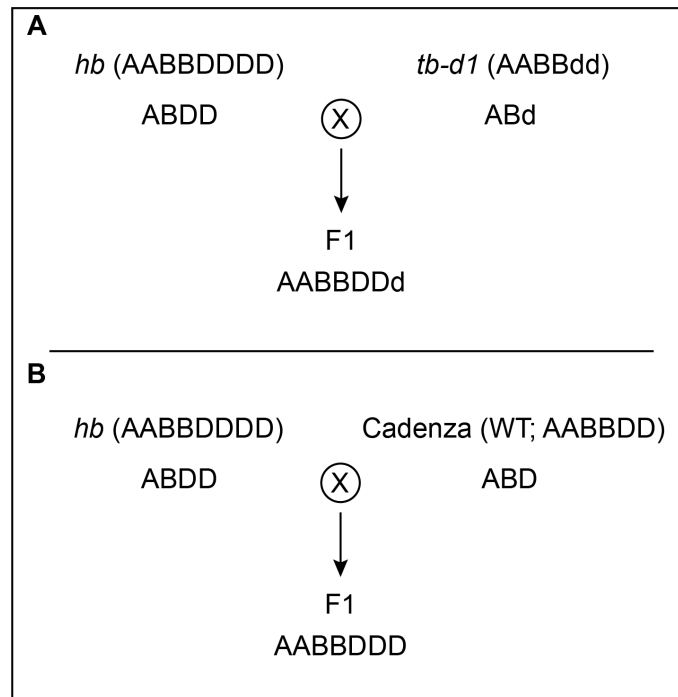
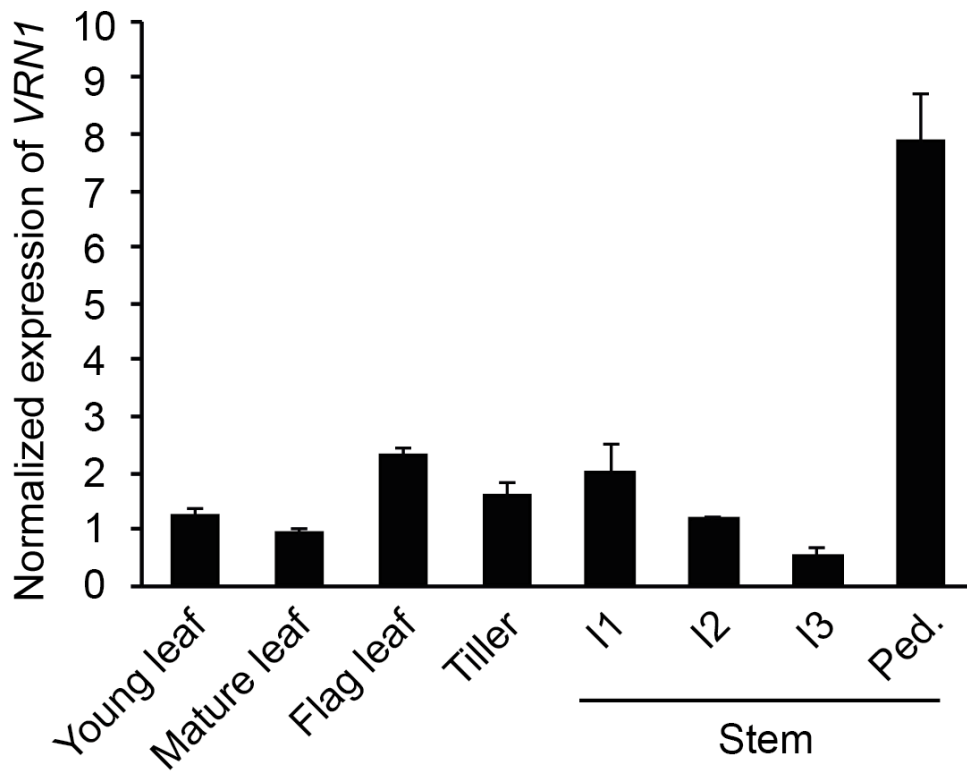


Supplementary Data



Supplementary Figure S1. Schematic of the *hb* × *tb-d1* cross, and the control *hb* × Cadenza cross. Schematic diagrams showing the crossing strategy of the *hb* line with either **(A)** *tb-d1* stop codon mutant (*Cad1721*) or **(B)** wild-type (Cadenza). A, B and D refer to *TB-A1*, *TB-B1* and *TB-D1* respectively, with ‘d’ referring to the nonsense allele of *TB-D1*. The diploid genotype is shown in brackets, and the gamete genotype is shown below. The F1 genotype is shown for the respective crosses.



Supplementary Figure S2. *VRN1* tissue specific expression analysis.

Transcript analysis of *VRN1* in leaf, tiller and stem tissue. I1, internode 1; I2, internode 2; I3, internode 3; Ped., peduncle. Values are mean \pm s.e.m of 4 biological replicates.

Supplementary Table S1. Oligonucleotide sequences used in qRT-PCR assays.

Gene	Gene ID	Forward (sense) sequence	Reverse (anti-sense) sequence
<i>TB-B1</i>	TraesCS4B02G042700	ACCCGCCAAACCAAAGC	CATCCGGTTCTTTTCCCTAGT
<i>TB-D1</i>	TraesCS4D02G040100	CACCCGCCAATCCAAAAC	ATCCGGTTCTTTTCCCTCGT
<i>Traes_6DS_BE8B5E56D.1</i>	TraesCS6D02G145100	CATGCTCTGGGATTTATCCAT	CTGGATCATTTCGGGTGC
<i>TaRPA-15</i>		GCACACGTGCTTTGCAGATAAG	GCCCTCAAGCTCAACCATAACT

Supplementary Table S2. Oligonucleotide sequences used in KASP marker assays.

Gene	WT allele oligonucleotide (FAM)	Alternate allele oligonucleotide (HEX)	Common allele	Source
<i>TB-B1</i>	GAAGGTGACCAAGTTCATGCT-TTCCTTTGCGGCTTTGGT	GAAGGTCGGAGTCAACGGATT-TTCCTTTGCGGCTTTGGA	CGGCGAGGGGAAGAAGCA	Dixon et al. 2018
<i>Rht-B1</i>	GAAGGTGACCAAGTTCATGCT-CCCATGGCCATCTCCAGCTG	GAAGGTCGGAGTCAACGGATT-CCCATGGCCATCTCTAGCTA	TCGGGTACAAGGTGCGGGCG	Simon Griffiths, JIC
<i>Rht-D1</i>	GAAGGTGACCAAGTTCATGCT-CGTGGCGCAGAAGCTGG	GAAGGTCGGAGTCAACGGATT-CGTGGCGCAGAAGCTGT	TCCCCATGGCCATCTCG	Simon Griffiths, JIC

Supplementary Table S3. *TB-B1* alleles of 8-way MAGIC lines investigated in this study.

MEL ID	TB-B1 genotype
002-1	<i>TB-B1b</i>
002-3	<i>TB-B1b</i>
002-5A	<i>TB-B1a</i>
002-8	<i>TB-B1a</i>
004-2	<i>TB-B1a</i>
004-3	<i>TB-B1a</i>
005-7	<i>TB-B1a</i>
005-8A	<i>TB-B1b</i>
006-3	<i>TB-B1b</i>
008-1	<i>TB-B1a</i>
008-2	<i>TB-B1a</i>
008-3	<i>TB-B1a</i>
010-1b	<i>TB-B1a</i>
010-3	<i>TB-B1a</i>
010-5	<i>TB-B1a</i>
011-1b	<i>TB-B1b</i>
011-2a	<i>TB-B1a</i>
011-3	<i>TB-B1b</i>
011-4	<i>TB-B1a</i>
012-4	<i>TB-B1a</i>
014-7	<i>TB-B1a</i>
015-3	<i>TB-B1b</i>
015-8	<i>TB-B1a</i>
016-4	<i>TB-B1b</i>
017-4	<i>TB-B1b</i>
017-7	<i>TB-B1b</i>
020-3	<i>TB-B1a</i>
020-7	<i>TB-B1a</i>
023-5	<i>TB-B1a</i>
024-2	<i>TB-B1a</i>
024-5	<i>TB-B1a</i>
025-1d	<i>TB-B1a</i>
025-1e	<i>TB-B1a</i>
025-1f	<i>TB-B1a</i>
026-1b	<i>TB-B1b</i>
029-2b	<i>TB-B1b</i>
032-2	<i>TB-B1b</i>
033-5	<i>TB-B1a</i>
033-7	<i>TB-B1a</i>
034-7	<i>TB-B1a</i>
035-1	<i>TB-B1a</i>
036-7	<i>TB-B1a</i>
036-8	<i>TB-B1b</i>
043-1	<i>TB-B1b</i>
043-2	<i>TB-B1a</i>
043-3	<i>TB-B1a</i>
043-5	<i>TB-B1b</i>
043-6	<i>TB-B1b</i>

044a-1	<i>TB-B1b</i>
045-1b	<i>TB-B1b</i>
046-1	<i>TB-B1b</i>
046-2	<i>TB-B1b</i>
049-2	<i>TB-B1a</i>
052-7	<i>TB-B1a</i>
056-1	<i>TB-B1b</i>
056-4	<i>TB-B1a</i>
057-1a	<i>TB-B1a</i>
059-1b	<i>TB-B1a</i>
060-1b	<i>TB-B1b</i>
060-3	<i>TB-B1b</i>
062-2	<i>TB-B1a</i>
062-3	<i>TB-B1a</i>
064-1b	<i>TB-B1a</i>
070-1c	<i>TB-B1b</i>
071-1b	<i>TB-B1b</i>
072-1a	<i>TB-B1b</i>
072-1c	<i>TB-B1b</i>
072-1d	<i>TB-B1b</i>
077-3	<i>TB-B1a</i>
083-1	<i>TB-B1b</i>
084-3	<i>TB-B1b</i>
086-3	<i>TB-B1b</i>
086-7	<i>TB-B1b</i>
088-1	<i>TB-B1a</i>
088-3	<i>TB-B1a</i>
088-6	<i>TB-B1a</i>
089-4	<i>TB-B1a</i>
090-1a	<i>TB-B1a</i>
090-2c	<i>TB-B1a</i>
095-1	<i>TB-B1a</i>
096-6	<i>TB-B1a</i>
097-1	<i>TB-B1b</i>
097-2	<i>TB-B1b</i>
099-4	<i>TB-B1b</i>
101-7	<i>TB-B1a</i>
103-1	<i>TB-B1a</i>
104-4	<i>TB-B1b</i>
105-1	<i>TB-B1a</i>
114-8	<i>TB-B1b</i>
119-1	<i>TB-B1a</i>
119-2	<i>TB-B1b</i>
119-4	<i>TB-B1b</i>
119-5	<i>TB-B1b</i>
120-3	<i>TB-B1a</i>
122-2b	<i>TB-B1a</i>
122-4	<i>TB-B1a</i>
123-1	<i>TB-B1a</i>
126-2	<i>TB-B1b</i>
128-3	<i>TB-B1a</i>
128-4	<i>TB-B1a</i>

129-3	<i>TB-B1a</i>
129-6	<i>TB-B1a</i>
130-4	<i>TB-B1a</i>
132-4	<i>TB-B1a</i>
139-6	<i>TB-B1a</i>
139-7	<i>TB-B1a</i>
140-1b	<i>TB-B1a</i>
140-3	<i>TB-B1a</i>
145-2	<i>TB-B1a</i>
146-1b	<i>TB-B1a</i>
152-2a	<i>TB-B1b</i>
154-3	<i>TB-B1a</i>
156-4	<i>TB-B1b</i>
158-4	<i>TB-B1b</i>
158-7	<i>TB-B1b</i>
159-8	<i>TB-B1a</i>
161-2	<i>TB-B1a</i>
168-1b	<i>TB-B1b</i>
170-3	<i>TB-B1a</i>
170-8	<i>TB-B1a</i>
179-2	<i>TB-B1b</i>
182-3b	<i>TB-B1a</i>
183-1	<i>TB-B1a</i>
185-2	<i>TB-B1b</i>
186-1b	<i>TB-B1a</i>
187-2a	<i>TB-B1b</i>
189-3	<i>TB-B1a</i>
190-4	<i>TB-B1b</i>
191-4	<i>TB-B1a</i>
191-6	<i>TB-B1a</i>
196-4	<i>TB-B1b</i>
198-2	<i>TB-B1b</i>
198-3	<i>TB-B1b</i>
199-3	<i>TB-B1b</i>
201-4	<i>TB-B1b</i>
201-5	<i>TB-B1b</i>
202-2	<i>TB-B1a</i>
202-4	<i>TB-B1b</i>
203-8	<i>TB-B1b</i>
204-4	<i>TB-B1a</i>
206a-1a	<i>TB-B1b</i>
207-6	<i>TB-B1a</i>
207-7	<i>TB-B1a</i>
208-6	<i>TB-B1a</i>

MEL = MAGIC Elite Line from the 8-way winter wheat population, NIAB UK. MEL is the prefix for each line.