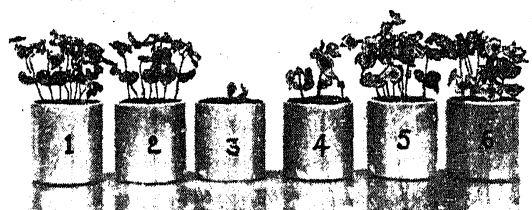


Fig. 1.

Infections with *Fusarium vasinfectum* form from wilt and rot soils.—(1) Jalgaon, 9 plants—3 deaths. (2) Jalgaon, 12-1, (3) Desan, 10-10, (4) Desan, 11-8, (5) Broach, 6-1, and (6) Broach, 9-0.

The fresh Desan fungus is very virulent as compared to the other two, which have lost their infective property due to their having remained for two generations in *gorat* soil.

Nematodes are generally symbiotically associated with this *Fusarium* Baroda form. No culture of the nematodes could be obtained free from the fungus although the fungus could be cultivated free from nematodes by dropping the worms in a liquid culture medium. It was thus quite probable that the existence of this *Fusarium* in affected plants was due to these nematodes.

The more closely associated rot organisms were thus the nematodes and *Macrophomina* sp., the parasitism of which could not always be induced under ordinary circumstances, although some evidence to that effect has been obtained. An interesting observation on the May and monsoon-sown cottons led to the discovery of the conditions favouring parasitism. A survey of the rot incidence made in the beginning of this Scheme on 1931-32 cotton crop from the Agricultural Experimental Station at Baroda indicated that rot occurs more extensively in the May-sown irrigated cottons as compared to those sown in monsoon after the first showers (Fig. 2).

Plot No. 22 (see graph) was sown on 15th of May 1931 and irrigated with well water seven times; this shows a rot percentage of 92 whereas with the monsoon-sown crop the percentage lies between 23 to 58. These latter plots were sown between the 18th and the 19th June, after the first showers which occurred on the 16th June 1931. Total precipitation for the year amounted to 55.60 inches. The only difference between the May and June sown crops lay in the conditions of irrigation, soil humidity and temperature. After the first showers the conditions were identical for both the crops.

Regular meteorological data were collected from April 1932 and an examination of these showed that a soil moisture of 30 per cent. and a temperature of 40° C. favoured parasitism in *Macrophomina* and *nematodes* jointly, although each one was capable of becoming parasitic under identical conditions.

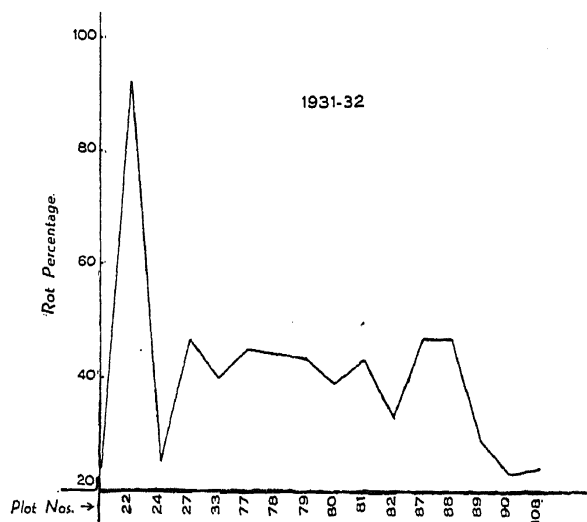


Fig. 2.

Experiments in which the organisms enjoyed these conditions were, therefore, planned in order to find out whether such conditions are conducive to infection. The methods employed were as follows.—

1. Roots of rot-affected cotton plants were cut into pieces, the bark being peeled off. This material was mixed up with sterilised soil and incubated for eight days after which delinted seed was sown. The temperature ranged between 38°—40° C. Within a month from sowing, out of a total of 25 seedlings 13 died of rot from which *Macrophomina* and *Nemas* were isolated. Controls from temperature tanks and rooms did not produce any deaths.

2. Roots from affected plants were chopped into pieces and mixed with sterilised soil. These were incubated for eight days in a multiple incubator with a range of temperature between 27°—42° C. Out of 41 seedlings 39 died of rot. Death roll ranged high between 30°—42° C. and isolations gave pure *Macrophomina* and *Nema* cultures.

3. Sterilised soil was mixed up with healthy cotton stalks and autoclaved. Cultures of *Macrophomina* and *Nemas* on cotton stalks were used. Infections were done with individual organisms and mixtures. Controls were kept in temperature tanks and at room temperature. The temperatures in the tanks ranged between 38°—40° C. Three out of the 15 seedlings from *Macrophomina*-pot and three out of 9 seedlings

from *Nema*-pot succumbed, and from the mixture one out of 9 died after a lapse of one month. Isolations gave identical organisms from dead plants.

4. Only *Macrophomina* was used in the same manner with two controls. Temperatures of the tanks ranged between 35°—42° C. Out of the 25 seedlings from 5 pots 14 died of rot from one tank and out of the 23 from the second tank 8 died after a lapse of one month. Isolations gave pure cultures of *Macrophomina* and there were no deaths in the controls.

The infective capacity of *Macrophomina* and *Nema* became established thus under certain temperature and humidity conditions of the soil. No sooner these conditions disappear the organisms tend towards saprophytism in the soil (see Fig. 2).

In all the above experiments water from the well with pH 8 was used. The tendency of the *Fusarium vasinfectum* form (pH 5.4) being towards acidity while that of *Nema* and *Macrophomina* was towards alkalinity as observed from cultural filtrates (pH 7.6—8.0). The soil reaction ranged from neutral to alkaline and compares with the pH ranges for the two infective organisms. The action of the irrigated water as compared to the rain water may also be taken into consideration.

In view of the results obtained, in addition to the study of resistant and immune strains to rot, control measures are being developed, involving soil disinfections, manurial and change of sowing date trials.

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