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Prevalence of Black Point Disease of Wheat in Madhya Pradesh

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ABSTRACT

Black point is grain fungal disease of wheat. Black point is defined as the discoloration of the embryo (germ) end and the surrounding areas of the wheat kernel, occurs any time from grain filling to near harvest. *Alternaria alternata* is the main pathogen which causes black point disease. This disease is known to adversely affect grain quality, appearance of flour, semolina and their products. Discoloration of wheat seed due to black point results in reduced qualitative appearance of the grain, particularly color and luster. It also affects the nutritive value of the grain negatively. The disease reduces its economic value. To study the prevalence of black point disease in Madhya Pradesh, farmers saved seed samples of wheat (300) were obtained from 30 districts covering 9 agro climatic zones of Madhya Pradesh. The seed samples represented the produce of 2015-17. Seeds placed on the top of the blotters as per the Standard Blotter method were incubated for six days. Under stereoscopic binocular microscope, based upon the habitat characters, fungus was identified as *Alternaria alternata*, responsible for black point. The prevalence of black point was found to be significant in Kymore plateau and Satpura hills zone. Maximum (49%) association of black point was noticed in seeds obtained from farmers of Betul district.

KEYWORDS - Black point, Symptoms, Identification, *Alternaria alternata*, Wheat Seed

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1. INTRODUCTION

Black point disease has been observed from all the major wheat (*Triticum aestivum*) growing regions of the world^{1,2,3,4}. The disease causes dark brown to black discoloration around embryo region of wheat seeds⁵. The disease reduces grain quality and its economic value³. Black point reduces qualitative appearance of the grain, particularly the colour and luster that reduces the market price of wheat in the range of 3.71 to 12.49 per cent in Gujarat⁶. The infection invariably causes deprivation of seed and grain quality coupled with diminution of nutritive value⁷. The distribution of black point has been observed in various states of India e.g. Haryana i.e. Karnal (75%) and Yamunanagar (70%), Sonipat (100%) and Panipat (95%)⁸. In Punjab it was found maximum in Fatehgarh Sahib (86%) Jalandhar (72%)⁴. In northern Maharashtra (Jalgaon, Dhule, Nandurbar and Nashik districts) the black point percentage ranged from 1 to 8 % and was maximum in Jalgaon district; whereas in western Maharashtra (Satara, Sangli, Kolhapur and Ahmednagar district) it ranged from 1 to 4% . In Marathwada region (Aurangabad) it was 1 % whereas in Vidarbha region (Nagpur, Bhandara, Gondia, Akola, Amaravati and Wardha) it ranged from 1 to 9 % and was maximum in Nagpur district⁹. In world it was also found in Turkey¹⁰, Copeland⁵ and New Zealand².

2. MATERIALS AND METHODS

2.1 Collection of Seed Samples

Farmers saved seed samples of wheat (300) were obtained from 30 districts covering 9 agro climatic zones of Madhya Pradesh (Table 1) .

Table 1: Wheat Seed Sample Saved by Farmers from Nine Agro Climatic Zones of M.P (2015-17)

Zone	Zone	Districts covered	Samples
II	Northern Hills Zone of Chhattisgarh	Mandla, Dindori, Shadol, Anuppur	40
III	Kymore Plateau & Satpura Hills	Jabalpur , Katni, Seoni, Rewa , Panna	60
IV	Vindhya Plateau	Sagar , Damoh, Bhopal ,Raisen, Sehore, Vidisha	60
V	Central Narmada Valley	Narasinghpur ,Hoshangabad , Harda	30
VII	Bundelkhand	Chhatarpur , Tikamgarh	20
VIII	Satpura Plateau	Chhindwara, Betul	20
IX	Malwa	Indore, Ujjain , Dewas , Dhar	40
X	Nimar Valley	Khandwa, Khargoon	20
XI	Jhabua Hills	Jhabua	10
09	09	30	300

The seed samples represented the produce of 2015-17. The seed samples were obtained through Seed Technology Research Centre, Department of Plant Breeding and Genetics, JNKVV, Jabalpur.

The seed samples were stored in paper bags and kept in conditions of low temperature (4°C) to avoid further deterioration.

2.2 Detection of Seed Associated Fungus

Seeds affected with black point and embryonic discoloration were placed on top of the blotters and incubated for six days under alternate cycles of 12 hr light and 12 hr dark period as per the protocol of ISTA¹¹. Observations on association of the fungus were recorded under stereoscopic microscope binocular microscope. The seeds (25) were placed in a Petri dish and 400 seeds/ sample were used and incubated at room temperature (25°C).

2.3 Identification

Based upon the habitat characteristics, associated mycoflora was identified and confirmed after making micro slides under compound microscope.

2.4 Analysis of Seed Samples

Visual inspection and under Diaphanoscope
Analysis of disease symptoms was made at seed level by using naked eye dry seed examination and with the help of Diaphanoscope¹².

2.5 Statistical Analysis

The data recorded from different agro-climatic zones was analyzed by comparing means using hau. opstat software. The level of significance was obtained using independent t-test. ($P=0.05$)

3. RESULTS AND DISCUSSION

A typical prominent small black point or dot was noticed on embryonic end during naked eye observation of dry seeds. The black point dot was also confirmed under Dipahnoscope observation as mentioned by Bhale et al¹³. Small specks brown to dark black localized discoloration especially around the embryonic end were noticed. In some cases blackening was extended beyond the embryonic end that covered three and half area of seed. In severe cases, shriveling and reduced grain weight was noticed^{14, 15, 16}. Seed borne nature of *Alternaria alternata* causing black point of wheat up to 10% is reported¹⁷.

3.1 Identification

Seeds placed on the top of the blotters as per the Standard Blotter method (ISTA 1996) were incubated for six days. Under stereoscopic binocular microscope, based upon the habitat characters, fungus was identified as *Alternaria alternata*, responsible for black point¹⁸.

3.2 Examination under Stereoscopic Binocular Microscope

On incubated wheat seeds, chain of dark brown conidia of variable lengths was noticed. The chain was normally branched at the beak of a spore. The color of the fungal growth was green to brown and wooly in appearance.

3.3 Examination under Binocular Microscope

Hyphae were dark brown, thick, septate and branched. Dark pigmented conidia were produced on conidiophores. Conidia have transverse and longitudinal (oblique) septa, muriform, with an elongated typical terminal cell. Conidia measured 10-18 X 20-65 micron.

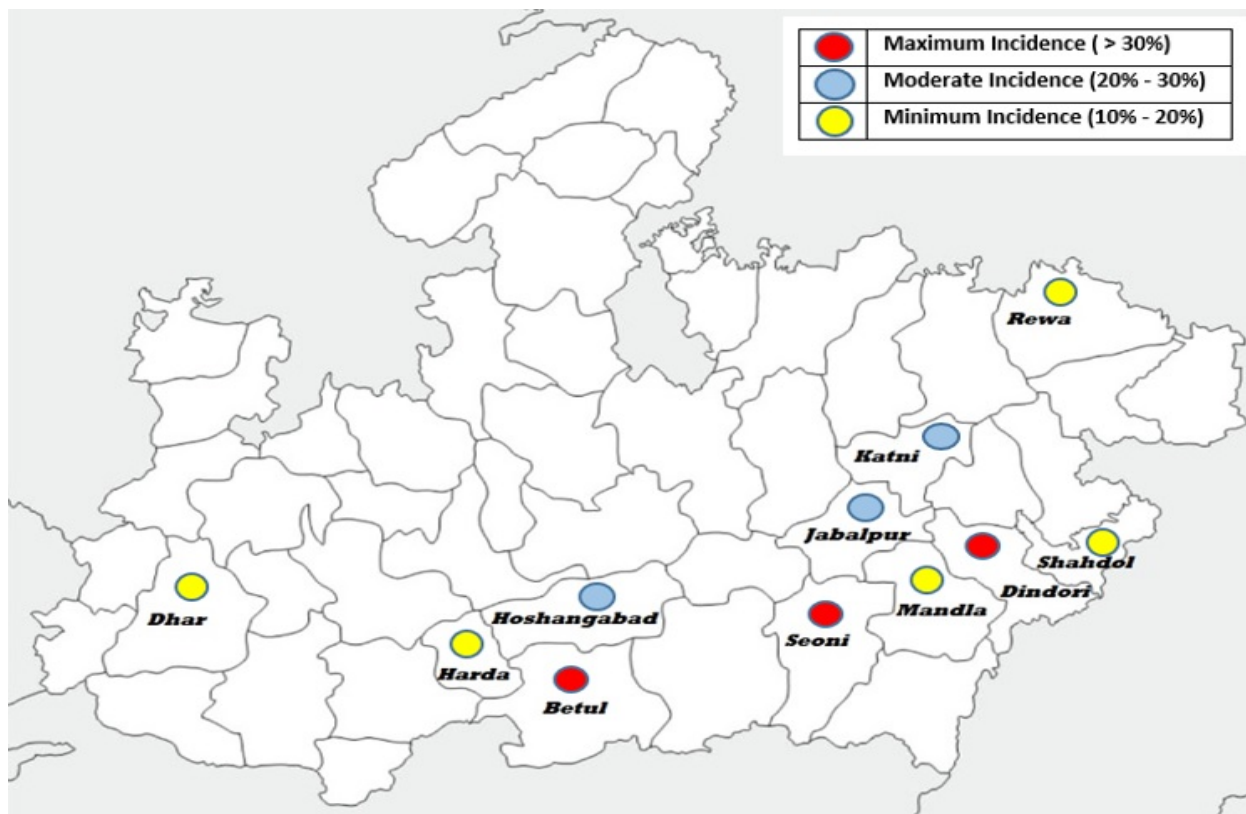
3.4 Distribution

Distribution of wheat seed associated black point diseases was investigated by observing the symptoms under Diaphanoscope and results are presented (Table 2).

Table 2: Incidence of Black Point Disease In Seeds From 30 Districts Covering 09 Agro-Climatic Zones of M.P

Zone Number	Name & Districts	Sample Tested	Range of Association (%)	Average (%)
II	Northern Hills Zone of Chhattisgarh			
	Mandla	17	3.0-17.0	10.0
	Dindori	19	1.0-27.0	14.0
	Shadol	18	2.0-19.0	10.5
	Anuppur	20	7.0-12.0	09.5
	Average		3.2-18.7	11.1
III	Kymore Plateau & Satpura Hills			
	Jabalpur	40	5.0-21.0	13.0
	Katni	20	3.0-24.0	08.5
	Seoni	25	2.0-29.0	15.5
	Rewa	19	1.0-19.0	10.0
	Panna	15	1.0-11.0	06.0
	Average		2.4-20.8	11.6
IV	Vindhya Plateau			
	Sagar	20	1.0-07.0	04.0
	Damoh	19	1.0-09.0	05.5
	Bhopal	21	1.0-13.0	07.0
	Raisen	22	1.0-05.0	03.0
	Sehore	27	4.0-09.0	06.5
	Vidisha	26	2.0-07.0	04.5
		Average		5.0-08.3
V	Central Narmada valley			
	Narsinghpur	20	5.0-17.0	11.0
	Hoshangabad	20	3.0-26.0	14.5
	Harda	20	2.0-18.0	10.5
		Average		3.3-20.3
VII	Bundelkhand			
	Chhatarpur	19	2.0-04.0	03.0
	Tikamgarh	20	1.0-06.0	03.5
		Average		1.5-05.0
VIII	Satpura Plateau			
	Chhindwara	20	3.0-19.0	11.0
	Betul	25	2.0-49.0	25.5
		Average		2.5-34.0
IX	Malwa			
	Indore	10	3.0-11.0	07.0
	Ujjain	10	1.0-15.0	08.0
	Dewas	15	1.0-15.0	08.0
	Dhar	15	1.0-18.0	09.5
		Average		1.5-14.7
X	Nimar Valley			
	Khandwa	20	2.0-07.0	04.5
	Khargosan	20	1.0-09.0	05.0
		Average		1.5-08.0
XI	Jhabua Hills			
	Jhabua	21	1.0-11.0	06.0
		Average		1.0-11.0

The average association of black point was in the range of 3.2-18.2 percent, in seeds from BundelKhand agro climatic zone (No. VII) and Satpura plateau zone (No.VIII), respectively. Maximum (49%) association of black point was noticed in seeds obtained from farmers of Betul district. Association of black point was over 15% in the seeds from Mandla (17%), Dindori (27%),



Shahdol (19%), Jabalpur (21%), Katni (24%), Seoni (29%), Rewa (19%), Hoshangabad (26%), Harda (18%) and Dhar (18%) (Fig.1).

Fig 1. Incidence of Black Point Disease of Wheat in Madhya Pradesh

The prevalence of black point disease in nine ago-climatic zones of Madhya Pradesh is evaluated in (Table 3).

Table 3: Prevalence of Black Point Disease in Nine Agro-Climatic Zones of M.P

Zone Number	Agro-Climatic Zones	Average (%)
II	Northern Hills of Chhattisgarh	11.1 ab*
III	Kymore Plateau & Satpura Hills	11.6ba
IV	Vindhya Plateau	06.6ci
V	Central Narmada Valley	11.8abd
VII	Bundelkhand	03.2e
VIII	Satpura Plateau	18.2f
IX	Malwa	08.1g
X	Nimar Valley	04.7h
XI	Jhabua Hills	06.0ic

*a-i column means followed by the same letters are not significantly different ($P=0.05$) according to Independent t-test

It was found to be significant in Kymore plateau and Satpura hills zone being minimum (1.0%) to maximum (29%). Betul, Dindori and Seoni were found at significant level of prevalence of black point disease while comparing with other districts.

In all the wheat growing districts of Madhya Pradesh, the black point was observed. A fungus associated primarily with black point is *Alternaria alternata*. Range of association of *A. alternata* was found least in many districts of Vindhya plateau (1%). Central Narmada valley and Satpura Plateau showed highest incidence of disease. District wise maximum association of *A. alternata* was found in Betul(49%), Seoni(29%) and Dindori (27%).

On comparing the means of Northern Hills Zone of Chhattisgarh and Kymore Plateau & Satpura Hills and Satpura Plateau with other agro-climatic zones a significant difference was found. Thus there is a high incidence of black point disease was present in the districts of these agro-climatic zones.

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