Infection of Seed
and Transmission
of Seed Borne
Pathogens

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Abstract

The Seed is a basic unit in commercial crop production. Seed plays a significant role in associating micro-organisms that prove hazardous for new plant created from it. Important seed-borne pathogen is various fungi, bacteria, viruses, nematodes, etc. They may be associated internally or externally with the seed or as concomitant contamination as sclerotia, galls, fungal cells, bacterial ooze, infected plant parts, soil particles, etc. mixed with the seed. Seed-borne pathogen usually caused a harmful for human welfares as well as agriculture seed production. Most of the fungal pathogens caused mycotoxin in the infected seed that harmful for those human populations that consume fungal infected seed as food. Various factors such as environmental factors, host genotype and pathogen inoculums play a vital role in seed-borne infection.

Introduction

Seed transmission refers to the passage of Inoculum from an infected or infested seed to a plant. Any pathogen present in as seedling seed sample that causes either failure of germination of seed or rotting of emerged or produces another kind of disease symptoms on adult plants may, in a broad sense, be called as a seed-borne pathogen. Mode of Infection of a seed-borne pathogen in seed by systemic and non-systemic through various ways that are stigma, embryo, seed coat, and also seed concomitant. Testing seed before sowing will identify potential disease problems and allow steps to be taken to reduce the disease risk.

Infection of Seeds

The infection of any single seed may take place by more than one process. This may occur systemically, either through the vascular system or plasmodesmatic connections or directly through floral infection or penetration of the ovary wall, seed coat, or natural opening. Seed infection is the establishment of a pathogen within any part of a seed.

<table>
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<tr>
<th>Table 1: Factor effecting seed transmission of the seed-borne microorganism</th>
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<tbody>
<tr>
<td>Environmental factors</td>
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<td>Temperature, Moisture</td>
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<td>Light, Soil micro flora, pH</td>
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<tr>
<td>Degree of internal infection of seed</td>
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(Source- Plant Pathology, G.N. Agrios)
Systemic Infection via stigma to embryo

Systemic transmission is when infected or infested seeds on germination result in a systemic disease in the plant to a stage of symptom development. Pathogen moved from infected plants to flowers. These pathogens may follow the pollen pathway to the embryo sac. These are typical examples of Systemic Infection via stigma to embryo Loose smut fungi (*Ustilago tritici*), *Drechslera graminea*-infected barley seedlings, *Fusarium moniliforme* in maize, *X. c. pv. campestris* in cabbage, *X. c. pv. phaseoli* in bean.

Direct systemic infection via seed coat contamination

Seed coat infection occasionally leads to systemic infection. The pathogen localized in/on the seed coat. It infects cotyledons or young seedlings at seed germination. Pathogenic hyphae from initial infection by conidia invaded successive leaves by first infecting the tip and then grew downward into the leaf and invaded the vascular system of the host plant. *Protomyces macrosorus* in Coriendor, *Pseudomonas avenae* in Rice, Stinking smut of wheat, *X. c. pv. Malvacerum* in Cotton, *X. c. pv. Campestris* in Cabbage, TMV in Pepper, Spotted wilt in Tomato is an example of direct systemic infection via seed coat contamination.

Non-Systemic transmission via seed coat contamination

Seed coat contamination refers to the passive association of pathogen with seeds. The pathogen adheres to the surface or is mixed with seeds. Seeds may be contamination at any time during harvest, extraction, threshing, or processing until packaging. Seed with seed coat contamination can produce healthy seedling, but the inoculum can remain viable in the soil and cause infection in later stages of plant development.

Non-Systemic transmission via seed concomitant

Seed concomitant either as pathogenic propagules or mixed with seeds in infested soil or plant debris results in non-systemic seed transmission. Pathogens are introduced in the soil along with seeds and cause infection at any stage. Ergot fungi of pearl millet and sorghum, and nematode ear cockle of wheat is a typical example of seed concomitant.

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<th>Table 2: Seed borne Inoculum threshold</th>
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<td><em>Xanthomonas campestris pv. Campestris</em></td>
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<td>1 in 30,000 seed</td>
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<td>Increase asymptotically before epidemic in fields.</td>
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(See Source: Principles of Seed Pathology, Agarwal and Sinclair)

Stage of Infection

- The mother plant gets infected by the pathogen, it attacks seed also
- At the time of transportation
- During processing
- In field various pathogenic fungi, bacteria, viruses and nematodes may also infection the seed.
- During seed germination
- During storage.

Effects of seed infection

- Germination percentage gets reduced.
- Due to changes in morphology, the market level get reduced.
- Due to infection it induces the changes in the content get reduced.
- Loss the nutrition value
Due to infection it induced the secretion of toxic chemicals (Mycotoxin) like Aflatoxin, Ochratoxin, etc.

Conclusion

The seed-borne disease plays a vital role in commercial seed production. Because seed-borne diseases reduce the economical values of seed, so producers will be the attention of the economical loss produces by seed-borne disease at the production stage, then we could efficiently control these losses by effective control measures. In respect to seed-borne disease, seed treatment is the best method to overcome on seed-borne pathogens. Use disease-free seed, destruction disease infected plant from the field; disease-resistant varieties are also effective management for seed-borne disease. Recently biological method is very effective for seed-borne disease management, *Trichoderma*, *Bacillus*, and *Pseudomonas* base bio-agent powder used as a seed treatment for management for seed-borne disease.

References