SUMMARY

STUDIES ON DOWNY MILDEW (SCLEROSPORA MAYDIS) OF MAIZE, WITH SPECIAL REFERENCE TO THE PERENNATION OF THE FUNGUS

Downy mildew is the most serious disease of maize in Indonesia. The distribution of the disease in given in Fig. 1.

The downy mildew of maize in Java is caused by Sclerospora maydis (Rac.) Butler. Generally speaking the damage caused by the fungus is more serious in Central Java than in East Java. In the neighbourhood of the city of Jogjakarta disease percentages of more than 25% have been frequently observed.

The disease is more prevalent in the rainy season, although it is commonly present in the dry season as well. Late planted early-rainy-season maize ("labuhan" maize) was found to be more severely damaged by the downy mildew.

The new recommended varieties, Perta and Metro, are more susceptible to the disease compared to local ones (Table 2). Susceptibility to downy mildew is one of the factors which inhibits the acceptance of those high yielding varieties by the farmers.

The intercellular mycelia of S. maydis have different forms of haustoria (Fig. 3). The fungus has spherical to subspherical conidia, 12 - 29 x 10 - 23 μ (19,21 x 16,99 μ), conidiophores 200 - 550 μ in length with 60 - 180 μ basal cell (Fig. 4, 5, and 6).

Conidia are formed on turgescent diseased plants during the nights when plant surfaces are covered by dew. Conidiophores arise through stomata at 11 - 12 p.m. The formation of conidia starts at 12 p.m. - 1 a.m. and mature at about 2 a.m. Conidia dispersal takes place untill the next morning, but the majority of the conidia are shed at 3 - 4 a.m. (Fig. 8). The

formation and dispersal of conidia conform to the formation of dew on the plant surface (Fig. 9).

Water was found to be necessary for the germination of the conidia. It germinated by means of a germ tube. Zoospore formation was never observed. The conidia lost their viability after nine hours of aging in saturated air in Petri dishes, while loss of infection ability occurred after ten hours. However, 20 hours of aging in saturated air on young maize leaves did not inactivate the conidia completely (Fig. 10 and 11).

The infection of maize seedling leaves by S. maydis took place through stomata and appressoria were formed in the neighbourhood (Fig. 16).

The inoculation method frequently used in this study was to cover the young seedlings with glass jars, where pieces of diseased leaves were attached unto their inner bottoms. The conidia fell directly on the seedlings and caused high percentage of infection. Inoculation by means of dropping conidial suspension into the leaf funnel of young seedlings gave much lower percentages (Table 6).

Infection took place in the same night as the dispersal of the conidia. Prolongation of the humid period of inoculation failed to increase the infection percentage (Table 5).

In the primary infected leaves the fungus spread to the leaf bases, entering the leaf whorl and infected the young leaves in it. Usually the fungus did not affect the growing point.

Leaves infected directly from conidia showed very slight chlorosis. Generally the next leaf to the primary infected leaf escaped infection, because it developed before the fungus reaches the whorl (Fig 17).

Seedlings infected by the fungus carried in the seeds of diseased plants showed severe chlorosis from the first leaf on.

The author failed to find S. maydis in the Minahasa (North Celebes). Downy mildew in this region is caused by S. philippinensis Weston, which has elongated conidia, 14 - 55 x 8 - 20 µ (33,04 x 13,33 µ), conidiophores 260 - 580 µ in length and basal cell 80 - 175 µ (Fig. 14).

In Jogjakarta a Sclerospora with elongated conidia was found in one observation. It was very similar to S. philippinensis (Fig. 12 and 13). But the author failed to find it again in the next observations. In another observation a Sclerospora with was very similar to S. spontanea Weston (Fig. 15).

S. maydis did not confine itself to certain plots. One plot which was severily damaged in one monsoon might be completely free from the disease in the following monsoons (Table 7). Microscopic examinations of diseased plant materials from the soil, and also examinations of the soil particles surrounding them, failed to show any sign of resting stuctures. It could be concluded that the fungus might not perennate in the soil.

There had been clear indications that in a wide "tegal" (dry field) area, downy mildew infections on "labuhan" (early-rainy-season) maize came from dry-season maize in the "sawah" (wet paddy field) area. The smaller the distance to the "sawah" area, the higher the infection percentages, and the earlier the infections took place (Table 8 and 9; Fig. 21, 22, and 23).

Wet fresh seeds taken from diseased maize of Metro variety gave a high percentage of diseased seedlings. However, no results were obtained from the local varieties tested. Wet seeds of Metro variety gave healthy seedlings when the seeds were air dried before planting out (Table 10). Observations on maize fields failed to show seedlings having symptoms on the first leaf, and a conclusion could be drawn that perennation of the

fungus in the seeds seemed not to play an important role.

The higher the altitude of the fields, the later the infections in the early-rainy-season maize took place (Table 11). There were no indications that S. maydis would perennate in the maize plants of higher altitude, from which the fungus infected lowland maize fields.

By means of observations and inoculation tests the author was unable to find other grasses susceptible to S. maydis.

Thus the primary source of infection for early-rainy-season maize was maize plants planted in dry season, especially those of the "sawah" areas. For social and economical reasons it would be difficult to prohibit the dry-season maize for the purpose of breaking the cycle of S. maydis.

It is advisable to eradicate diseased plants in the dry-season maize to lessen the infection sources for the rainy-season maize, since the total acreage of dry-season maize is relatively small.

The author stresses the necessity of the search of resistant high productive maize varieties.