

2. DOWNY MILDEW DISEASE IN NEPAL*

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Nepal is a rectangular shaped country, extending 500 miles east to west and 100 miles north to south. The country is divided into three distinct geographic regions. The flat fertile plain, the Terai, along the southern border with India constitutes 32 percent of the land area. The middle region is comprised of hills and valleys of which the Kathmandu Valley is part. The Himalayan Mountains on the Tibetan border cover the northern part of the country ranging from 5,300 to 8,850 meters.

The population of Nepal is approximately 12 million. One-third of the population lives in the Terai which produces 60 percent of the total grain. The hills and mountains contain two-thirds of the population but produce only 30 percent of the grain. The export of food grains from the Terai to India rather than to the hills creates a more serious regional food imbalance. Migration from the hills to the Terai is generally seasonal for such reasons as trade, employment and animal grazing. Resettlement in the Terai is taking place due to the food supply imbalance.

Maize (*Zea mays*) is the most important cereal food crop after rice in Nepal. It is grown as a staple food mainly in the hill region, but it is also grown less extensively in the Terai and Inner-Terai region. Maize is grown on approximately 568,000 hectares. The maize growing areas range in elevation from 90 to about 3,600 meters with an average yearly rainfall of 1,400 mm in the West to 2,200 mm in the East. The traditionally grown maize is a flint type. The national average yield is 1.66 metric ton per hectare. The usual food preparations of maize in Nepal are the following:

- a. Maize ground into flour which is used for "Roti" and "Dhendo" which is a kind of thick porridge.
- b. A coarse ground product which is cooked like rice called "Chyakhla".
- c. Roasted and popped matured dried kernels, and
- d. Roasted immature kernels on the green ears.

The major diseases affecting maize in the hills are rust, (*Puccinia sorghi*), ear rots (*Fusarium sp.* and *Cephalosporium sp.*), *Helminthosporium turcicum* and *Leptosphaeria*. However, in the subtropical areas of Nepal the major diseases are downy mildew and stalk rots caused by *Erwinia sp.* and *Fusarium sp.* Downy Mildew caused by *Sclerospora philippinensis* Weston is one of the most destructive corn diseases in the Terai and Inner-Terai regions of Nepal. Preliminary survey of this disease shows that the loss is up to 50 percent of grain yield in severe cases. The areas of infection have extended from Rapti Valley to Hetaura and the districts of Makawanpur, Bara, Parsa, and Rautahat. This area encompasses 25,000 hectares under maize cultivation. In addition, Brown strip Downy Mildew—*Sclerophthora rayssine* var. *zeae* has been found to be less destructive in the Terai.

The occurrence of downy mildew disease of maize in Nepal was reported for the first time by Shah in 1966. Preliminary studies on downy mildew disease were started in 1970. Observations were made on the incidence and the spread of the disease during the period of 1970–1972. Dr. Keshari L. Manandhar of the Pathology Section conducted

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varietal screening tests of imported germplasm and locally selected varieties. Materials were tested under natural as well as artificial epiphytotic conditions of the disease.

It is obvious from the studies of different dates of sowing that as the rainfall and the humidity increases, the infection and the spread of the disease tends to increase. Normally the monsoon rains begin in June, therefore, if maize is planted before the first of June downy mildew is not a problem. Most farmers in the affected areas plant in April and harvest in August. The maize is followed by millet which is harvested before the winter crop is planted. The early maize planting helps the farmers to escape the downy mildew problem and fits into their multiple cropping pattern.

Local varieties have not been shown to be resistant to downy mildew but escape the disease due to the early planting. Likewise, the recommended varieties (Khumaltar Yellow, Kakani Yellow, Rampur Yellow, and Hetaura Composite) show little resistance to the disease. The field observations on downy mildew disease has indicated that varieties differ markedly in their response to the disease. Philippines DMR-2 has shown good resistance and has been accepted by farmers in the Janakpur area. Seed production of DMR-2 had been carried out and sold to the farmers.

Up to the present, varieties and progenies are screened for downy mildew at the Rampur Experiment Station, the national maize headquarters in the Rapti Valley, mainly under natural conditions. The full sibs of Thai Composite #1 DMR BC² and Cupurico×Flint Compuesto DMR BC² are screened artificially in Thailand. The selections made in Nepal are based on the downy mildew resistant data from Thailand. In the future the Nepal maize team hopes to have the manpower and facilities to screen artificially for downy mildew resistance.

The breeding program plans to incorporate genetic resistance to downy mildew in some of the nationally recommended varieties. The program includes a systematic introduction of improved varieties which includes incorporating local germ plasm and testing in different localities for adaptation. In this process altitude, climate, growing period, insect and disease resistance and eating quality are significant factors.