

---

## Histopathological studies on Turcicum Leaf Blight disease (*Exserohilum turcicum*) of maize (*Zea mays* L.) in hill agro-ecological zone of West Bengal

---

SAJEED ALI\* AND A. K. CHOWDHURY\*\*

Darjeeling Krishi Vigyan Kendra, Uttar Banga Krishi Viswavidyalaya, Kalimpong, Darjeeling 734 301, WB

\*\*Department of Plant Pathology, Uttar Banga Krishi Viswavidyalaya, Pundibari, Coochbehar, WB

---

Received : 08.11.2013

Accepted : 04.03.2014

Published : 28.04.2014

---

Histopathology of Turcicum Leaf blight of maize (*Zea mays* L.) in Darjeeling district was investigated and it was observed that the conidia germinate after 12-24 h of incubation, the germination is generally bipolar. After successful penetration, the pathogen colonized both intra-cellularly and inter-cellularly within the host tissue. The maximum colonization was observed in xylem vessels, which ultimately led to disintegration of histological organization of the hosts resulting breakdown of chlorenchyma cells and rapid killing of cells except epidermal layer. It was observed that the conidiophores arised as lateral branches from the hyphae and came out of the abaxial as well as adaxial stomata in tufts giving the lesion a dark appearance. As a result symptoms appeared as a small gray spots on the lower leaves spreading upwards. Slowly the spots enlarged and appeared spindle shaped with pointed ends having gray centre and dark brown margin. The lesion varied in length ranging from 2.0 cm to 15.5 cm and breadth ranging from 0.5 cm to 2.0 cm. In severe conditions, all the leaves get attacked.

**Key words:** *Exserohilum turcicum*, Turcicum Leaf Blight, histopathology

---

### INTRODUCTION

Maize is an important crop of Darjeeling hills. It is cultivated as a cereal as well as fodder. The farmers start sowing seeds from mid of February to mid of March as rainfed crop. The growing period coincides with monsoon and hot summer which makes plant more liable to different diseases. Among the different foliar diseases affecting maize, Turcicum Leaf Blight (TLB) disease caused by *Exserohilum turcicum* is important. This pathogen has been reported to attack both maize and sorghum. It can cause yield loss greater than 50 % in susceptible varieties and is favoured by mild temperatures and humid weather with heavy dews (Carson, 1995). The pathogen survives in

unfavourable conditions over long periods within undecomposed crop residues in the fields after harvest (Levy 1995). In this paper, histopathology of Turcicum Leaf Blight of maize (*Zea mays* L.) in Darjeeling district has been investigated.

### MATERIALS AND METHODS

The investigation was conducted in the Plant Health Clinic, Darjeeling Krishi Vigyan Kendra, Kalimpong, Darjeeling. The fresh leaves of susceptible maize landrace (*Sadthiya*) were collected from field and were surface sterilized with 0.1% HgCl<sub>2</sub> solution for one minute. These leaves were inoculated with the conidial suspension of *Exserohilum turcicum* (1.5×10<sup>4</sup> spore/ml). The inoculated leaves were placed inside 20 cm. × 30 cm rectangular trays in a parallel manner. The humidity was maintained

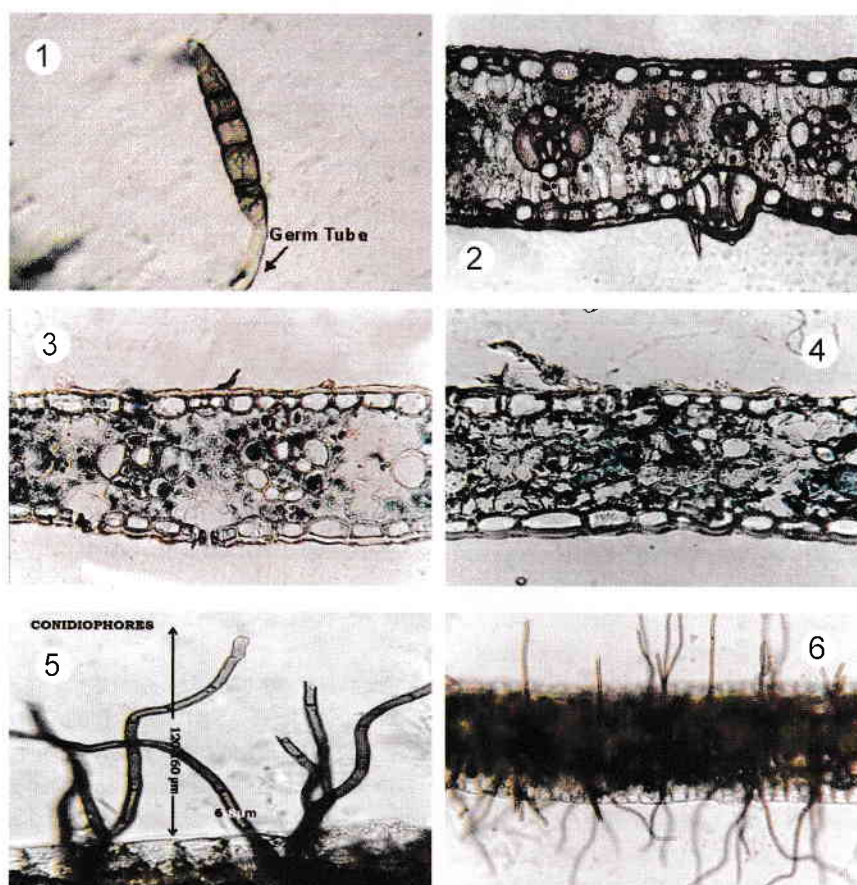
---

\*E-mail: drsajeedaliubkv@gmail.com

by placing the water soaked absorbent cotton inside the trays and the cut ends of the leaves were covered with water soaked cotton pads. The lesion started to develop slowly. Every day the leaf discs along with lesions were cut, transverse sections were made with new stainless blade and placed on filter papers inside 90 mm glass Petri dishes. Mixture of ethanol: chloroform, (75:25 (v/v)) was added containing 0.15% trichloroacetic acid and kept overnight at room temperature. The leaf discs and sections were washed in deionized water followed by staining with a dye consisting of one volume 15% trichloroacetic acid in water and one volume 0.6% Coomassie Brilliant Blue in 99% methanol. The solution was prepared a day before use. Leaf pieces and leaf sections were stained for 5 minutes and washed with deionized water (Muiru *et al.*, 2008). The observations were made every day under microscope and photographed. The symptoms of TLB were also studied in detail from different maize growing areas of Darjeeling hills.

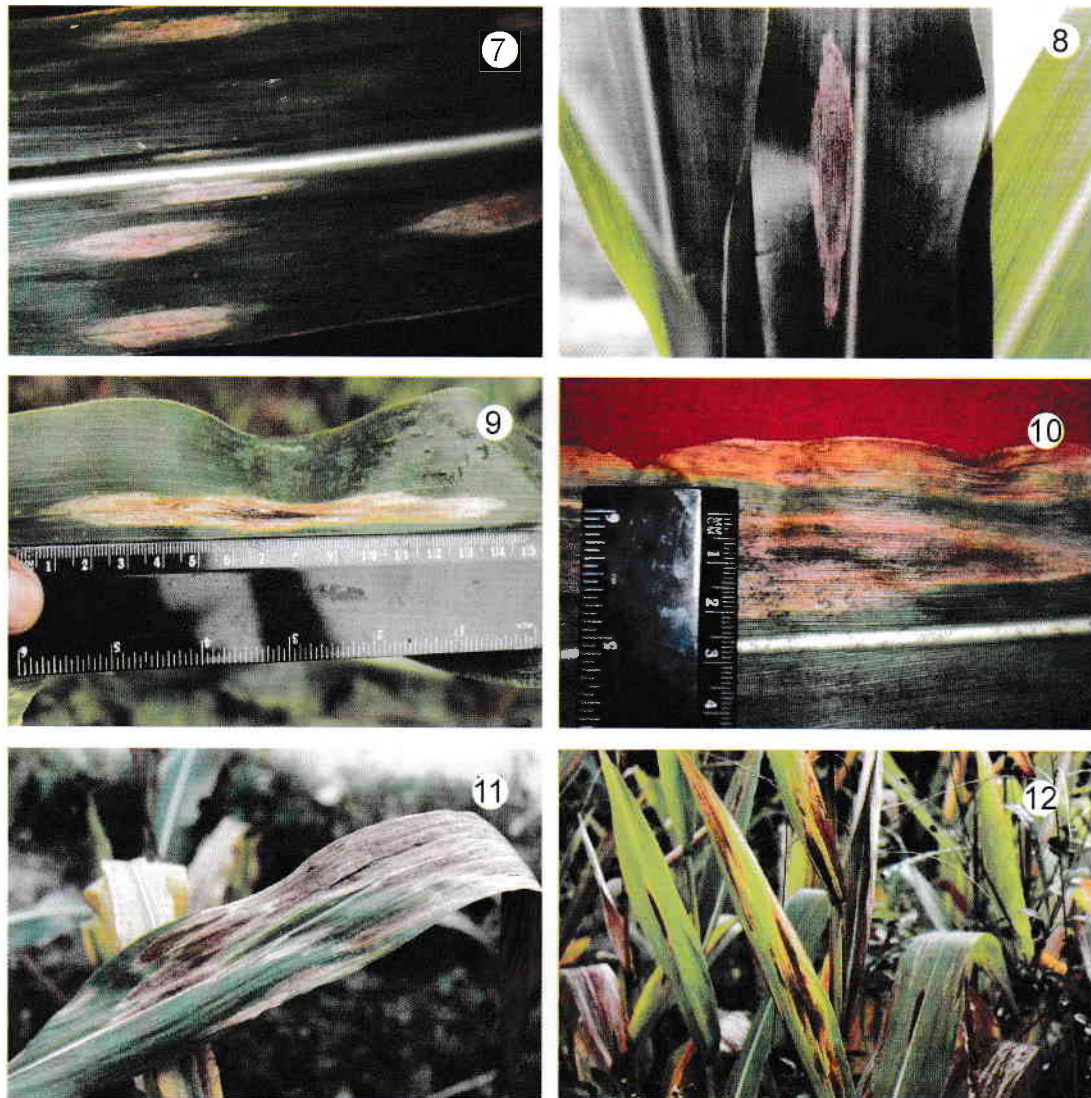
## RESULTS AND DISCUSSION

To study the response of maize genotype to invasion by *E. turcicum* comparing compatible host-pathogen system, infected maize leaves were observed under the microscope following the methods described earlier. It was observed that the conidia germinate after 12-24 h of incubation and the germination is generally bipolar (Fig.1). However, Hilu and Hooker (1964) reported that the germination of conidia occurs after 3-6 h after inoculation and this may be due to different biotype, but bipolar germination is confirmatory with the findings of Muiru *et al.* (2008). After successful penetration, the pathogen colonized both intra-cellularly and inter-cellularly within the host tissue. The maximum colonization was observed in xylem vessels (Fig. 2 & 3), this findings supports the findings of Muiru *et al.* (2008). The colonization in bundle sheath and mesophyll cell was also observed, which ultimately led to disintegration of his-



**Fig. 1:** Germinating conidia, **Fig.2:** Transverse section of healthy maize leaf, **Fig.3:** Transverse section of diseased maize leaf-1, **Fig. 4:** Transverse section of healthy maize leaf -2, **Fig. 5:** Conidiophores arising from stomata in tuff, **Fig. 6:** Conidiophores from abaxial





**Fig. 7:** initial symptoms, **Fig. 8 :** spindle shaped symptoms, **Fig. 9:** Length of lesion, **Fig. 10:** Width of a lesion, **Fig. 11 :** Lesion coalescing with each other to cover whole leaf area, **Fig.12:** Severe infestation

tological organization of the hosts resulting breakdown of chlorenchyma cells and rapid killing of cells except epidermal layer (Fig 4). It was been observed that the conidiophores arised as lateral branches from the hyphae (Fig.6) and came out of the abaxial as well as adaxial stomata in tufts giving the lesion a dark appearance (Fig.5) This findings is confirmatory with the findings of King and Muruku (1994). The first symptom appeared as a small gray spots on the lower leaves (Fig.7) spreading upwards. Slowly the spots enlarged and appeared spindle shaped with pointed ends having gray centre and dark brown margin (Fig. 8). The lesion varied in length ranging from 2.0 cm to 15.5 cm and breadth ranging from 0.5 cm to 2.0 cm (Fig. 9 and 10). In susceptible varieties, the

lesion together forming bigger spot or sometimes it also covered whole leaf area (Fig.11). In tolerant varieties, a yellow coloured halo surrounded the lesion restricting its growth. In severe conditions, all the leaves get attacked (Fig. 12). These findings corroborates with the findings of Harlapur *et al.* (2008).

## REFERENCES

- Carson, M.L. 1995. Intertrance of latent period length on maize infected with *Exserohilum turcicum*. *Plant Disease*. **79** : 551-585.
- Harlapur, SI, Kulkarni, MS, Wali, MC, Kulkarni, S, Hegde, Y. and Patil, B.C. 2008. Status of Turcicum Leaf Blight of Maize in Karnataka. *Karnataka J. Agric. Sci.* **21**: 55-60.
- \*Hilu, H.M. and Hooker, A.L. 1964. Host pathogen relationship of *Helminthosporium turcicum* in resistant and susceptible corn

- seedlings. *Phytopathology*. **54**: 570-575.
- King, S.B. and Mukuru, S.Z. 1994. An overview of sorghum finger millet and pearl millet in Eastern Africa with special attention to diseases. Breeding for disease resistance with emphasis on durability Wageningen, Netherlands: Wagening Agricultural University.
- Levy, Y., 1995. Inoculum survival of *Exserohilum turcicum* on corn between and during growing periods. *Canadian Journal of Plant Pathology* **17**: 144-146.
- Muiru, W.M, Mutitu, EW, Kimenju, JW., Koopmann, B. and Tiedemann, AV. 2008. Infectious structures and response of maize plants to invasion by *Exserohilum turcicum* (Pass) in compatible and incompatible host pathogen systems. *Journal of Applied Biosciences*. **10**: 532 - 537.
- Rangaswami, G. and Ethiraj, S. 1963. Studies on the survival of plant pathogens added to the soil. *Helminthosporium sacchari*, *H. sativum* and *H. turcicum*. *Indian Phytopathology*. **26**: 10-13.
- \*Ullstrup, AJ. 1966. Corn diseases in the United States and their control. *Agriculture Handbook No. 199*, United States, Department of Agriculture. pp26.