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EFFECT OF SEED-BORNE VIRUS ON WHEAT AND MAIZE SEED BIOCHEMICAL CHARACTERISTICS

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ABSTRACT

The present disquisition was accepted during to test the seed borne infection of wheat and sludge seeds. Five different kinds of wheat and sludge were taken from around the Aligarh quarter for seed health testing which is one of the veritably important aspects of icing good factory stage and factory health. Utmost of the seed-borne fungi of wheat and sludge were controlled by biocontrol agents, pesticides and factory excerpts by seed priming with the certain boluses as they were set up effective in webbing test on fungal infection chance and seed germination chance. It has got diversified domestic and artificial uses, because of its high profitable value and place among the food crops. In Uttar Pradesh, the area and product of wheat is large, but its productivity is veritably poor because of early rains, pathogenic infection, imbalance use of chemicals, etc. Crop failure and poor productivity eventually produce problems for food security and livelihood. In case of wheat, loose soil and bunts are the most important seed- borne complaint. In developing countries, the losses are relatively high. In India, 30 – 40 losses have been reported. Along with some abiotic limitations, these protein and bounce rich cereal crops are also largely susceptible to colorful pest and conditions and a number of storehouse grain moulds beget considerable losses. Colorful trials have been conducted in the last three decades to find out the effective means of segregating and controlling seed fungi of different crops.

KEYWORDS: Biocontrol, Chemical crop, Food security, Fungi, Maize seeds, Wheat.

INTRODUCTION

It is well known fact that wheat and maize grains are important for their carbohydrate and protein content; they are found to be most affected by several species of fungal genera.

Deterioration in stored grain is manifested by decrease in germination, processing quality, sick or germ damaged grain, heating and mustiness. Therefore, deterioration affect germination, nutritional contents, trade and grading of seeds which results economic loss to the growers and health hazards to consumers.

Biochemical changes leading to wheat grains deterioration, generally take place when the grains moisture level is favorable for the growth of storage moulds. Colonization of storage fungi lead to a decrease in Carbohydrates, Protein, Fats & Fiber content in most cases. Infection of fungi reduces all the biochemical components in the seeds including protein, carbohydrates and fat. The fungal infection resulted in the decrease of the chemical components of the seeds and consequently reduces its nutritive value and can reduce the antioxidant property of the whole grain. Along with some of the biotic limitations, these protein and starch rich cereal crops are also highly susceptible to various pests and diseases and a number of storage grain molds cause considerable losses. It has long been noted that seed-borne fungal pathogens are responsible for reducing seed quality, protein and carbohydrate contents, reduction or elimination of germination capacity as well as seedling damage, which results in the reduction of crop yield.

The seeds were also assessed for their nutritional value when freshly harvested and during storage conditions. Proteins, total and reducing sugar contents decreased gradually with increase in the RH values. An increase in the moisture content brings a reduction in the fat and decrease in the available carbohydrates. Similarly, the energy content showed a significant ($p<0.05$) decrease in all the grains. *Aspergillus flavus* decrease lipids and carbohydrate contents of wheat, soybean and faba-bean seeds. Changes in the protein, reducing and non-reducing sugars were observed in cowpea seeds infected with either

A.nidulants or *A. tereus.* Chemical composition protein, lipid, carbohydrate, crude fiber of sesame and soybean seeds were influenced by *A. flavus* growth. Invasion of seeds by some pathogens may result in biochemical deterioration and change in quality of seed nutrient as infected in soybean seed with *A. flavus.* There are some indications that the infection process is dependent on the nutritional status of the inoculums. Indeed, previous studies suggested that the presence of nutrients is essential for hyphal development, penetration and for subsequent establishment of a successful invasion of a susceptible host by the pathogen a decreased rate of plant photosynthesis and as a consequence plant death or yield loss. While the regulation of plant defense responses has been extensively investigated, the effects of pathogen infection on primary metabolism, including photosynthesis, are however less known. Currently, interest in this research area is growing and some aspects of photosynthesis and source–sink regulation in different types of plant–pathogen interactions has been investigated. Berger *et al.,* 2007 have reviewed how plant physiology meets phyto-pathology. The reduction of these bio-chemical components in the infected legume seed may be due to the utilization of these components by the fungi in its growth. Qualitative and quantitative yield of seeds and expansion of the cultivability of required crops can only be achieved when there is an adequate and balanced supply of nutrients in plants. Integrated Nutrient Management (INM) is one such approach which seeks to increase the agricultural production and safeguard the environment, together, for future generations. It is a strategy that incorporates both organic and inorganic plant nutrients to attain higher crop productivity and prevent soil degradation, thus help meeting the consumption expectations in future.

Deterioration of soil, seed and crop health, and its productivity due to phytopathogens especially the seed-borne, and the increasing environmental pollution due to continuous usage of chemical fertilizers, have resulted in serious concerns for sustenance in agriculture

with an emphasis on eco-friendly inputs in the renewed interests on integrated plant nutrient supply systems. Conceptually, the latent, yet fundamental basis of the integrated plant nutrient supply systems is the maintenance of soil fertility, sustaining agricultural productivity, improving farmer's profitability through appropriate and efficient usage of pesticides, fertilizers, organic manures and bio-fertilizers to the widest stretch of possibility. Realizing the importance of the crops in the area and losses caused by associated fungi with the seeds, a detailed and thorough progressive seed health testing methods to safeguard the seeds and crops were carried out during these studies. The purpose of this research work is therefore to contribute towards the above mentioned goal with systematic research.

Importance of seeds

Importance of seeds is twofold in the agriculture, as it is the source of origin of agriculture, being fundamental unit of any crop and it is also a source of inoculum and dissemination of infection. Realizing the importance of seed in agriculture and the increasing demand of the healthy seeds in the production of disease free crops raised a new area of science that studies the relationship between the pathogens and seed. It does not only identify the pathogens, it also includes the role of the seed as a source of inoculums, the survival of the pathogen and the actions taken to control the pathogens associated to seeds.

Seed Pathology

The term 'seed pathology' denotes the science dealing with seed health and it is concerned with the seed-borne microorganisms which may be associated externally, internally or as concomitant contamination as selerotia, gall, fungal bodies, bacterial ooze, infected plants parts which not only create problems to agricultural producers but are hazardous to animals and human being who consumed them, besides this, they also reduce the market value of the grain.

Test crop 1- Wheat

Triticum aestivum, commonly known as 'Genhu' is an important cereal crop of Indian agriculture and food security system. Wheat is one of the main staple food or feed crop of several countries of Asia, Africa and is grown in almost all the temperate and subtropical regions of the world. This important food crop covers an area of more than 12 million hectors (Britannica online 2015). Wheat is a genus of the family Poaceae (Graminae) with the typical spike of spikelet inflorescences containing the most important part of the plants i.e. the food grain used to feed a large population of the world.

Production and economic importance of Wheat

Wheat is grown in India over an area of about 266.92 lakh hectare. With a production of 721.40 lakhs tonnes. The normal National productivity is about 2703 kg/ha. The major Wheat producing States are Uttar Pradesh, Punjab, Haryana, Madhya Pradesh, Rajasthan, Bihar, Maharashtra, Gujarat, Karnataka, West Bengal, Uttaranchal, Himachal Pradesh and Jammu & Kashmir. These States contribute about 99.5% of total wheat production in the country. Remaining States, namely, Jharkhand, Assam, Chhattisgarh, Delhi and other North Eastern States contribute only about 0.5 % of the total wheat production of the country.

Production and economic importance of Maize

Heavy losses have been observed to be caused by seed-borne pathogens in various crops including wheat and maize. Seed rot, seedling rot, i.e. pre and post emergence losses, diseases at various stages of plant growth, leaf spot, stem rots, wilt, blights, root rot, fruit rots etc influence the crop stand and ultimate yield. The expectations of a cultivar are shattered if the seeds used are not of a high quality and pathogen free. In developing countries with poor farming practices seed-borne pathogens are among the major constraints. Two-thirds of total losses of maize crops are due to seed-borne diseases, and of these Diplodia and *Fusarium graminearum* accounts for about 25 per cent and *Drechslera* spp. for almost 20 per cent of the total loss due to diseases (Neergaard, 1979). Seed-borne fungi are important from economic point of view as they render losses in a number of ways, loss in germination, pre and post emergence losses, discolorations and shriveling, toxin production, also play an important role in disease spread.

REVIEW OF LITERATURE

Dean et al. 2012- The genus *Colletotrichum* has been included in plant pathogens of major importance, causing diseases of a wide variety of woody and herbaceous plants. The genus was recently voted the eighth most important group of plant pathogenic fungi in the world, based on perceived scientific and economic importance Anthracnose disease symptoms include limited, often sunken necrotic lesions on leaves, stems, flowers and fruit, as well as crown and stem rots, seedling blight etc.

Bagga and Sharma, 2006- The fungi which are exclusively seed-borne can be controlled only through the treatment of seeds. Almost all control methods are aimed at protecting plants from becoming diseased rather than at curing them after they have become diseased and seed

treatment is one of the methods. Seed treatment is the safest and the cheapest way to control the seed-borne fungal diseases and is used to prevent biodeterioration of grains.

Chapman and Harris, 1981-Seed treatments can be classified as physical, biological, chemical and botanical. Evidently, there is a need to increase the yield and improve the health and seed quality of the crop by controlling seed-borne fungal pathogens. Efforts made include breeding for disease resistant varieties, the use of chemicals in reducing seed borne pathogens and the use of biological control agents to reduce plant pathogens. Chemical methods involving seed treatment with fungicides have been employed to protect the seed and seedling, to improve germination, vigor, crop establishment, crop stand, and yield. However, indiscriminate use of chemicals for controlling plant diseases has resulted in environmental pollution and health hazards.

Khanzada et al., 2002-A survey in 1991 of seed treatment product segments throughout the world showed that fungicides dominated the market with a 68% share, followed by insecticides at 11% (Schwinn, 1994). Some of the common chemicals used for seed treatment in the world include dithiocarbamates, mancozeb, maneb fludioxonil, shavit, prothioconazole, picoxstrobin, and fluoxastrobin (Morton and Staub, 2008). Efficacy of different fungicides was tested for the control of seed-borne fungi associated with wheat.

Mohana et al. 2011-Exploration of microbes and plant products in crop protection appears to be one of the safer and long lasting methods of crop disease management programs to overcome the toxic effects of synthetic chemicals. Seeds are usually treated with chemicals to prevent their decay after planting by controlling pathogens carried on them, present inside the seed or existing in the soil where they will be planted. To achieve these objectives the most common biologically based control measures include use of resistance plant varieties, use of pathogen free seeds or propagating stocks and use of eco-friendly products to control the pathogen. This requires persistent search for new and safer pesticides accompanied by wide use of pest control methods, which are eco-friendly safe and effective.

Objective of the Study

- Survey to ascertain the incidence of seed-borne diseases of wheat and maize in various growing fields of Gaya district.

- To determine pathogen profile associated with seeds of wheat and maize. Standardization of different seed health testing methods to know their efficacy for the quick and accurate diagnosis of seed-borne fungal pathogens.
- To determine the nature of damage caused by seed-borne mycoflora on seed quality parameters of wheat and maize while the infection transmit from seed to plant.
- To determine the pathogenic nature of certain fungi on naturally and artificially inoculated seeds, pathogenicity tests were conducted in laboratory and in pot conditions.

CONCLUSION

Seed pathogens are known to beget perceptible changes in viability and nutritive value of the crop shops and are relatively effective in producing large no of damage to the quantitative and qualitative characters of wheat crop. This important food crop is attacked by a number of pathogens including a large group of fungal member which frequently take a heavy risk of the crop and render them diseased. The main end of the present study is to enumerate the fungal species and their effect on germination associated with wheat and sludge seeds. In this study webbing of five kinds of wheat and sludge and seed health testing ways have been estimated for their relative efficacity in the discovery of seed mycoflora which can be helpful for determining the quality of seeds in the laboratory. In case of agar plate system 20 fungi were detected from non castrated seeds and 17 were detected from castrated seeds of wheat and 13 fungi were detected from non castrated seeds and 14 were detected from castrated seeds of sludge seeds. In case of deep snap system 18 fungi were detected from non castrated seeds and 16 were detected from castrated seeds of wheat and 16 fungi were detected from non castrated seeds and 13 were detected from castrated seeds of sludge seeds.

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