

Southern Corn Leaf Blight- An Important Disease of Maize: An Extension Fact Sheet

Rajesh Singh¹ and R.P. Srivastava²

1. Professor, 2. Ph.D. Scholar, Department of Genetics & Plant Breeding, Institute of Agricultural Sciences, BHU, Varanasi

Corresponding author e-mail: rsingh6361@gmail.com

ABSTRACT

Southern Corn Leaf Blight (SCLB) or Maydis Leaf Blight (MLB) is the most important and widespread maize leaf disease worldwide including India. SCLB disease appears as young small and diamond shaped lesions. As they mature, they elongate. SCLB tends to be limited by temperature and climate to the warmer part. Spore production is influenced by temperature. Infected tissue is extensively covered with spots and chlorosis rendering them non productive. It is found to have a higher saprophytic ability and hence high primary inoculum level is likely to be found in areas with high disease occurrence. SCLB disease causes the significant yield losses in cultivars developed from subtropical or temperate germplasm ranging from 9.7% to 11.7% depend upon the weather conditions. Disease is mainly controlled through breeding resistant varieties which is the most efficient, economical and sustainable way than chemical control in the long run. Moreover, it also ensures environment safety standards. Other approaches such as fungicides application could also be adopted to control the SCLB disease in maize.

Key words: Maydis Leaf Blight, *Helminthosporium maydis*, *Zea mays*, Disease Cycle

Southern Corn Leaf Blight: Southern Corn Leaf Blight (SCLB) or *Maydis Leaf Blight* (MLB) caused by *Helminthosporium maydis* (Syn. *Bipolaris maydis* (Nisik.) Shoemaker), (telomorph: *Cochliobolus heterostrophus*) is a serious fungal disease of maize throughout the world where maize is grown under warm, humid conditions (White, 1999). SCLB has now become one of the most prevalent and severe diseases in Pakistan, India, Nepal, Kampuchea, Philippines, Indonesia, Vietnam and China. In India it is also commonly known as '*Maydis Leaf Blight*' and crops affected by this disease are Corn (*Zea mays*), Sorghum and Teosinte. In India, SCLB has now become serious disease particularly in Jammu & Kashmir, Himachal Pradesh, Sikkim, Meghalaya, Punjab, Haryana, Rajasthan, Delhi, UP, Bihar, MP, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu. The disease is prevalent in warm humid temperate to tropical region, where the temperature ranges from 20-30°C during cropping period. This disease has great significance in the history of agriculture because of its epidemic propositions in 1970 in US and subsequent devastation of most of the corn crop that year. It tends to be limited by temperature and climate to the warmer

part of the US (Hooker *et al.*, 1970). Spore production is influenced by temperature (Warren, 1975). Infected tissue is extensively covered with spots and chlorosis rendering them non productive. It is found to have a higher saprophytic ability (Blanco and Nelson, 1972) and hence high primary inoculum level will be likely to be found in areas with high disease occurrence. SCLB disease causes the significant yield losses in cultivars developed from subtropical or temperate germplasm ranging from 9.7% to 11.7% depend upon the weather conditions. In SCLB, Two races, race O and race T, are responsible for causing this disease in Pakistan, while race C has been reported only in China (Wei *et al.*, 1988). In 1970's an epidemic was caused by race T in maize with Texas male sterile cytoplasm in most maize-growing areas of the USA but maize with normal cytoplasm was resistant to the pathogen.

SYMPTOMS

The symptoms "O" strain of the fungus appears as young small and diamond shaped lesions. As they mature, they elongate. Growth is limited by adjacent veins, so final lesion shape is rectangular and 2 to 3 cm long. Lesions may coalesce, producing a complete

burning of large areas of the leaves, whereas as "T" strain caused severe damage to maize cultivars in which the Texas source of male sterility had been incorporated. Lesions produced by the T strain are oval and larger than those produced by the O strain (Fig.1).



Fig: 1 Southern Corn Leaf Blight

DISEASE CYCLE

The disease cycle of *Bipolaris maydis* is poly-cyclic and releases either asexual conidia or sexual ascospores to infect corn plants. The asexual cycle is known to occur in nature and is of primary concern. Upon favorable moist and warm conditions, conidia (the primary inoculum) are released from lesions of an infected corn plant and carried to nearby plants via wind or splashing rain. Once conidia have landed on the leaf or sheath of a healthy plant, *Bipolaris maydis* will germinate on the tissue by way of polar germ tubes. The germ tubes either penetrate through the leaf or enter through a natural opening such as the stomata. The parenchymatous leaf tissue is invaded by the mycelium of the fungus; cells of the leaf tissue subsequently begin

to turn brown and collapse. These lesions give rise to conidiophores which, upon favorable conditions, can either further infect the original host plant (kernels, husks, stalks, leaves) or release conidia to infect other nearby plants. The term 'favorable conditions' implies that water is present on the leaf surface and temperature of the environment is between 60 and 80 °F. Under these conditions, spores germinate and penetrate the plant in 6 hours. The fungus overwinters in the corn debris as mycelium and spores; waiting once again for these favorable spring conditions the generation time for new inoculum is only 51 hours.

As previously mentioned, *Bipolaris maydis* also has a sexual stage with ascospores, but this has only been observed in laboratory culture. Its ascospores are found in the ascocarp *Cochiobolus*, a type of perithecium rare in nature. Thus, the main route of SCLB infection is asexual via conidial infection (Fig. 2).

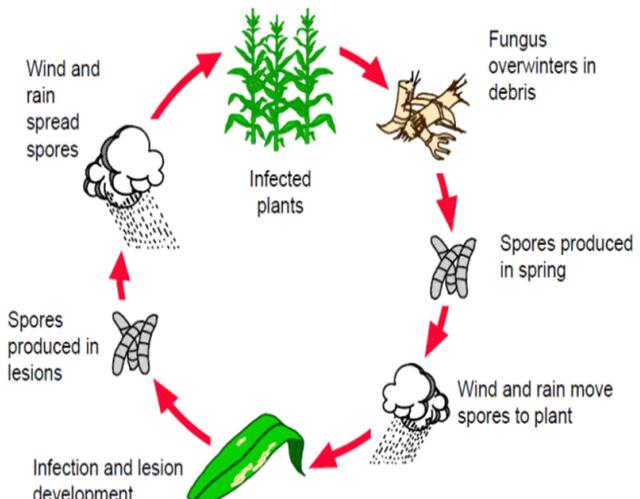
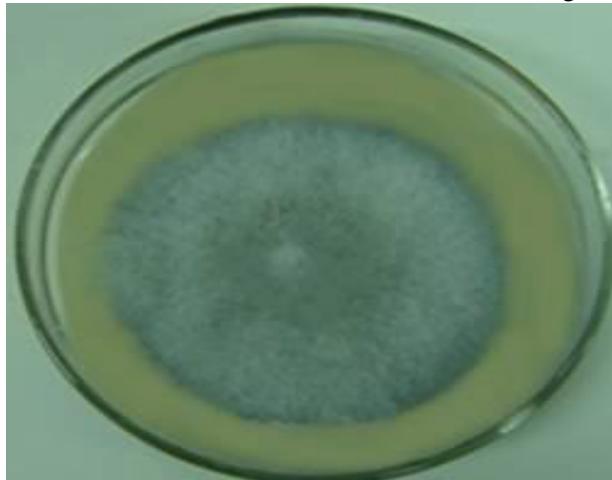


Fig. 2 Disease Cycle of Southern Corn Leaf Blight

INOCULATION

To prepare the inoculum, lesion is cut from the infected leaves and placed on the moist chamber for 2-3 days to allow the sporulation. Single spores are picked up from lesion with the aid of sterile microscope and transferred on PDA plate and to incubate at room temperature. Individual colonies of *E. turcicum* are subsequently sub-cultured on to fresh PDA plates and used to inoculate autoclaved sorghum kernels and allow colonizing the grains for about 10 days. The colonized sorghum kernels were air dried to field inoculation by placing 20-30 seeds of colonized sorghum kernels into leaf whorls. Inoculation is done 4-6 leaf stages at evening to allow successful infection when dew and ambient tem-

perature is optimal and followed by two additional sprays of inoculums at one to three weeks intervals (Fig.3).



A- Growth of *Exserohilum turcicum* on PDA



B- Multiplication on PDA



C- Multiplication on Sorghum grains



D - Creation of artificial inoculation in field

Fig. 3 Procedure for Inoculation A, B, C and D

MANAGEMENT OF DISEASE

The best practice for management of Southern Corn Leaf Blight is breeding for host resistance. Hybrids and inbreds are available with both monogenic and polygenic resistance and should be used whenever possible. Normal cytoplasm maize hybrid can resist both Race T and Race C, hence the more widespread

presence of Race O. In some resistant hybrids flecking may be found, but is only a reaction to resistance and will not cause loss of economic significance. Plant evaluation for SCLB resistance is done mostly at the soft dough stage, about 3 weeks after silk emergence using the different disease rating scale as 1-5 or 1-9 scale. *Payak and Sharma (1985)* used 1-5 disease



rating scale to estimate the disease severity consists of five broad categories. Fungicide application can effectively control SCLB when applied at the right time. Foliar disease control is critical from 14 days before to

21 days after tasselling, this is the most susceptible time for damages from leaf blight to occur. The fungicides should be applied to plants infected by SCLB immediately once lesion becomes apparent.

REFERENCES

Blanco, M. H. and Nelson, R.R. (1972). Relative survival of populations of race T of *H. maydis* on corn hybrid in normal cytoplasm. *Plant Disease Reporter* 56: 889-891.

Hooker, A.L., Smith, D.R., Lim, S.F. and Musson, M.D. (1970). Physiologic races of *H. maydis* and disease resistance. *Plant Disease Reporter*. 54: 1109-1110.

Payak, M.M. and Sharma, R.C. (1985). Maize diseases and their approach to their management. *Tropical Pest Management*, 31: 302-310.

White, D.G. (1999). In: Compendium of Corn Diseases, 3rd ed., Amer. Phytopathol. Soc., St. Paul, MN.

Warren, H. L. (1975). Temperature effects on lesion development and sporulation after infection by races O and T of *B. maydis*. *Phytopathology* 65: 623-626

Wei, J., Lui, K., Chen, J., Luo, P. and Stadelmann, O.Y. Lee. (1988). Pathological and physiological identification of race C of *Bipolaris maydis* in China. *Phytopathol.* 78: 550-554.

• • • •