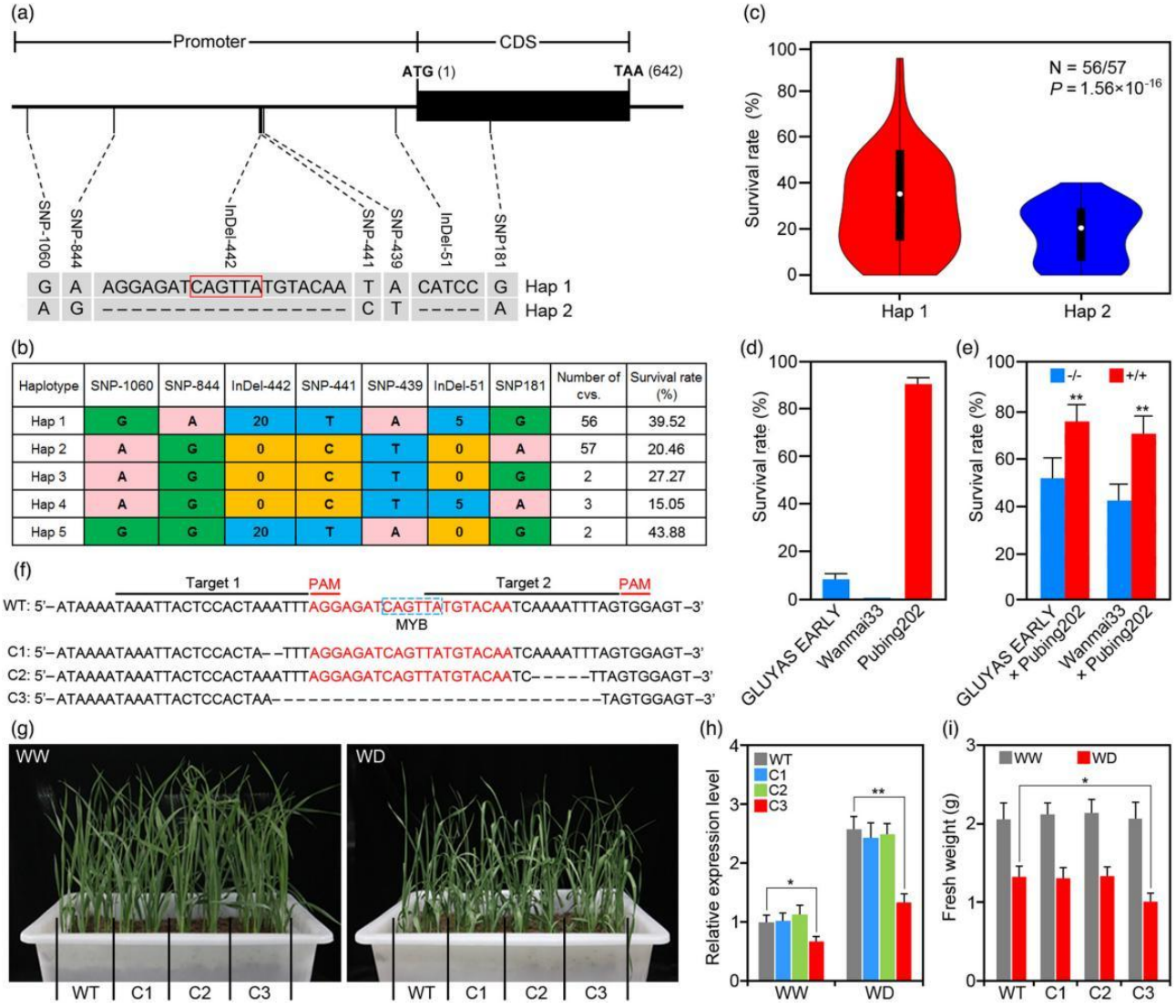
In addition to ABA receptors, transcription factor genes are also important regulators of drought resistance in wheat. Chen et al. (2021) studied the wheat NAC transcription factor TaNAC48 and found that its expression was induced by drought, PEG treatment, hydrogen peroxide, and ABA. The gene was localized in the nucleus. Wheat lines overexpressing TaNAC48 showed higher proline content, lower water-loss rate, and reduced levels of malondialdehyde, hydrogen peroxide, and superoxide anions under drought stress. The study also demonstrated that TaAREB3 could bind to the ABRE element in the TaNAC48 promoter and activate its expression, revealing a regulatory relationship between ABA signaling and NAC transcription factors.



Haplotype	SNP-1060	SNP-844	InDel-442	SNP-441	SNP-439	InDel-51	SNP181	Number of cvs.	Survival rate (%)
Hap 1	G	A	20	T	A	5	G	56	39.52
Hap 2	A	G	0	C	T	0	A	57	20.46
Hap 3	A	G	0	C	T	0	G	2	27.27
Hap 4	A	G	0	C	T	5	A	3	15.05
Hap 5	G	G	20	T	A	0	G	2	43.88

Figure 3 Genetic variations in TaPYL1-1B and their association with wheat drought tolerance (a) Distribution of DNA polymorphisms within the TaPYL1-1B promoter and the coding sequence region. The red frame indicates an MYB-binding sequence. (b) Haplotype analysis of TaPYL1-1B genotypes among 120 wheat varieties based on seven SNPs/indels. (c) Comparison of drought tolerance between wheat varieties carrying Hap 1 and Hap 2 genotypes. (d) Survival rates of wheat cv. Pubing202, Wanmai33 and GLUYAS EARLY plants under severe drought stress. (e) The survival rates of the F4 individuals carrying either the homozygous tolerant (+/+) or sensitive (-/-) allele of TaPYL1-1B in response to drought conditions. (f) Targeted mutagenesis of the 20-bp insertion via CRISPR-Cas9. Red labels indicate protospacer adjacent motif (PAM) sequences. Three independent lines were obtained harbouring deletions of the 20-bp insertion or its flanking sequence. (g) Phenotypic analysis of drought tolerance and (h) TaPYL1-1B relative expression levels in deletion mutants and WT plants under well-watered (WW) and water-deficit (WD) conditions. (i) Fresh weight of mutant and WT plants under WW and WD conditions. Data represent the mean ± SD of three replicates. Statistical significance was determined by a Student's t test, * $P < 0.05$; ** $P < 0.01$ (Adopted from Mao et al., 2022)