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Research Note

Field screening of wheat genotypes against Karnal bunt caused by *Neovossia indica* (Mitra) Mund.

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Abstract
One hundred fifty genotypes of wheat were screened for Karnal bunt resistance under artificial inoculation condition in field during 2009-10 rabi seasons. Significant variability in the incidence of disease was observed among genotypes where the per cent disease incidence ranged from 0.2-63.1 at grains harvest stage. Out of one hundred fifty genotypes screened, 12 were rated as highly resistant, 6 as resistant, 6 as moderately resistant and rest as moderately susceptible to highly susceptible genotypes against Karnal bunt of wheat.
Keywords:
Wheat, Resistance, Karnal bunt, Genotypes

Wheat (*Triticum aestivum* L.) is the most popular grain of the world and is the staple food of millions of people. The geographical concentration of wheat is found between 30-55ºN latitude in the Northern hemisphere and between 20-40ºS in Southern hemisphere (Anonymous 2011). Indian wheat programme has achieved record harvest to the tune of 80.71 million tons during 2009-10 from an area of 28.0 million ha towards its march for enhanced wheat productivity (Anonymous 2010). Karnal bunt (KB), caused by *Neovossia indica* (Mitra) Mundkur syn. *Tilletia indica* (Mitra) was first reported from Karnal, India (Mitra, 1931) and causes heavy losses in wheat production mainly in Northern and Central India. All efforts to control the disease through cultural practices and chemical treatment have been futile. The only alternative to avert this disease is to develop cultivars resistant to KB. For effective breeding programs of KB disease resistance, knowledge of variability of pathogens, host range and source of resistance in the host or related species and effective screening under epiphytic conditions is required (Gill *et al.* 1993a).

One hundred fifty wheat genotypes were collected from Directorate of Wheat Research, Karnal and Hill Agricultural Research and Extension Centre, Dhaulakuan and sown on 19thNovember, during rabi season (2009-10) at Experiment farm of HAREC, Dhaulakuan. Each entry was sown in a single row of 1m row length. All the entries of wheat were artificially inoculated by the Hydrodermic syringe inoculation technique. A sporidial suspension containing allantoids sporidia (10^4 sporidia/ ml) was injected (1.0 ml/ spike) through hydrodermic syringe at the boot leaf stage when the awns were just visible along with flag leaf. Ten spikes per entry were inoculated before emergence. Perfo spray equipment was used for maintaining >80 per cent relative humidity. Karnal bunt incidence was recorded after threshing as per formula given below according to Aujla *et al.* (1980):

$$\text{KBI (\%)} = \frac{\textbf{Number of bunted grains in ten spikes}}{\textbf{Total number of grains in ten spikes}} \text{ x } \mathbf{100}$$

Further, entries were categorised into different groups as per modified disease rating scale of Aujla *et al.* (1989).

This study was designed to identify new source of resistance to Karnal bunt which can be used in developing resistance cultivars to disease, with a view to mitigate losses in farmers' field. During rabi season (2009-10), wheat germplasm obtained from different sources were screened and evaluated under artificial inoculation conditions against Karnal bunt of wheat. Data on Karnal bunt incidence were recorded and presented in Table 1. Further on the basis of disease incidence, genotypes were categorised into highly resistant (0%), resistant (<1%), moderately resistant (1.1-2.0%), moderately susceptible (2.1-5.0%), susceptible (5.1-10%) and highly susceptible (>10%) classes. The data presented in Table 1 indicated that twelve genotypes namely, DBW-52, VL-829, VL-616, TL-2942 (I), HS-375, HS-513, DDW-12, HPW-251, RAJ-3777, RAJ-3765, HPW-211 and HPW-236 were highly resistant while the six genotypes viz. AKAW-4627(I), HI-8627(d), HS-490, WH-1061, HD-4719 (d) and VL-944 were resistant. Six genotypes namely, MACS-2971(I), DBW-51, WHD-943, VL-925, HI-1544(C) and PDW-314(1) were moderately resistant and rest of the genotypes were recorded as moderately susceptible to highly susceptible (Table 1).

Germplasm evaluation is the preliminary step to identify resistance to develop Karnal bunt resistant wheat varieties. Present studies revealed that genotypes DBW-52, VL-829, VL-616, TL-2942 (I), HS-375, HS-513, DDW-12, HPW-251, RAJ-3777, RAJ-3765, HPW-211 and HPW-236 were completely free from Karnal bunt under field condition. However, six wheat genotypes namely, AKAW-4627(I), HI-8627(d), HS-490, WH-1061, HD-4719 (d) and VL-944 were recorded resistant. Rathee *et al.* (1993) conducted an extensive screening of wheat genotypes and varieties for resistance to Karnal bunt at Dhaulakuan and found 16 genotypes / varieties that were free from infection under artificial inoculation conditions. Sharma *et al.* (2001) identified six stable sources of resistance to Karnal bunt ('KBRL 10', 'KBRL 13', 'KBRL 15', 'KBRL 18', 'KBRL 22', 'KBRL 24') and developed three high yielding Karnal bunt resistant wheat varieties ('W 7952', 'W 8086', 'W 8618') by pyramiding Karnal bunt resistant genes using pedigree method of breeding. However, Sharma *et al*. (2001) obtained a Karnal bunt resistant wheat stock ('KBRL 22') from a cross of two resistant lines ('HD29' and 'W485'). They used it as a donor for introgression of Karnal bunt free trait into 'PBW 343', the most widely grown wheat variety in India.

Shakoor *et al.* (2008) screened 244 advanced germplasm lines and commercial cultivars of wheat for their resistance to Karnal bunt disease and found that 16 lines were highly resistant, 9 were resistant, 18 were moderately resistant, 40 were moderately susceptible, 58 were susceptible and 112 lines/cultivars were highly susceptible to Karnal bunt disease at Wheat Research Institute, Faisalabad, Pakistan. Similarly, a large number of advanced wheat germplasm and varieties are being screened at Directorate of Wheat Research, Karnal, India to release Karnal bunt resistant varieties at national level. Twelve wheat varieties in present study were found highly resistance to Karnal bunt. Out of these, five wheat varieties HPW-251, RAJ-3777, RAJ-3765, HPW-211 and HPW-236 are being cultivated in Karnal bunt prune areas of Himachal Pradesh.

References:

Anonymous, 2010. Marching towards enhanced productivity. *The Hindu survey of Indian Agric.*, pp. 28-30

Anonymous, 2011. Food Grains Production. *Chronicle* vol. **xxii** (2): 90.

Aujla, S. S., Grewal A. S., Gill K. S. and Sharma I. 1980. A screening technique for Karnal bunt disease of wheat. *Crop Improve.,* **7:** 145–146.

Aujla, S.S., Sharma I., and Singh B.B. 1989a. Rating scale for identifying of wheat varieties resistant to *Neovossia indica*. *Indian Phytopathology* **42**(1): 161-162.

Gill K.S., Sharma I. and Aujla S.S. 1993. Karnal Bunt and Wheat Production. Ludhiana, Punjab, India: Punjab Agric. Univ. Press. p. 153.

Mitra, M. 1931. A new bunt on wheat in India. *Annals of Applied Biol*., **18**(2): 178-179.

Rathee, V.K., Sharma, B.K., Verma, B.R. and Sirohi, A. 1993. Search for sources of resistance in wheat to Karnal bunt. *Crop Res. Hisar*, **6**(3): 566-567.

Shakoor, M.A., Khan, M.A., Arif, M.J., Nazir, J., Mahmood, M.A. and Ilyas, M.B. 2008. Screening of advanced lines and commercial varieties of wheat against Karnal bunt disease. *Pakistan J. Phytopathol.*, **20**(2): 209-213.

Sharma, I., Nanda GS, Chand K. and Sohu VS. 2001. Status of Karnal bunt (*Tilletia indica*) resistance in bread wheat (*Triticum aestivum*). *Indian J. Agril. Sci.*, **71**(12): 794-796.

Sharma, I., Nanda, G.S., Singh, H. and Sharma, R.C. 2004. Status of Karnal bunt disease of wheat in Punjab (1994-2004). *Indian Phytopathol.*, **57**(4): 435-439.

Table 1. Reaction of wheat genotypes to *N. indica* under field conditions.

Disease rating scale and KBI	Response of test genotypes against the disease	Wheat genotypes
0 = No infection at all	Highly Resistant (12)	DBW-52, VL-829, VL-616, TL-2942 (I), HS-375, HS-513, DDW-12, HPW-251, Raj 3777, Raj 3765, HPW-211 and HPW-236.
1 = Less than 1% grain bunted	Resistant(6)	AKAW-4627(I), HI-8627(d), HS-490, WH-1061, HD-4719 (d) and VL-944.
3 = 1.1-2% grain bunted	Moderately resistant(6)	MACS-2971(I), DBW-51, WHD-943, VL-925, HI-1544(C) and PDW-314(1).
5 = 2.1-5% grain bunted	Moderately susceptible(30)	GW-173, HP-1913, HS-502, HUW-612, K-0617, PDW-313, Sonalika, UAS-315, PBW-175, PDW-233, PBW-396, DBW-46, RSP-561, HUW-234, K-0307(1), MP-4106, HD-4672, UAS-316, AKDW-2997-16(d), HI-8663 (D), DDK-1009, KRL-19(C), UP-2799, HPW-307, TL-2968, TL-2969, HPW-338, HS-534, VL-930 and VL-946.
7=5.1-10% bunted grain	Susceptible(28)	CBW -38, GW-391, HI-8681, HS-507, HS-240, HS-295, PDW-317, WH-1081, WH-1021(C), WH-896, DBW-14, K-8027, AKDW-4021(D), HW-5207-1, DL-788-2, HD-2864, MP-4010, HI-977, UAS-304(I), KRL-238, KRL-240, KHARCHIA-65, HS-525, HPW-339, HS-514, VL-945,DBW-55 and DBW-59.
9=More than 10 per cent grain bunted	Highly susceptible(68)	HI-8680, PBW-613, HS-277, VL-804, VL-892, VL-907 (I), DBW-50, PBW-621, PBW-629, PDW-315, UP-2744, WH-1080, C-306, DBW-17, HD-2967(I),PBW-343, PBW-373, PBW-550, PBW-590, PDW-291, HD-2997, HD-3016, HI-1563, NW-4035, DBW-39(I), HD-2888, HD-2733, NW-2036, HI-8691(d), MACS-3742, MP-3288, A-9-30-1, GW-322, HD- 2932, HI-1500, HI-1531, HI-8498(d), LOK-1, MPO-1215(D)(I), NIAW-1415, DBW-60, DBW-58, VL-934, VL-931, VL-926, UP-2798, SKW-441, HS-533, HPW-348, HPW-347, HPW-317, HPW-316, KRL-213(I), MACS-2496, HD-2009, KRL-210(I), HW-2044, CoW-(W) 1, HW-5207(I), RAJ-4083, PBW-596, NIDW-295(D), NIAW-917, NI- 5439, MACS-6273(I), MACS-6222(I), HD-2987(I) and HD-2781.