

Prevalence of Karnal Bunt of Wheat in NWFP (Pakistan)

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ABSTRACT

A karnal bunt survey was carried out on 78 locations in NWFP. The low disease incidence of 0.41% was recorded from Agriculture Extension farm, Jambra, Mardan. A high incidence of 46% was recorded from Hathion. Wheat varieties Pak-81 and Pirsabak-85 planted throughout the NWFP were found susceptible to Karnal bunt disease. Heavy infection was found in wheat growing areas of Mardan, Swabi and Malakand agency.

Key Words: Karnal bunt; Wheat; Pakistan

INTRODUCTION

Karnal bunt is caused by *Tilletia indica* Mitra {synonym *Neovossia indica* (Mitra)}, a floral infecting organism that partially infects the seed of bread wheat (Mitra, 1931), durum wheat and triticale (Agarwal *et al.*, 1977). The disease is found in northern India, northern Pakistan, southern Nepal and parts of Iraq (Commonwealth Mycological Institute, 1976) and Mexico (Duran, 1972).

The teliospores of *T. indica* are both seed and soil borne retaining their viability for up to four years (Krishna & Singh, 1983). Those teliospores at the soil surface germinate under favourable conditions giving rise to a promycelium bearing many filiform primary sporidia at its tip (Mundkur, 1940). These primary sporidia or secondary sporidia that develop subsequently are carried to the wheat spike either by air currents or water droplets (Mundkur, 1943; Dastur, 1946; Gill *et al.*, 1981). Wheat plants are most susceptible when the spikes emerge from the boot, but infection can take place throughout anthesis (Warham, 1984).

MATERIALS AND METHODS

The wheat growing locations of NWFP were surveyed during 1980. Two disease samples were collected randomly from both sides of road after every eight kilometer distance. Each sample consists of five bunted ears and brought to the laboratory. After threshing the disease data was recorded on the basis of percent disease incidence.

$$\text{Per cent disease incidence} = \frac{\text{Number of diseased seeds}}{\text{Total number of seeds in sample}} \times 100$$

According to the survey the disease data recorded is presented in Table I from NWFP during 1990.

Techniques used for identification of Karnal Bunt. The infection occurs at the flowering stage and the disease becomes evident when grains have developed. In a stool all the ear heads are not infected and in an ear all the grains are not bunted. The fungus affects the grains partially with some tissues of the grain remaining normal and some

converted into a mass of bunt spores. However, some individual grains in a diseased head are also completely bunted. In badly infected spikelets, the glumes spread apart and quite often fall off exposing the bunted grains which also fall to the ground. Normally, the embryo tissue, except in very severe cases, is not destroyed. Generally the infection spreads to the tissue along the groove of the grain, but the endosperm material lying along the groove of the grain remains uninfected. The disease causes reduction in the length of ears as well as number of spikelets in the infected heads. Frequently the grains are partially infected but in heavy attack of this disease sometime grains seem to be filled completely with bunt spores.

The Teliospores of *Neovossia indica* are darker brown than those of *T. caries* and *T. foetida*. They are spherical to oval with reticulations on the epispore and curved spines, measuring 22-49 μm (average 35 μm) in diameter. A thin hyaline membrane surrounds the spines on the epispore and persists when the spores are mature. Yellowish sterile cells are also found with spores. Electron microscopic studies of teliospores revealed the presence of three walls or viz, the perisporium (Sheeth), the episporium and the endosporium. The young spores bear an epicule arising from the episporium. The perisporium is adorned with thick truncate projections and individual projection is composed of two double strands, which are cemented together by two cross bands at or near the apex. In *N. indica*, endosporium is thick and lamellate.

RESULTS AND DISCUSSION

High disease incidence prevailed in Hathion on variety WL-711/Blue Silver (Table I). Pirsabak-85 on the other hand showed low disease incidence of 0.1% at Agriculture Extension Farm, Jambra. The disease was more prevalent on local mixture ranging from 0.64-23.42%. The disease was high on variety Pak-81 ranging from 0.47-6.32% and was less prevalent on Pirsabak-85 than Pak-81 and ranged from 0.41 to 5.57%. High intensity of Karnal bunt was recorded from Mangora, Mardan, Malakand agency and Swabi. The medium and low disease intensity

was recorded from Mansehra, Peshawar, Abbottabad, Attock and Nowshera. The disease recorded very low or 0 from Akora Khattak to Ahmadabad, Sarikot to Pannian, Bisham to Salakalay. Very low disease incidence at some locations is low due to less rain and low humidity or rotation of wheat with other crops.

Table I. Karnal bunt survey report from NWFP during 1990

S. No.	Name of localities	Varieties	% disease incidence
District Peshawar/Nowshera			
1.	Sumal Khail	Lyellpur-73	0.00
2.	CCRI Pirsabak	Pak-81	0.00
3.	Shaidu	Pak-81	2.36
4.	CCRI Pirsabak	Khyber-87	0.00
5.	Chamkani	Local mixture	0.00
6.	Taro Jabba	Local mixture	0.64
7.	Pir Pia	Local mixture	0.00
8.	Pir Pia	Local mixture	1.69
9.	Akora Khattak	Local mixture	0.00
10.	Chamkani	Local mixture	0.00
11.	Nasir Kalay	Local mixture	0.00
12.	Aza Khail	Local mixture	0.00
13.	ARI, Tarnab	Pirsabak-85	0.00
14.	Ahmed Sair	Pak-81	0.00
15.	Aagman	Local mixture	0.00
16.	Ahmad Abad	Local mixture	0.00
17.	CCRI Pirsabak	Pisabak-85	1.04
District Charsadda			
18.	Khan Abad	Pirsabak85	0.00
District Mardan			
19.	Jalala	Pak-81	0.00
20.	Sheikhabad	Local mixture	1.95
21.	Sheikhabad	Pirsabak-85	5.57
22.	Aspilano	Pirsabak-85	2.31
23.	Bala Garhi	Local mixture	0.00
24.	Agri.Farm, Jambra	Pirsabak-85	0.41
25.	Sheeshi Zaie	Local mixture	2.94
26.	Catlang	WL-711	1.88
27.	Naurozabad	Local mixture	14.20
28.	Hathion	WL-711/b. silver	46.00
District Swabi			
29.	Azeem Garhi	Layallpur-73	0.00
30.	Topi	Pirsabak-85	2.38
31.	Zaida	Pak-81	1.22
32.	Zaida	Pirsabak-85	0.54
33.	Lahore	Pak-81	0.93
34.	Zaida	Pak-81	4.88
35.	Zaida	Pak-81	2.71
36.	Rattodair	Local mixture	0.77
37.	Akunda	Pak-81	0.77
38.	Kaloo khan	Pak-81	5.85
39.	Fazalabad	Pak-81	2.16
District Abbottabad			
40.	Haripur City	Pak-81	0.00
41.	Haripur Road, Tarbala Dam	Pak-81	1.37
42.	Sari Kot	Pak-81	0.00
43.	Bal Deer	Pak-81	0.00
44.	Pannian	Pak-81	0.00
45.	Abbottabad	Local mixture	0.00
District Mansehra			
46.	Battal	Local mixture	1.04
47.	Mansehra	Pak-81	0.00
48.	Pachora	Local mixture	2.53

49.	Chappar Gram	WL-711	0.42
50.	Kotli Bala	Local mixture	0.00
51.	Dodial	Pak-81	0.47
District Mangora			
52.	Bisham	Pak-81	0.00
53.	Alam Ganj	Pirsabak-85	0.00
54.	Topsin	Local mixture	0.00
55.	Bisham	Pak-81	0.00
56.	Alla Abad	Local mixture	0.00
57.	Bon Daie	Pak-81	0.00
58.	Kot Madayan Road	Local mixture	0.00
59.	Sangota	Local mixture	0.00
60.	Sala kalay	Local mixture	0.00
61.	Bazar Gay, Dagar Road	Local mixture	2.53
62.	Bahrain Road	Local mixture	0.00
63.	Sawari	Local mixture	4.16
64.	Dagar Road	Pak-81	0.00
65.	Bari Kot	Pirsabak-85	2.73
66.	Madayan	Local mixture	0.00
67.	Fateh Pur	Local mixture	0.00
68.	Iso Darra (Pir Baba Road)	Local mixture	0.00
69.	Qambar	Local mixture	0.00
70.	Alay (Dagar Road)	Local mixture	23.42
71.	Sawari to Deewana Baba Road.	Local mixture	5.47
72.	Deewana Baba Road	Local mixture	5.55
73.	Torwarsak	Pak-81	0.00
74.	Ashnayie(Dagar Road)	Local mixture	6.69
75.	Sawari to Deewana Baba Road	Local mixture	3.01
Malakand Agency			
76.	Yara Abad	Pak-81	6.32
District Attock			
77.	Mola Manzoor	Shah Zour	0.00
78.	Haji Shah	Pak-81	1.25

The Karnal bunt disease occurs in certain regions of India, Pakistan and Afghanistan (Mitra, 1931; Mundkur, 1967; Munjal, 1975). In India, it was known to occur in various northern states of country viz., Delhi, Haryana, sub-mountainous regions of Hamachal Pradesh, Jammu and Kashmir, Punjab, Rajistan and Uttar Pradesh (Munjal, 1975). The incidence of disease was observed high from Mingora, Mardan, Malakand Agency and Swabi. The medium and low disease intensity was recorded from Mansehra, Peshawar, Abbottabad, Attock and Nowshera. The disease recorded very low from Akora Khattak to Ahmadabad, Sarikot to Pannian, Bisham to Salakalay. The farmers are mostly planting wheat varieties Pak-81 and Pirsabak-85, which are, recorded highly susceptible varieties to Karnal bunt. High incidence in Tarai region of Uttar Pradesh and parts of Punjab was observed. The Karnal bunt was also observed in varieties, Pusa, 4, 52, 114, 115, 116, 117, Federation and Punjab 8A (Gill *et al.*, 1983).

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