Pak. J. Bot., 32(2): 251-253, 2000.

# PATHOGENS ASSOCIATED WITH STALK ROT OF CORN IN PAKISTAN

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**Abstract**

Of the 17 species of fungi, *Macrophomina phaseolina, Fusarium moniliforme, Rhizoctonia solani* and maize stem borer *Chilo partellus*, were found predominantly associated with stalk rot disease of corn in different parts of Pakistan. The bacterium *Erwinia chrysanthemi* pv. *zeae* was found only in samples collected from Punjab and N.W.F.P areas of Pakistan.

Stalk rot disease of corn (*Zea mays* L.) is distributed in different parts of the world causing serious yield losses (De Leon & Pandey, 1989). The disease is caused by many soil-borne and residue-borne fungi and is highly influenced by stress especially low moisture (Ahmad *et al.*, 1997). Stress from drought, mechanical injury, high plant density, foliar diseases and insect infestation are considered as pre-disposing factors for the disease (Ahmad *et al.*, 1995). In Pakistan, *Fusarium* spp., followed by *Macrophomina phaseolina* (Tassi) Goid were found attacking maize plants and causing stalk rot (Ahmad & Aslam, 1984).

During 1988-89, a survey of corn fileds in 30 localities of 10 main corn growing areas in different provinces of Pakistan viz., NWFP (Swat, Mansehra, Mardan, Swabi, Noshehra CCRI Pirsabak), Punjab (Sahiwal MMRI Yousafwala, Faisalabad, Toba Tek Singh) and Sindh (Dadu), and Islamabad Capital Territory (ICT) during both spring and summer seasons was carried out. In each field 1000 plants at 5 spots were examined on a diagonal path where 10 five m long rows $plot^{-1}$ having 20 plants $row^{-1}$ were included. Number of plants showing symptoms of the disease were counted. Severity of disease was assessed visually by splitting the stalks lengthwise and recording the extent of the spread of rot on a 0-5 scale (Hooker,1957). Disease data thus recorded were then expressed in percentages as follows:

$$\text{Disease index} = \frac{\Sigma \text{ Disease rating in plants examined}}{\text{Total no. of plants examined}}$$

$$\text{Disease severity \%} = \frac{\text{Disease Index}}{5} \times 100$$

The stem borer *Chilo partellus* which produced tunnels and excretions was scored in accordance with the length of the tunnels on a 1-9 scale (Guthrie *et al.*, 1960). Diseased specimens were also collected and laboratory identification was made through isolation and microscopic examination.

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During the survey, a total of 18 stalk rot pathogens were observed of which 17 were due to fungi and only one appeared to be caused by a bacterial rot, *Erwinia chrysanthemi pv. zeae*. The intensity of stalk rots caused by different pathogens varied in different provinces (Table 1). The bacterial stalk rot appeared to be present only in Punjab and NWFP where the weather is hot and humid whereas it was absent from Sindh. With a relatively higher severity of disease, higher losses of grain yield were found during summer than in spring, supporting that the pathogens became more destructive under favorable environmental conditions especially in the presence of more damaging pathogens and then finally disease appeared at later growth stages resulting in lodging of plants. After lodging, the crop was further damaged by many common saprophytes occurring in the soil.

**Table 1. Incidence of corn stalk rot disease in different areas of Pakistan (1988-1989).**

| | Infection[x] (%) | | | |
|---|---|---|---|---|
| **Stalk rots** | **Punjab** | **NWFP** | **Sindh** | **ICT[y] areas** |
| **Fungal stalk rot** | 56.4 | 60.5 | 31.4 | 79.6 |
| *Ascochyta* sp. | 0.0 | 0.0 | 0.0 | 2.8 |
| *Cephalosporium acremonium* | 3.8 | 0.0 | 0.0 | 2.3 |
| *Cephalosporium maydis* | 3.5 | 0.0 | 0.0 | 1.5 |
| *Colletotrichum* sp. | 2.1 | 0.0 | 0.0 | 1.3 |
| *Diplodia maydis* | 0.0 | 0.0 | 0.0 | 1.1 |
| *Fusarium graminearum* | 0.0 | 11.2 | 0.0 | 3.7 |
| *Fusarium moniliforme* | 13.2 | 14.4 | 7.8 | 18.4 |
| *Fusarium oxysporum* | 1.2 | 0.0 | 0.0 | 5.1 |
| *Fusarium roseum* | 3.7 | 0.0 | 0.0 | 3.4 |
| *Fusarium semitectum* | 0.0 | 0.0 | 0.0 | 1.8 |
| *Helminthosporium rostratum* | 0.0 | 2.9 | 0.0 | 0.0 |
| *Macrophomina phaseolina* | 19.1 | 18.5 | 17.1 | 20.8 |
| *Nigrospora* sp. | 0.0 | 0.0 | 0.0 | 2.1 |
| *Pythium aphanidermatum* | 3.9 | 5.7 | 0.0 | 0.0 |
| *Rizoctonia solani* | 5.9 | 7.8 | 6.5 | 9.9 |
| *Sclerotinia sclerotiorum* | 0.0 | 0.0 | 0.0 | 1.7 |
| *Verticillium albo-atrum* | 0.0 | 0.0 | 0.0 | 3.7 |
| **Bacterial stalk rot** | | | | |
| *Erwinia chrysanthemi* pv. *zeae* | 13.7 | 9.7 | 0.0 | 0.5 |
| **Stalk borer** | | | | |
| *Chilo partellus* | 39.5 | 42.2 | 28.0 | 48.0 |
| | (7.2) | (9.3) | (3.1) | (9.1) |

Parenthesis represented enhanced percentage of stalk rot due to *C. partellus*.
[y]ICT area = Islamabad Capital Territory Area.
[x]Infection = Stalk rot symptoms were scored on 0-5 scale (Hooker, 1957).

Out of 17 fungal pathogens, the stalk rot pathogen *M. phaseolina* was found to be the most damaging causal organism followed by *Fusarium moniliforme* and *Rhizoctonia solani* (Table 1). *C. partellus*, the corn stem borer, was also commonly found in different agro-ecological zones of Pakistan which influenced the disease incidence. Wounds caused by the insect facilitated infection by stalk rot causal organisms viz., *F. moniliforme* and *M.*

*phaseolina* thus aiding in the spread of the disease. It would suggest that control of the pest can minimize the disease incidence which should be looked into in an integrated disease management system.

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(Received for publication 27 March 2000)