

A *vrs1* mutant in CIho 4196 to facilitate breeding of 6-rowed cultivars with Fusarium Head Blight resistance.

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Development of commercial 6-rowed Fusarium Head Blight (FHB) cultivars has been difficult due to the close linkage of the 2-rowed (*Vrs1*) trait to a major FHB resistance QTL on chromosome 2H bin10 (Horsley et al. 2006; Mesfin et al. 2003). We have initiated a mutation program with the FHB resistant 2-rowed line CIho4196 to convert it to a 6-rowed (*vrs1*) phenotype and to correct other undesirable traits such as tall stature and late ripening (Boyd et al. 2007).

We have now confirmed a *vrs1* mutant in CIho 4196 background. This mutant should facilitate breeding for 6-rowed Fusarium Head Blight (FHB) resistant cultivars since it is closely linked with the chromosome 2H bin10 FHB resistance. The mutant designated G07-014 was isolated in a gamma irradiated CIho 4196 M2 population (proposed gene and allele designation *vrs1.u*). The mutant phenotype was confirmed in Pullman, WA summer 2008 and genotype confirmed sequencing. Sequence analysis revealed that the mutant *vrs1* gene has a 9 nucleotide (nt) deletion compared with the wild-type CIho 4196 *Vrs1* gene (Fig. 1).

	(750)	750	760	770	780	790	800	810	825	
g07-014 <i>Vrs1</i> (287)		ACCCCAAGAAGCGGCGGCTCACCGACGAG				-----	ATTCTGGAGCTGAGCTTCCGGGAGGACCGCAAGCTGGA			
CIho4196 <i>Vrs1</i> (750)		ACCCCAAGAAGCGGCGGCTCACCGACGAG				CAGGCCGAG	ATTCTGGAGCTGAGCTTCCGGGAGGACCGCAAGCTGGA			
Consensus (750)		ACCCCAAGAAGCGGCGGCTCACCGACGAG					ATTCTGGAGCTGAGCTTCCGGGAGGACCGCAAGCTGGA			

Fig.1 Comparison of the CIho 4196 *Vrs1* and gene sequence with the mutant G07-014 gene sequence.

Since the 9 nt deletion does not result in a frameshift, we wondered why the protein is inactivated. It turned out that the deletion is at the beginning of the homeodomain of exon II, a critical region of the gene (Fig. 2).

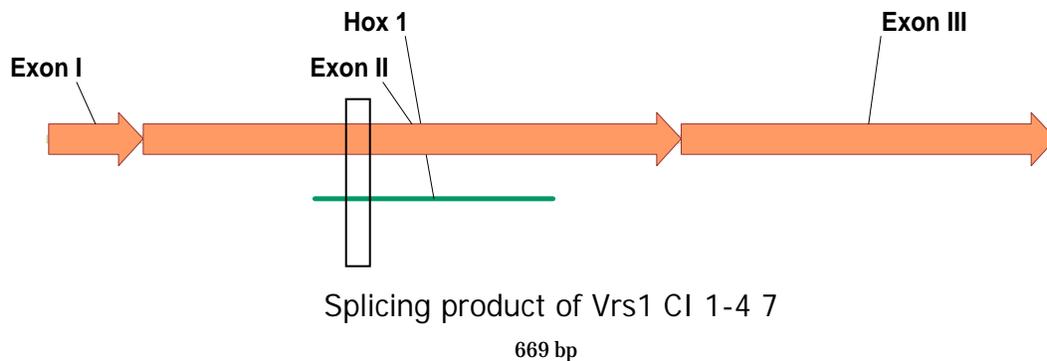


Fig. 2. CIho 4196 *Vrs1* cDNA structure. The approximate location of the 9 nt deletion is boxed. The homeodomain region is underlined.

The mutant spike appears as a typical 6-rowed (Fig. 3) with fully fertile side florets, except that the side florets are a bit thin (Fig. 4). This is probably due to the presence of the 2-rowed *Int-c* allele in the mutant (Lundqvist and Lundqvist 1989).



Fig. 3. From left to right, CIho 4196, Mutant G07-014, and Morex spike.

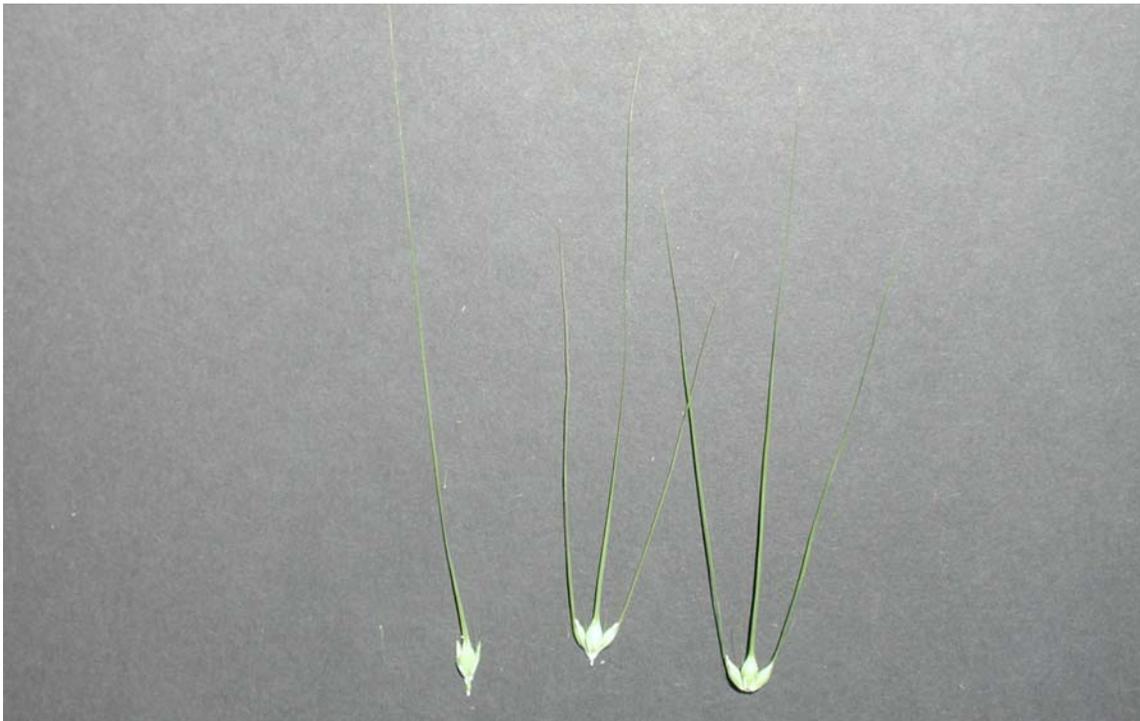


Fig. 4. From left to right CIho 4196, Mutant G07-014 and Morex spikelet.

The mutant was tested for FHB reaction in China winter '07-'08 by RH. The results showed that the mutant is essentially identical to CIho 4196 in FHB rating and plant height, at least in China (Table 1).

Table 1. Fusarium head blight (FHB) score and plant height of CIho 4196 and G07-014 in the 2007-2008 FHB nursery at Zhejiang University, Hangzhou, China.

Entry	FHB score				Plant height cm
	7 May 2008	9 May 2008	Average	Standart deviation	
	-----1-5 score†-----				
CIho 4196	2.0	2.0	2.0	0.00	140
G07-014	1.0	2.0	1.5	0.71	141

†Score of 1 = no disease and 5 = severe disease.

Limited seed is available from AK.

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