

DOWNY MILDEWS OF MAIZE IN WEST BENGAL

BY

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Researches on diseases of maize was actually started in West Bengal from the year 1976 when All India Coordinated Maize Improvement Project started functioning at Kalimpong and Kalyani centres. Since then a number of diseases have been recorded on this crop (Kaiser and Sengupta, 1979). The last five years surveys during the years 1976 to 1980 at and around Kalyani (plains) and at and around Kalimpong (hills) show that maize is attacked by three distinct species of downy mildew fungi, namely *Perenosclerospora philippinensis*, *Sclerophthora rayssiae* var. *zeae* and *Sclerospora macrospora*.

Sclerophthora rayssiae var. *zeae* is present in the plains as well as in the hills whereas *Perenosclerospora philippinensis* mainly in the hills. Payak and Renfro (1967) described *Sclerophthora rayssiae* var. *zeae* causing a serious brown stripe downy mildew of maize in many parts of India. The pathogen also produces a similar type of symptoms in West Bengal situation. Short, unbranched sporangiophores of the pathogen arise through the stomata of the infected leaves and bear the sporangia on sympodial branches. Sporangia are hyaline, ovate to obclavate, smooth with a rounded apex and they measure 25-60 x 16-26 (average 37 x 21) microns. Oospores are abundantly produced in leaf mesophyll or under the stomata. They are thin walled, spherical and straw coloured, and measure 35-40 microns in diameter.

Perenosclerospora philippinensis on maize was reported by Weston (1920) who described the pathogen as *Sclerospora philippinensis* which has been recently transferred into *Perenosclerospora* by Shaw (1978) on the basis of production of true conidia which always germinate by a germ tube. Symptoms produced by this species are same as described by Weston (1920). Conidia

borne on dichotomously branched conidiophores are hyaline, thin walled, almost barrel shaped and they measure 15-50 x 9-24 (average 28 x 15) microns. However, oospores were not observed in any case.

Perenosclerospora philippinensis might be transmitted every year through seeds as the role of alternate hosts has not been established whereas *Sclerophthora rayssiae* var. *zeae* through oospores in the crop debris of the previous season. Seeds may also serve as the primary source of inoculum in the later case. The last five years observations have shown that these two downy mildew fungi occur regularly in the hills mainly during the kharif season. However, their occurrence in the plains is irregular and the incidence is also less. *Sclerophthora rayssiae* var. *zeae* occurs in the plains during the kharif season whereas *Perenosclerospora philippinensis* during the Rabi season.

Data recorded have shown that the incidence of these two species is influenced by host varieties and climatic factors. Hybrids and composites are generally susceptible. A large number of full sib progenies of Vijay and Kisan have shown various degree of susceptible reaction. Hybrid Ganga-3, VI-54, (Syn. P 200 x Kisan) Tarun and Mecadonian Flint-585 are highly susceptible whereas hybrids Ganga-5, Vijay and Lalat A-de-cuba are moderately resistant to both these fungi.

Observations made at Kalimpong show that cloudiness (4-6 hours/day), high humidity (96% and above) and moderate temperature (16-25°C) during the kharif season favour disease development by these two species. *Sclerophthora rayssiae* var. *zeae* has been found to thrive better at a higher temperature (22-26°C). Payak and Renfro (1967) observed that the zoospore production of *Sclerophthora rayssiae* var. *zeae* is induced by incubating the sporangia at 20°C for 12-24 hours. Exconde (1970) also observed that moisture and darkness are essential for the formation of conidia and their germination in *Perenosclerospora philippinensis*, the optimum temperature being 19-20°C. The existing high humidity, cloudiness and temperature range between 19-25°C during the vegetative growth phase (May-August) might be the main attributing factors for the high incidence and regular appearance of both the species in this area. Their irregular appearance and low incidence in the plains may be due to the unfavourable temperature during the crop season, for the development of infection and spread of the disease.

Time of sowing has also a direct impact on the incidence of these two downy mildew fungi as studied in Kalimpong area. Disease severity is

comparatively less in the early sown (March—April) crop than in the late sown (May—June) crop that is exposed to moderate temperature and high humidity during the early stage of growth.

The third downy mildew fungus, namely *Sclerospora macrospora* causing crazy top symptoms has been recorded only once during the Rabi seasons of 1978—79 at the University Experimental Farm, Kalyani on two exotic lines of *Zea*, namely *Zea mexicana* and *Zea parennis*, which were grown for evaluation of germplasm of maize against disease under normal agronomic conditions (Kaiser and Sengupta, 1980). Symptoms appeared as marked stunting of the plants, excessive tillering and narrow leathery leaves (Plate 1, Fig. 1). Most diseased plants were barren with undeveloped thin ears and complete or partial suppressing of tassels (Plate 1, Fig. 2). A very few plants bore nubbins with a few kernels which were very small and undeveloped. Sporangia were not found but thick walled and yellowish oospores (45—68 microns) were observed within the leaves and leaf sheaths of heavily affected plants. The disease on maize has so far not been reported from any part of India. *S. macrospora* on maize appears to be primarily seed borne (Ullstrup, 1952) and the disease might have been transmitted to West Bengal through seeds. The primary factor determining the appearance of this disease has been suggested to be flooding or water-logging of the soil before planting (Ullstrup, 1952) and complete water logging of Kalyani Farm for about ten days in the month of September—October of 1978 due to floods in West Bengal might be the main attributing factor in the occurrence of this disease in West Bengal.

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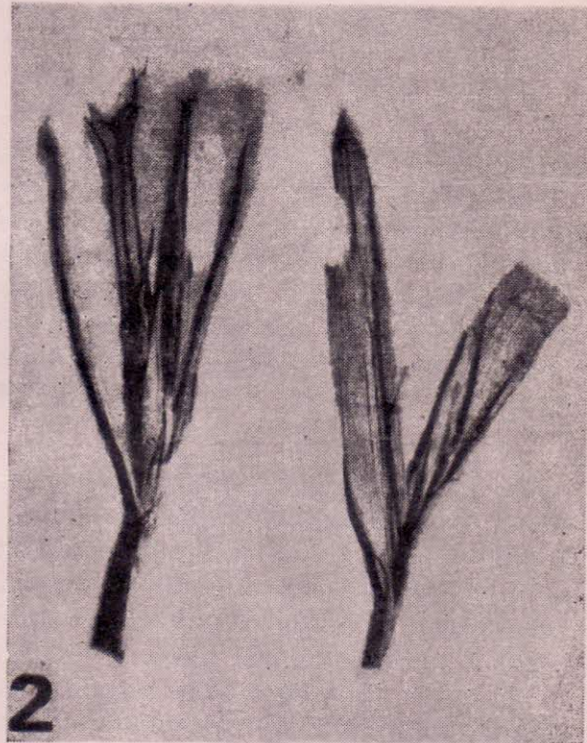
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Explanation of Plate

- Plate I. Fig. 1 Plant showing the crazy top symptoms.
Fig. 2 Undeveloped thin ears.



On Downy mildew of maize



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