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Short Communication

Agronomic performance of the constituted near-isogenic lines in hexaploid wheat

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Deployment of diverse genetic sources for disease resistance in high yielding wheats assists in achieving yield stability at higher levels of productivity without resorting to costly and potentially harmful chemicals. There were a few earlier reports of yield variation associated with transfer of rust resistance genes in wheat. This was attributed to presence or absence of 'linkage drag' associated with the transferred gene. The present communication reports the agronomic performance of near-isogenic lines carrying various rust resistance genes in a few Indian wheat cultivars.

Near-isogenic wheat lines carrying six *Lr* genes (*Lr*9, *Lr*19, *Lr*24, *Lr*28, *Lr*32 and *Lr*37), three *Sr* genes (*Sr*24, *Sr*25 and *Sr*38) and one *Yr* gene (*Yr*17), in the genetic background of four hexaploid wheat varieties (HUW 318, PBW 226, HI 1077, WH 542) were constituted in BC_2F_5 and BC_5F_5 generations. Each constituted near-isogenic line was grown in the field 3 × 2 metre plot and replicated three times. Grain yield of all the lines were compared with the respective recurrent parents under rust free condition created by using Tilt. The plot grain yield was recorded and expressed in quintal per hectare. Factorial RBD was used to compare the means of population, treatment and interaction.

When compared to control both increase and decrease in grain yield was noticed (Table 1). The yeild depression was in the range of –0.68% (WH 542 × RL 6081) to –7.45% (HUW 318 × CS 2D/2M 3/8). Yield reduction was noticed in the lines that carried rust resistance genes from CS 2D/2M 3/8 *LR*28 and RL 6081 *Sr*38 + *LR*37 + *Yr*17. In all other consituted lines, the yield increase was in the range of 0.11% (PBW 226 × RL 6081) to 19.58% (HI 1077 × Cook'6/C 80-1). There are a few earlier reports of yield variation associated with transfer of rust resistance (gene(s). Islam and Shephered [1] have reported that significant yield depression occurred in the rust resistant lines with *Sr*26 and *Sr*21 giving 9 and 7 per cent lower yield respectively. On the other hand, lines developed by Sawhney and Sharma [2] carrying diverse rust resistance genes in the genetic background of Indian wheat cultivars Kalyansona and Sonalika, showed higher

Table 1. Comparative percent grain yield difference of the constituted rust resistance lines over chemical treated controls (mean)

Control/Resistance source	Genera-tion	Constituted hexaploid wheat lines of			
		HUW 318	PBW 226	HI 1077	WH 542
Control (Chemical treated)		38.39	36.59	26.51	38.8
Sonalika*7/Abe (*Lr*9)	BC_2F_5	+11.82	+8.96	+14.33	+5.55
	BC_5F_5	+9.87	+7.90	+12.38	+4.49
Cook*6/C 80-1 (*Lr*19+*Sr*25)	BC_2F_5	+15.60	+12.63	+19.58	+7.96
	BC_55F_5	+14.53	+8.31	+17.50	+6.63
Darf*/6/3Ag/Kite (*Lr*24+*Sr*24)	BC_2F_5	+7.94	+6.48	+10.66	+2.88
	BC_2F_5	+6.95	+5.33	+8.91	+1.57
CS 2D/2M3/8(*Lr*28)	BC_2F_5	–5.52	–3.85	+0.99	–3.23
	BC_5F_5	–7.45	–4.84	–0.89	–3.91
C 86-8/Kalyansona F_4 (*Lr*32)	BC_2F_5	+3.91	+4.73	+6.67	+1.17
	BC_5F_5	+2.06	+2.92	+5.41	+0.21
RL 8061 (*Lr*37+*Sr*38+*Yr*17)	BC_2F_5	–1.25	+0.11	–1.75	–0.68
	BC_5F_5	–2.99	–1.38	–3.63	–1.83

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yields. Incorporation of leaf rust resistance gene *Lr*41 increased the grain yield and milling quality [3]. Dyck [4] also did not observe any deleterious effect of stem rust resistance gene *Sr*40 when transferred from *Triticum araraticum* to bread wheat. On the other hand, four of the eleven rust resistant lines developed by Zeven *et al.* [5] exhibited superior agronomic performance. Similarly Thatcher backcross derivative RL 6058, carrying leaf rust resistance gene *Lr*34, out yielded the parent by 0.3% [6]. Although in spring wheats, *Lr*9 incorporation is associated with improvement in yield and yield contributing characters, its effect seems to vary in winter wheats [7]. From the absence of yield depressive effect of leaf rust resistance gene in wheat cultivar Agent [8], stem rust resistance genes in wheat cultivar LMPO [9], inconsistency in the effect of the same gene on yield at different years and locations [8, 9], variation in the yield due to various resistance genes in a particular wheat genetic background [8, 10], it is evident that the effect of resistance gene(s) on yield may vary with different genotypic backgrounds, different genes, different sources of rust resistance (donor parents) and the environment.

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