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RESEARCH ARTICLE

WHEAT ABNORMALITIES ASSESSMENT IN SOUTH WESTERN PUNJAB

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ABSTRACT

The investigation on different kind of abnormalities in wheat produced in South Western Punjab were done during 2016-2017. To know the status of wheat seed, 500 wheat samples were collected from 47 different grain markets belonging to 10 districts of Punjab. The abnormalities of seeds were categorized into wrinkled seeds, discoloured seeds, and two fungal diseases i.e. Black Point and Karnal Bunt disease. It was found that Karnal Bunt (KB) was least (20%) in Faridkot and Sangrur district whereas Abohar district was totally disease – free. Black Point (BP) was most susceptible inBarnala, Fazilka, Moga, Muktsar and Sangrur. Most susceptible varieties were HD3086, HD2733, HD2967, HD2329 and WH1105 for KB and BP.

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INTRODUCTION

In India, Punjab is contributed about 60% wheat to the national grain pool (Sharma *et al.*, 2004). In seeds, abnormality is a major constraint in crop production. These seed abnormalities are in various form like wrinkled seeds, discoloured seeds and fungal infestation (Nanaiah *et al.*, 1986 and Tanaka *et al.*, 1990). The types and severity of seed abnormalities are dependent on the type and pathogenic potential of the associated fungi as well as the weather conditions (Owolade *et al*., 2001; Fernandez and Conner, 2011). Seed-borne fungus are very common causes for seed abnormalities and often accounts for a large percentage of crop losses (Varshney, 1990). Today the minor diseases like Karnal Bunt (KB) and Black Point (BP) has emerged as one of the major constraints. The BP occurs almost all over the world wherever wheat is grown (Mathur and Cunfer, 1993).

Karnal bunt (KB), is incited by *Neovossia indica* (Mitra) Mundkur. It is widely distributed and economically important in wheat growing countries (Singh 1997)

Whereas Black point caused mainly by *Bipolarissorokiniana, Alternariaalternata, Cladosporiumcladosporioides, Curvularialunata*and*Fusarium*spp. (Fakir, 1998). The disease is characterized by the presence of mass of bunt spores in KB. Whereas in BP brown to black discolouration usually restricted to the embryonic end of the grain were observed (Ehsan-ul- Haq*et al.*, 2002; Adlakha and Joshi, 1974). These pathogen not only reduces the weight of seeds but also causes deterioration of flour quality due to production of trimethylamine (Singh *et al.*, 1993). The seeds results in poor stands and reduced field emergence and market value (Tenkouano and Sereme, 1996; Khanum*et al.,* 1987; Rahman and Islam, 1998; Rees *et al.,* 1984; Chaudhary *et al.,* 1984; Solanki *et al.,* 2006). An effort has been made to highlight the status of different grain markets of Punjab through the assessment of seed abnormalities in South Western Punjab during 2016-17.

MATERIALS AND METHODS

Dry inspection of seeds

In order to observe frequency of seed abnormality, 50 grain market were visited. Ten samples of 15 wheat varieties, measuring about 500gm to 1Kg were collected at an interval of 3 month in thick brown paper bags from each unclean heap belonging to different farmers. The collected samples were brought to the laboratory for further analysis.

Each variety was examined by visual inspection under the stereoscopic binocular microscopes. Normal seeds werehaving smooth coat, light brown to butter colour without discolouration or fungal propagates. Abnormal seeds

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werehaving malformed seed shapes, wrinkled seed coats, discolouration or having fungal propagates. Four replicate samples having 100 seeds per variety was examined and further abnormal grains count were done. Average percent of different abnormal seeds from each district were calculated.

Calculation: Percent frequency of KB infected samples = n/N× 100

RESULTS AND DISCUSSION

A total of 50 grain markets have been surveyed in 2016-17 from 10 districts of Punjab. The total 500 samples were collected.

Table 1. Status of Av% Karnal Bunt (KB) –free areas and varieties in different grain markets of Punjab (2016-2017)

Area	Percentage of KB-free varieties of wheat samples in different grain markets of Punjab				
	80-85%	Above 85-90%	Above90-95%	Above 95%	Free Areas
Abohar District					
AboharMandi	-	-	-	-	DBW17 PBW 509 HD3086, PBW550, HD2851, HD2967
Kallarkhera	-	-	-	-	HD 2967
Balluna	-	-	-	-	HD 2967
Barnala District					
Thikriwala	-	-	-	HD2967	HD3086
BarnalaMandi	-	-	-	HD2967	HD2733
Jhaloor	-	-	-	-	PBW725 HD2967
Bathinda District					
BathindaMandi	-	-	HD2967	-	HD2687
Kotshamir/KotFatta	-	-	-	HD2967	HD3086
Badhiwala(RampuraPhul	-	-	-	HD2967	HD3086 PBW725
Talwandi Sabo	-	-	-	HD2733	HD2967 HD 2851 PBW34
Ramanmandi	-	-	-	HD2967 HD2733	HD3086
Pithu(RampuraPhul)	-	-	-	-	HD2967 PBW725 HD3086
RampuraPhul	-	-	-	-	HD 2851
Talwandi Bhai	-	-	-	HD2967	-
BathindaMandi					
Bhucho	-	-	-	-	HD2733 HD2967
Tung Wali	-	-	-	-	HD2967 HD3086
KamaluSwaitch	-	-	-	-	HD2967
LehraMohabbat	-	-	-	HD3086	-
Faridkot District					
Faridkot Mandi	-	-	-	-	HD3086
Kabuli Wala	-	-	-	WH1105	HD3086
Pipli	-	-	-	-	HD2967
Golewala	-	-	-	-	PDW 291
Fazilka District					
Fazilka Mandi	-	-	-	HD2967	-
Ferozpur District					
Ferozpur Mandi	-	-	-	HD2967	-
Guru HarSahai	-	-	-	-	PBW502
Jalalabad	-	-	-	PBW509	PBW502
Mansa District					
Mansa Mandi	-	-	-	-	HD2967 HD3086
Matti	-	-	HD2967	HD3086	
Sardulgarh	-	-	-	-	HD2967 HD3086
Bareta(Budhlada)	-	-	-	-	HD2967
ThuthiaWali	-	-	-	HD2967	
Bhikhi	-	-	-	-	HD3086
Rori	-	-	-	HD2967 HD2329	
Budhlada	-	-	-	-	PBW725
BhammoKalan	-	-	-	-	HD2967
NangalKalan	-	-	-	-	HD2967
Moga District					
Dharamkot	-	-	HD2967	-	-

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Bhinder Kalan	-	-	-	-	HD3086
MogaMandi	-	-	-	-	HD2967 HD3086
BaghaPurana	-	-	-	HD2967	
Manuke	-	-	-	-	HD2967
Muktsar District					
Mahan Bhaddar	-	-	-	HD2967	PBW725
				HD3086	
Gidderbaha	-	-	-	-	HD3086
Muktsarmandi	-	-	-	HD2967	HD3086
Badal	-	-	-	-	HD3086
					Orbit
Bhunder	-	-	-	-	HD3086
Lambi	-	-	-	-	HD3086
Sangrur District					
Bhullarheri	-	-	-	HD2967	HD3086
Sangrur Mandi	-	-	-	-	HD3086
					PBW34
Loharmajra	-	-	-	-	PBW725

Table 2. Status of Av% Black Point (BP) –free areas and varieties in different grain markets of Punjab (2016-2017)

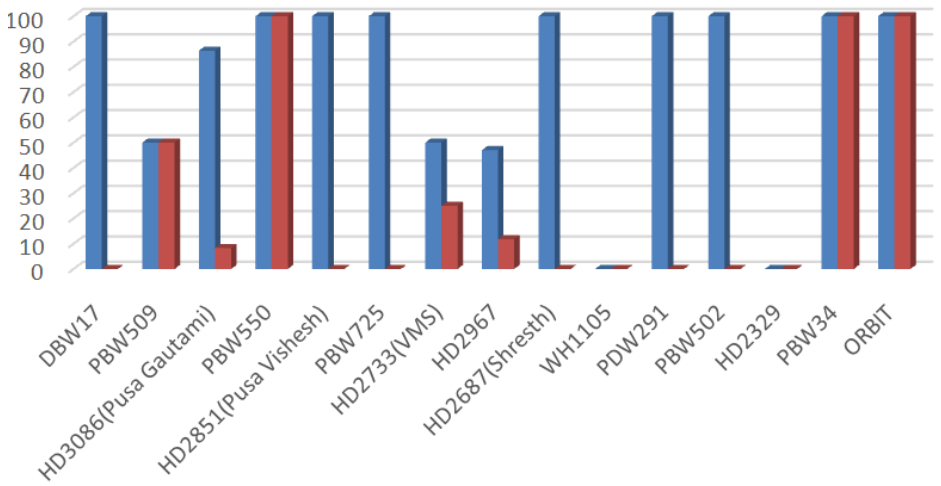
Area	Percentage of BP-free varieties of wheat samples in different grain markets of Punjab				
	80-85%	Above 85-90%	Above 90-95%	Above 95%	Free Areas
Abohar District					
Abohar Mandi	-	-	DBW17	HD2851	PBW550
			PBW509 HD3086	HD2967	
Kallar khera			HD 2967		
Balluna				HD 2967	
Barnala District					
Thikriwala			HD2967		
			HD3086		
Barnala Mandi			HD2967 HD2733		
Jhaloor				PBW725 HD2967	
Bathinda District					
Bathinda Mandi	HD2967			HD2687	
Kotshamir/KotFatta		HD2967		HD3086	
Badhiwala		HD2967	HD3086		
(Rampura Phul)			PBW 725		
Talwandi Sabo			HD2967	HD2733	
			PBW 34	HD2851	
Raman Mandi			HD2967 HD3086		HD2733
Pithu			PBW725	HD2967	
(Rampura Phul)			HD3086		
Rampura Phul			HD 2851		
Talwandi Bhai				HD2967	
Bhucho				HD2733	
				HD2967	
Tung Wali				HD3086	HD2967
Kamalu Swaitch				HD2967	
Lehra Mohabbat					HD3086
Faridkot District					
Faridkot Mandi					HD3086
Kabuli Wala		HD3086	WH1105		
Pipli				HD2967	
Golewala					PDW 291
Fazilka District					
Fazilka Mandi			HD2967		
Ferozpur District					
Jalalabad			PBW502		
Guru HarSahai			PBW502		
Jalalabad					PBW509
Mansa District					
Mansa Mandi		HD3086		HD2967	
Matti		HD3086			HD2967
Sardulgarh			HD3086	HD2967	
Bareta(Budhlada)			HD2967		
ThuthiaWali			HD2967		
Bhikhi			HD3086		
Rori				HD2967 HD2329	
Budhlada				PBW725	

Continue……..

Table 3. Incidence of normal and abnormal wheat seeds in sample collected from different grain market of Punjab

Area	Cultivars (variety)	Normal seeds (%)	Wrinkled seeds (%)	Cut seeds (%)	Entirely discoloured seeds (%)	Black Point %	Karnal Bunt%
Abohar District							
Abohar Mandi	DBW17	81	3	6	1	9	-
	PBW 509	77	4	13	-	6	-
	HD 3086	84	2	8	-	6	-
	PBW 550	70	17	17	3	-	-
	HD 2851	87	1	8	-	4	-
	HD 2967	84	9	3	2	3	
Balluna	HD 2967	63	18	13	2	4	-
Kallar khera	HD2967	73	3	9	-	5	-
Barnala							
jhaloor	PBW 725	86	1	8	1	4	-
	2967(mix)	76	8	15	-	1	-
Thikriwala	HD 3086	74	15	5	1	5	-
	HD 2967	74	6	12	-	7	2
Barnala Mandi	HD 2967	42	24	26	1	6	1
Barnala Mandi	HD 2733	61	14	22	2	3	-
Bathinda							
Talwandi Sabo	HD 2967	78	1	15	1	5	-
	HD 2851	82	4	7	-	4	-
	PBW 34	80	3	8	-	9	-
	HD 2733	69	8	16	1	4	2
Talwandi Bhai	HD 2967	80	9	5	-	2	1
Bathinda	HD 2967	66	1	10	-	16	7
Mandi	HD 2687	90	3	7	-	1	-
Kotshamir/KotFatta	HD 2967	68	11	10	-	10	1
Kotshamir	HD 3086	88	5	2	1	4	-
Raman Mandi	HD 2967	75	5	15	-	6	1
	HD 3086	74	7	13	-	6	-
	HD2733	91	3	15	-	-	1
Pithu(RampuraPhul)	HD2967	77	6	8	-	3	-
	PBW 725	70	16	7	1	6	-
Pithu	HD3086	87	3	3	-	7	-
Badhiwala	PBW 725	76	5	10	1	8	-
	HD3086	75	6	13	1	6	-
	HD2967	78	6	4	-	11	1
Bhucho	HD2733	69	4	23	-	4	-
	HD2967	78	1	17	-	4	-
Lehra Mohabbat	HD3086	77	2	19	-	-	2
Rampura Phul	HD2851	72	2	20	-	6	-
Tung Wali	HD2967	51	1	48	-	-	-
	HD3086	87	1	8	-	4	-
Kamalu Swaitch	HD2967	70	2	24	1	4	-
Faridkot							
Faridkot Mandi	HD 3086	87	9	4	-	-	-
Kabuli Wala	WH 1105	78	18	9	1	6	1
	HD3086	83	2	4	-	11	-
Golewala	PDW 291	92	5	-	-	3	
Pipli	HD 2967	92	3	3	-	2	-
Fazilka							
Kamalu Swaitch	HD2967	70	2	24	1	4	-
Faridkot							
Faridkot Mandi	HD 3086	87	9	4	-	-	-
Kabuli Wala	WH 1105	78	18	9	1	6	1
Fazilka Mandi	HD 2967	79	5	3	-	10	3
	HD 3086	85	2	6	-	6	1
Ferozpur							
Ferozpur Mandi	HD 2967	91		1	-	7	1
Jalalabad	PBW 502	84	1	8	1	6	-
	PBW 509	93	2	5	-	-	1

	PBW 509	93	2	5	-	-	1
Guru HarSahai	PBW 502	81	7	5	2	5	-
Mansa							
Mansa Mandi	HD 2967	65	-	31	2	2	-
	HD 3086	81	2	6	1	12	-
Sardulgarh	HD 3086	83	1	9	-	7	-
	HD 2967	65	3	31	-	1	-
Rori	HD 2967		10	13	-	4	1
	HD 2329	78	4	15	-	2	1
Bareta(Budhlada)	HD 2967	81	7	9	-	8	-
Bhammo Kalan	HD 2967	87	4	8	1	-	-
Budhlada	PBW 725	93	-	3	-	4	-
ThuthiaWali	HD 2967	43	3	48	-	5	1
Nangal Kalan	HD 2967	87	1	12	-	-	-
Bhikhi	HD3086	87	-	6	-	7	-
	HD 2967	76	-	12	-	-	6
Matti							
	HD 3086	83	-	3	-	10	2
Moga							
Moga Mandi	HD3086	89	4	4	2	1	-
	HD2967	86	2	7	-	5	-
Dharamkot	HD 2967	36	9	35	4	11	6
Manuke	HD 2967	90	3	3	-	4	-
BaghaPurana	HD 2967	83	-	10	-	5	2
Bhinder Kalan	HD3086	14	27	43	4	12	-
Muktsar							
Muktsar Mandi	HD 2967	56	16	7	-	9	3
	HD3086						
Lambi	HD 3086	77	5	14	-	4	-
Mahan bhaddar	HD 2967	83	4	4	1	12	1
Mahan bhaddar	PBW 725	83	8	3	4	1	-
	HD3086	81	2	6	-	11	1
Gidderbaha	HD3086	87	1	1	-	11	-
Badal	HD3086	88	1	6	1	4	-
	Orbit	70	6	22	-	6	-
Bhunder	HD3086	79	3	10	-	8	-
Sangrur							
Sangrur Mandi	HD3086	76	4	28	-	2	-
	PBW43	77	17	2	2	2	-
Loharmajra	PBW 725	80	2	14	-	4	-
Bhullarheri	HD 3086	81	4	10	2	9	-
	HD 2967	81	7	4	1	6	1



Graph 1. Status of KB & BP – free varieties in different grain markets of Punjab (2016-2017)

It was further examined in laboratory. During the year, 2016-17, the disease was negligible in the Abhoar district. HD 3086 and HD2967 varieties were showing KB disease free (above 95 percent) in Barnala, Muktsar and Sangrur district. Bathinda, Mansa and Moga districts were having above 90-95 percent disease free samples. Four varieties i.e. HD2733 in Ramanmandi (Bathinda District), WH1105 in Kabuli Wala (Faridkot district), PBW509 in Jalalabad (Ferozpur District) and HD2329 in Rori (Mansa district), were found susceptible to Karnal Bunt disease during 2016-17 survey (Table 1). Five grain markets i.e. Lehra Mohabbat (Bathinda District), Faridkot, Golewala Mandi (Faridkot District) and Bhammo Kalan, Nangal Kalan(Mansa District) were found as BP-free area. HD2967 variety was showing 80-85% BP-free at Bathinda Mandi. Kotshamir/KotFatta, Rampura Phul (Bathinda District), Dharamkot (Moga District) and Mahan Bhaddar(Muktsar District)were showing 85-90% BP-free in HD2967 variety. Kabuli Wala(Faridkot District), Mansa Mandi, Matti(Mansa District), Bhinder Kala(Moga District) and Mahan Bhaddar, Gidderbaha(Muktsar District) were showing 85-90% BP-Free for HD3086 variety. The maximum incidenceof Black Point (0-15%) was recorded in HD2967 and HD3086, followed by PBW 502 variety (Table 2).Amongst 15varieties, total 9 varieties (DBW17, PBW550, HD2851, PBW725, HD2687, PDW291, PBW502, PBW34 and Orbit(Non recommended)) were Karnal Bunt (KB) - free. Only three common varieties,PBW550, PBW34 and Orbit (Non recommended) was both Karnal Bunt and Black Point - free varieties. HD3086, HD2733, HD2967 were 86.36%, 50% and 47% KB- free variety, whereas same varieties were 8.3%,25% and 11.76%BP-free (Graph 1). However, in the year 2016-17 the disease KB and BP was found high in WH1105 and HD2329. The maximum Karnal Bunt seeds were found in variety HD2967 at Bathinda Mandi (7%). Karnal Bunt free areas were Abohar, Kotshamir of Bathinda district, Fazilka, Jalalabad of Ferozpur district and Muktsar Mandi.The percentage range of normal seeds were 14 – 88%. Range of abnormal seeds which includes: cut seeds, entirely discoloured seeds, Karnal Bunt and Black Point infested seeds were 1.0-48%, 0 – 8.0%, 0 – 7.0% and 0-16%respectively (Table 3). The dry inspection of seeds revealed the higher incidence of cut and discoloured seeds than normal seeds. According to Tyagi and Olugbemi (1980);Sisterna and Sarandon (2010) the grain discoloration was the results of fungal infection of wheat heads under humid conditions. However the disease is highly dependent on the climatic factors during the crop season, year to year variations in the disease are likely to occur. The variations in disease development is related to varietal susceptibility and the environmental conditions prevalent in different years at vulnerable stage of wheat growth (Joshi, 1978,1988; Bedi and Dhiman, 1982; Singh *et al*., 1986; Aujla*et al*., 1986, 1987; Sharma *et al.,*1998). Therefore, this information will be significant for the trader who are involve in wheat marketing.

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