



RESEARCH ARTICLE

Effect of Unseasonal Rains on Incidence of black point disease of wheat in Agra region during 2014-15

Ajay Garg, Ratika Singh and S. Singh
Botany Department, Agra College, Agra (U.P.)
Email : drajaygarg009@gmail.com

Received: 4th December 2015, Revised: 14th December 2015, Accepted: 16th December 2015

ABSTRACT

During pre and post harvest period of wheat crop, unseasonal rains occurred in the months of March, April and May 2015, which increased incidence of black point disease of wheat kernels as compared to previous years. This effect was noted during survey of 7 districts viz., Agra, Mathura, Aligarh, Hathras, Etah, Mainpuri and Firozabad of western Uttar Pradesh. The average incidence before and harvest of wheat crop was 39.64 and 55.14% respectively in direct observation of grain samples. On the other hand, in agar plate technique the incidence of black point of wheat grains before and after harvest was 48.85 and 58.85 per cent respectively. The maximum incidence of this disease by both methods was noted in samples collected from Aligarh and Agra, while the minimum incidence by both methods was recorded in samples collected from Firozabad district. In agar plate method, 6 fungi viz. *Alternaria alternata* (Syn. *A. tenuis*), *Helminthosporium sativum*, *Curvularia palleseus*, *Aspergillus flavus*, *Cochliophis tritici* and *Nigrospora sphaerica* were frequently found associated with black point affected grains such a high incidence with black point affected grains. Such a high incidence in the seed lot may adversely affect wheat flour quality and germinability.

Keywords : Black point of wheat, *Alternaria*, *Helminthosporium*.

INTRODUCTION

Wheat (*Triticum aestivum* L.) has remained a source of food to mankind since times immemorial being under cultivation in the Indian sub-continent well before the arrival of the Aryans. It is considered as staple food for about a billion people in the world and it provides almost 20 per cent food calories to the human race. In India, no major crop has achieved the growth rate comparable to wheat production. In the last crop season of 2014-15, the total production of wheat in the country is reported to be 69 million tonnes. With this increase in production and area, awareness of diseases and pests has also increased. Certain diseases, which were considered unimportant in the past have become diseases of major concern particularly in rust resistant wheat varieties. One such disease is black point of wheat grains caused by *Alternaria* and *Helminthosporium* species.

The black point disease of wheat was reported for the first time in India by Dastur in 1932 from the central provinces and later by Dharamvir *et al.* (1968), Gill and Tyagi (1970), Agarwal and Verma (1975), Khetrpal and Agarwal (1979), Kulkarni and Hegde (1980) and Sinha *et al.* (1984) from other parts of India. This disease affects both quality and quantity. Parasher and Chohan (1967) recorded a reduction of 44.6% in germination due to black point disease. Goswami and Sehgal (1968) found no significant change in protein, ash, calcium and phosphorus contents but the varying percentage of affected grains slightly changed the dough, puffing character and taste of flour and chapati, which renders the affected grains unacceptable to millers. The black pointed grains sometimes show poorer germination and produce seedling blight, root rot and weak plants, thereby causing significant reduction in yield (Parashar and Chohan, 1967) with the introduction of Mexican blood in the Indian wheat cultivars, much emphasis was given to development of rust

resistant varieties of wheat. As such other disease of wheat was ignored. In recent past (2013, 2014 & 2015) unseasonal rains have been experienced in western U.P., Haryana, Delhi and Punjab particularly during pre and post harvest period of wheat crop. These rains adversely affect the grains and increase the incidence of seed borne diseases particularly black point of wheat. Therefore, the present study was undertaken to study the incidence of black point disease of wheat in grains during pre and post harvest period in relation to unseasonal rains.

MATERIALS AND METHODS

A survey of Agra region comprising of 7 districts viz., Agra, Mathura, Firozabad, Mainpuri, Etah, Aligarh and Hathras was conducted in April and May 2015 to collect wheat grain samples before and harvest of wheat crop. The wheat grains weighing about 400 – 500g were collected from different fields of above mentioned districts in sterilized polythene bags which were sealed over flame soon after collection to avoid external contamination. They were kept at 4°C in refrigerator till analysed. Usually samples were analysed within a week by direct observation method (ISTA, 1966) and within a fortnight but never later than a month in case of agar plate method using PDA medium following instructions of ISTA (1966).

In direct observation method 400 randomly selected wheat grains from a composite sample of each district were kept uniformly on a glass plate measuring 20 x 30" in size. The individual grains were observed for black point by magnifying lens and percent seeds affected by this disease was calculated. On the other hand, in "Agar plate method" 400 grains from each sample were randomly taken and surface sterilized with 2% sodium hypochlorite solution for 5 minutes and then washed with sterile water and subsequently plated on petridishes containing solidified potato dextrose agar medium @ of 10 grains per plate. These plates were then incubated in B.O.D. incubator at 25 ± 1°C for 6 days in an alternate cycle of 12 hours fluorescent light and 12 hours darkness. After incubation period, the plates were studied with the help of stereobinocular and normal compound microscope for presence of black spot on grain and associated moulds. The colonies of different fungi were purified by subculturing and identified with the help of illustrations and description given by Barnett (1960) and Smith (1969).

RESULTS AND DISCUSSION

Neergaard (1979) suggested that many parasitic seed borne fungi infect the seed coat causing conspicuous black or brown or grey necrotic discolouration. Likewise black point of wheat is a disease with superficial necrotic lesion on grain particularly towards apical end. Tandon (1946) reported blackening of wheat grains due to unusual rains during March and April when temperature ranges from 28-32°C. In the present study an average incidence of black point disease of wheat in and around Agra district was found to be 39.64% before harvest and 55.14% after harvest in direct examination of wheat grains while mean incidence in agar plate method was noted as 48.85% before harvest and 58.85% after harvest in wheat crop of 2014-2015. Maximum incidence by both methods was observed in samples collected from Aligarh and Agra, while the minimum incidence was noted in samples collected from Firozabad. Thus less contamination in samples of Firozabad can be attributed to the fact that atmosphere of this district is having more CO and SO₂ due to several glass industries. The sulphur dioxide in atmosphere is known to decrease disease intensity in many cases due to adverse effect on growth and survival of fungal pathogens. There is overall increase in the incidence of this disease in Western U.P. due to unseasonal rains during months of March, April and May in year 2015. Further, mean temperature ranged from 25 to 32°C during these months. So, the favourable temperature (optimum being 30°C) and relative humidity (more than 80%) due to rains caused proliferation of fungal pathogens particularly *Alternaria triticina* and *Helminthosporium sativum* as a result of which the grains got infected in standing crop and the disease intensity increased with maturity of crop due to high humidity in atmosphere.

Table 1: Incidence of black point disease in direct examination of wheat grains collected from crop of 2015

S. No.	Place	No. of seeds analysed		No. of seeds affected		% seeds affected	
		BH	AH	BH	AH	BH	AH
1.	Agra	400	400	160	205	40.00	51.25
2.	Mathura	400	400	150	210	37.50	52.50
3.	Firozabad	400	400	140	200	35.00	50.00
4.	Mainpuri	400	400	145	240	36.25	60.00
5.	Etah	400	400	170	210	42.50	52.50
6.	Aligarh	400	400	185	250	46.25	62.50
7.	Hathras	400	400	160	230	40.00	57.25
Average incidence =						39.64	55.14

BH = Before harvest; AH = After harvest

Table 2: Incidence of black point disease in wheat grains by agar plate method collected from crop of 2015

S. No.	Place	No. of grain samples analysed		No. of samples affected		% sample affected	
		BH	AH	BH	AH	BH	AH
1.	Agra	50	50	28	32	56.00	64.00
2.	Mathura	50	50	26	28	52.00	56.00
3.	Firozabad	50	50	22	26	44.00	52.00
4.	Mainpuri	50	50	27	31	54.00	62.00
5.	Etah	50	50	22	27	44.00	54.00
6.	Aligarh	50	50	24	32	48.00	64.00
7.	Hathras	50	50	22	30	44.00	60.00
Average incidence =						48.85	58.85

BH = Before harvest; AH = After harvest

In agar plate method, 6 fungi have been found to be frequently associated with black point of wheat grains. These include *Alternaria alternata* (Syn. *A. tenuis*), *Helminthosporium sativum*, *Curvularia pallescens*, *Aspergillus flavus*, *Cochliobolus tritici* and *Nigrospora sphaerica*. However, *Rhizopus arrhizus*, *Cladosporium herbarum* and *Ophiobolus tritici* and *Alternaria triticina* were also noted in some samples. According to Dastur (1942) species of *Alternaria* and *Helminthosporium* are the chief causes of black point disease of wheat in India. Dharamvir *et al.* (1968) could get only *Alternaria tenuis* (now called *Alternaria alternata*) and *Helminthosporium sativum* from the black point affected wheat grains. Now, in the present study also these fungi were found to be the main causes of this disease. Joshi *et al.*, (1969) reported an outbreak of the disease in an epidemic form in 1967-68 in the northern belt of the country. They stated that due to the prolonged wet weather in Punjab, Haryana, Delhi and Uttar Pradesh in 1967-68, just before harvest, black point disease of wheat had a wide spread occurrence. Khetrpal *et al.* (1980) also observed that high relative humidity with frequent rains was conducive for the incidence of black point of wheat. We have also noted frequent rains and high relative humidity during March, April and May in 2015, which adversely affected wheat grains in the Western U.P. particularly in the districts of Agra, Mathura, Aligarh, Hathras, Firozabad, Mainpuri and Etah consequently incidence of black point of wheat ranged from 40 to 64% in different areas. The incidence of the disease was more in post harvest grains as compared to preharvest conditions. It means the incidence increased with passage of time and may assume alarming dimension in storage, if the storage conditions are not proper. This high incidence of disease not only affects the quality of the grain but also adversely affect germinability, seedling emergence, root rot in the subsequent crop and over all productivity. Further, the flour quality is

also adversely affected. Therefore, strategy for reducing the incidence of this disease should be formulated at state or national level because unseasonal rains are likely to occur in coming years also on account of overall change in climate due to various reasons of environmental pollution.

ACKNOWLEDGEMENT

The authors are thankful to the Principal, Agra College, Agra for providing necessary facilities and moral support.

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