



SSR marker TSM106 a convenient tool for wheat-rye 1AL:1RS translocation selection.

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Key message: SSR-TSM106 behaved like a dominant marker that clearly identified the distal wheat-rye 1AL:1RS translocation, coming from “Insave” or similar rye chromatin, from other rye chromatin usually present in 1BL:1RS translocations.

Introduction

Development of new wheat cultivars with resistance to biotic and abiotic stresses, better yields and good quality will be always an objective for breeders from entire world. To accomplish this objective breeders have to find new genetic resources.

The rye (*Secale cereale* L.) is and continues to be such a resource. Today, there are many wheat cultivars that carry rye translocation, in special 1BL:1RS and 1AL:1RS that have provided resistance genes to rusts (Li et al. 2016), powdery mildew (Lu et al. 2014), greenbug (Porter et al. 1991), common bunt (Ciuca M., 2011), etc. Also, these translocations have brought positive impact on wheat yield, adaptability and drought (Howell et al. 2014).

The wheat-rye chromosomal translocations 1BL:1RS and 1AL:1RS are widely reported to have detrimental effects on hard wheat quality (McKendry et al. 2001). Graybosch et al. (1993) found the effects of 1AL:1RS to be less severe on quality than those of 1BL:1RS.

Materials and methods

Plant Material

Our study was conducted on 17 genotypes (rye cultivar-Harkovskaya; five Romanian wheat cultivars; four 1AL:1RS translocation genotypes, including “Amigo” derived from “Insave” rye, and seven 1BL:1RS translocation genotypes).

Molecular analysis

Genomic DNA was isolated from two seeds using 1,5% SDS extraction buffer and 3M potassium acetate.

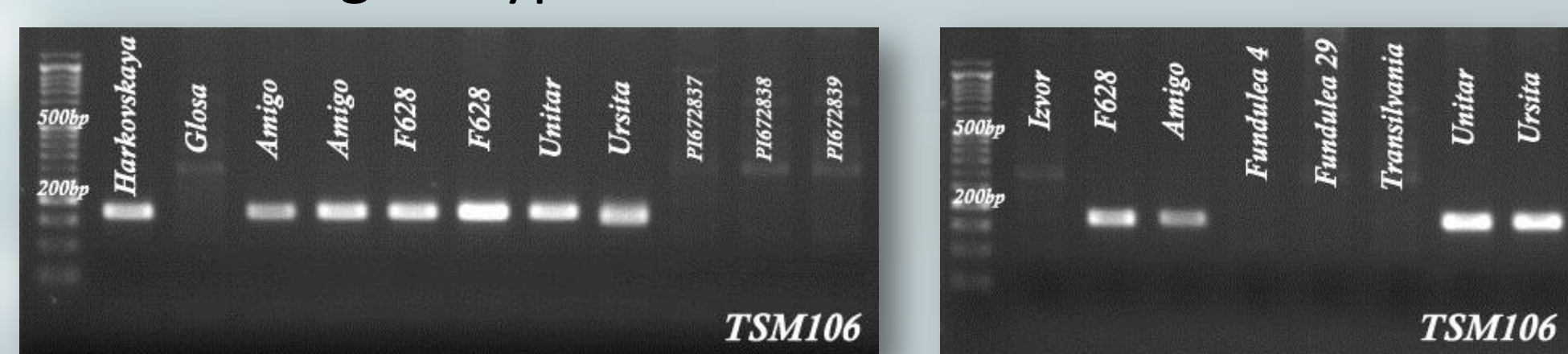
Five sets of primers (four sets specific for 1RS and one for 1AS) were used to detect 1RS or 1AS arms chromosomes. One of them, O-SEC5'-A/OSEC3'-R, is special for *Sec-1* locus (Schimizu et al. 1997). The other three sets SCM9 (Saal and Wricke, 1999), TSM106 and TSM123 (“Tulln Secale Microsatellites” Koefer et al., 2008) are specific for 1R chromosome and gwp7072 (Nicot et al., 2004: wheat.pw.usda.gov/cgi-bin/.../name=GPW7072) is specific for 1A chromosome.

Results and discussion

Characterization of 1AL:1RS and 1BL:1RS translocations in wheat has an important practical value for wheat improvement (Yediay et al. 2010).

Therefore, identification of new tools for detection/selection of favorable rye alleles can help obtaining fast and reliable results. Molecular markers-SSRs are such convenient tools.

In this study, the marker gwp7072 gave PCR product in all genotypes apart of T1AL:1RS. Based on previous research, SCM9 and O-SEC5'-A/OSEC3'-R markers differentiated these two wheat-rye translocation. Furthermore, amplification with TSM123 marker gave PCR product in all genotypes with wheat-rye translocation and rye cultivar Harkovskaya. In contrast to the TMS123, TSM106 showed PCR product only in 1AL:1RS translocation and Harkovskaya cultivar (Tabel). We tested this result in three repetitions. Thereby, SSR-TSM106 is a convenient tool that can be used in MAS (Marker-Assisted Selection) for 1AL:1RS wheat-rye translocation. The disadvantage of this marker is that it can't differentiate between genotypes with 1BL:1RS translocation and genotypes without it.



In our study we found that the SSR-TSM 106 (~170bp) marker clearly distinguished the wheat-rye 1AL:1RS translocation, coming from “Insave” or related rye chromatin, from the wheat-rye 1BL:1RS translocation, coming from other rye sources. Therefore, SSR-TSM marker could be used in MAS (Marker-Assisted Selection) for 1AL:1RS translocation.

Cultivars/ Lines	Rye source	Seeds source	Rye specific markers/wheat specific marker							
			Scm9 (bp)		O-SEC5'-A/OSEC3'-R (bp)			Tsm123 (bp)	Tsm106 (bp)	Gpw7072 (bp)
			220	200	1500	1100	700	250	170	230
T1AL:1RS										
F00628G34-1 (F628)	unknown	NARDI Fundulea	+	-	+	+	-	+	+	-
Unitar	F00628G34-1	NARDI Fundulea	+	-	+	+	-	+	+	-
Ursita	F00628G34-1	NARDI Fundulea	+	-	+	+	-	+	+	-
Amigo	Insave FA	IPK Gatersleben, Germany	+	-	+	+	-	+	+	-
T1BL:1RS										
Fundulea-29	Avrora/Petkus	NARDI Fundulea	-	+	+	-	+	+	-	+
Transilvania-1	Avrora/Petkus	NARDI Fundulea	-	+	+	-	+	+	-	+
Fundulea-4	Avrora/Petkus	NARDI Fundulea	-	+	+	-	+	+	-	+
C429-99	unknown	NARDI Fundulea	-	+	+	-	+	+	-	+
PI 672837 WW	Petkus (Howell et al. 2014)	National Small Grains Collection	-	+	-	-	-	+	-	+
PI 672838 WR	Petkus	National Small Grains Collection	-	+	-	-	-	+	-	+
PI 672839 RW	Petkus	National Small Grains Collection	-	+	+	-	+	+	-	+
NO-Rye										
Izvor	NO	NARDI Fundulea	-	-	-	-	-	-	-	+
Glosa	NO	NARDI Fundulea	-	-	-	-	-	-	-	+
Pitar	NO	NARDI Fundulea	-	-	-	-	-	-	-	+
Miranda	NO	NARDI Fundulea	-	-	-	-	-	-	-	+
Litera	NO	NARDI Fundulea	-	-	-	-	-	-	-	+
Harkovskaya	rye cultivar	NARDI Fundulea	+	-	+	+	+	+	+	-

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