# Some *Triticum turgidum* L. cultivars possessing the chromosome T1BL.1RS substitution

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**Summary**

Six durum wheat (*Triticum turgidum* L.) cultivars were pollinated by Cando/Veery to produce chromosome 1B, T1BL.1RS $F_1$ heterozygotes. Each $F_1$ combination was pollinated by its respective durum maternal parent to yield the first backcross ($BC_1$) derivatives. Heterozygous 1B, T1BL.1RS plants were identified by glucose phosphate isomerase (GPI) electrophoresis and Giemsa C-banding. These $BC_1F_1$ heterozygotes were backcrossed further to their durum parents to yield $BC_2$ derivatives, which were similarly advanced to $BC_7$ and then self-pollinated. From the selfed progeny, plants homozygous for chromosome 1B and T1BL.1RS were identified biochemically and cytologically. We discuss here the utility and uniqueness of this germplasm to elucidate the contributions of the 1RS translocated chromosome arm in different durum genotypes.

Index words: Durum wheat, T1BL.1RS translocation, Isogenic lines

**Introduction**

Our bread wheat (*Triticum aestivum* L.) germplasm comprises of about fifty-five percent of the lines possessing the T1BL.1RS translocation. Such translocated wheats have been preferentially used by breeders worldwide and are planted on over 5 million hectares. The T1BL.1RS translocation chromosome has been associated with superior agronomic performance (Villareal *et al.* 1994,1995), grain yield, and environmental stability (Rajaram *et al.* 1983). The 1RS arm also possesses four biotic stress resistance genes (McIntosh 1983). In durum wheats (*T. turgidum* L.) the T1BL.1RS translocation has been incorporated so far in two cultivars; Cando/Veery (Friebe *et al.* 1987, 1993) and Altar 84 (Mujeeb-Kazi *et al.* 1999). Agronomic evaluations of the isogenic 1B and T1BL.1RS Altar 84 germplasms have been made (Villareal *et al.* 1997) that indicate advantageous T1BL.1RS contributions. Hence, in order to study this favorable response across more durum genotypes, we selected six leading durum cultivars and develop in them chromosome T1BL.1RS isolines; germplasms reported here.

## Materials and Methods

### *Production and cytological diagnostics*

Six *Triticum turgidum* L. (2n=4x=28, 1B,1B) cultivars (Bia, Croc 1, Dvergand 2, Gutros, Laru, Pardo) as female parents were pollinated by Cando/Veery; a durum T1BL.1RS genetic stock (Friebe *et al.* 1993). All $F_1$'s were backcrossed by their respective durum parents to yield $BC_1F_1$ derivatives. These derivatives were screened by C-banding (Jahan *et al.* 1990) after their endosperm halves had been biochemically tested positive to possess the T1BL.1RS chromosome. Two 1B, T1BL.1RS heterozygote plants were identified within each cultivar, and crossed with respective durum parents to yield $BC_2$ derivatives. $BC_2$ progeny of only one plant was similarly advanced to $BC_7$ and selfed. From each of the $BC_7$ selfed progenies plants homozygous for 1B and T1BL.1RS chromosomes were selected and seed increased. The 1B derivatives were categorized as "extracted".

### *Biochemical diagnostics*

Endosperm halves of the germplasm for each cultivar from $BC_1F$ up to $BC_7$ were utilized for GPI analyses in order to identify 1B homozygotes, T1BL.1RS homozygotes, and their heterozygotes (William and Mujeeb-Kazi 1993). After reaching the $BC_7$ the heterozygotes (1B, T1BL.1RS) were selfed. GPI analyses on individual endosperm halves identified homozygous 1B derivatives and the corresponding embryo halves of these seeds were seed increased. The remaining embryo halves were germinated and root-tips analyzed by Giemsa C-banding (Jahan *et al.* 1990) to identify plants that were T1BL.1RS homozygotes. Root tips were collected from the growing young T1BL.1RS homozygote seedlings and subjected to the fluorescent *in situ* hybridization (Schwarzacher *et al.* 1992, Islam-Faridi and Mujeeb-Kazi 1995) diagnostic test for conclusive validation.

## Results and Discussion

The presence of T1BL.1RS in durum wheat (*T. turgidum* L.) is restricted to two cultivars; Cando/Veery (Friebe *et al.* 1987, 1989) and Altar 84 (Mujeeb-Kazi *et al.* 1999). From Cando/Veery an $F_2$ segregant homozygous for T1BL.1RS was selected and registered as KS91WGRC14 (Friebe *et al.* 1993). The development of the translocation stock in Altar 84 was unique in that a commercial durum cultivar was utilized. Seven backcrosses made the resulting products nearly isogenics, and also yielded after the $BC_7$ selfing 1B "extracted" derivatives. These extracted lines were anticipated to differ from the Altar 84 parent for the recombination events on chromosome arm 1BL as well as the remaining 26 chromosomes since a different cultivar (Seri M82) was the T1BL.1RS donor to Altar 84 for the heterozygote $F_1$.

Villareal *et al.* (1997) studied the two germplasm products in Altar 84 (Altar T1BL.1RS and Altar "extracted" lines), and concluded that the translocation lines had increases of 3 percent or more in grain yield and above-ground biomass. This translocation effect was considered to be a likely product of a complex chromosomal recombination interaction, apart from the presence of the 1RS rye arm alone. It was suggested that a greater durum germplasm diversity should be made available to further validate the positive T1BL.1RS results obtained for Altar 84. We have as a consequence, substituted the T1BL.1RS translocation into six elite durum wheats. The protocol involved Cando/Veery as the T1BL.1RS donor pollen parent, seven backcrosses of each heterozygote combination with its durum 1B parent, followed by a final selfing after $BC_7$ to yield homozygous T1BL.1RS lines and its 1B "extracted" derivatives (Table 1).

The germplasm diversity thus generated shall further elucidate T1BL.1RS effects over a range of durum wheats as gauged by their agronomic performance. Overlooked in general has been the role that this translocation will have on durum quality, which if detrimental may offset the yield advantages that Villareal *et al.* (1997) have reported. Such quality evaluation results will be forthcoming.

Table 1. Some durum wheat cultivars where the homozygous 1B chromosome has been substituted by the T1BL.1RS translocation chromosome following seven backcrosses and a selfing.

| Durum wheat cultivar | Parental chromosome status | Cultivar used to produce $F_1$ (1B, T1BL.1RS) | $BC_7$ Selfed Status: Homozygous near isogenic selections | Homozygous "Extracted" selections |
|---|---|---|---|---|
| Laru | 1B, 1B | Cndo/Vee | T1BL.1RS | 1B |
| Croc 1 | 1B, 1B | Cndo/Vee | T1BL.1RS | 1B |
| Dverd 2 | 1B, 1B | Cndo/Vee | T1BL.1RS | 1B |
| Pardo | 1B, 1B | Cndo/Vee | T1BL.1RS | 1B |
| Gutros | 1B, 1B | Cndo/Vee | T1BL.1RS | 1B |
| Bia | 1B, 1B | Cndo/Vee | T1BL.1RS | 1B |

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Received 30 July, 1999, accepted 16 September, 1999