

A

Region	Spike		Vernalized Leaf		Leaf	
	PCC	R^2	PCC	R^2	PCC	R^2
1.0Kb-TSS-0.1Kb	0.678	0.424	0.678	0.424	0.551	0.23
1.0Kb-TSS-0.5Kb	0.716	0.357	0.716	0.357	0.69	0.231
1.0Kb-TSS-1.0Kb	0.737	0.466	0.737	0.466	0.656	0.216
1.5Kb-TSS-1.5Kb	0.742	0.506	0.742	0.506	0.693	0.336
2.0Kb-TSS-1.0Kb	0.685	0.419	0.685	0.419	0.747	0.364
2.0Kb-TSS-1.5Kb	0.762	0.562	0.762	0.562	0.812	0.595
2.0Kb-TSS-2.0Kb	0.758	0.483	0.758	0.483	0.648	0.358
2.5Kb-TSS-2.5Kb	0.735	0.467	0.735	0.467	0.715	0.395
3.0Kb-TSS-0.5Kb	0.71	0.456	0.71	0.456	0.69	0.281
3.0Kb-TSS-1.0Kb	0.759	0.56	0.759	0.56	0.743	0.523
3.0Kb-TSS-1.5Kb	0.763	0.525	0.763	0.525	0.62	0.3
3.0Kb-TSS-2.5Kb	0.741	0.447	0.741	0.447	0.744	0.548

B

Region	Spike		Vernalized Leaf		Leaf	
	PCC	R^2	PCC	R^2	PCC	R^2
0.4K-TTS-0.2Kb	0.782	0.574	0.653	0.288	0.769	0.176
0.5K-TTS-0.1Kb	0.793	0.617	0.642	0.211	0.767	0.271
0.5K-TTS-0.2Kb	0.813	0.646	0.646	0.679	0.764	0.577
0.5K-TTS-0.3Kb	0.784	0.599	0.564	0.175	0.774	0.571
0.5K-TTS-0.4Kb	0.771	0.499	0.595	0.22	0.786	0.612
0.5K-TTS-0.5Kb	0.781	0.61	0.614	0.351	0.762	0.339
0.5K-TTS-1.0Kb	0.766	0.369	0.614	0.351	0.769	0.536
1.0Kb-TTS-0.1Kb	0.808	0.643	0.511	0.237	0.782	0.585
1.0Kb-TTS-0.2Kb	0.796	0.462	0.694	0.428	0.684	0.251
1.0Kb-TTS-0.5Kb	0.786	0.564	0.741	0.108	0.771	0.472
1.0Kb-TTS-1.0Kb	0.764	0.547	0.747	0.555	0.779	0.523

Table S1. Optimization of input regions for gene expression prediction around TSS and TTS.

Pearson correlation coefficients (PCC) and R^2 values for predictions versus experimental gene expression data across regions of varying lengths around the transcription start site (TSS) (A) and best TSS + transcription end site (TTS) (B) in different tissues and developmental stages. The numbers before TSS or TTS represent the length of the upstream region, while those after represent the length of the downstream region.

Species	Models	Tissues	R^2	PCC
<i>Arabidopsis thaliana</i>	Xpresso	CIM7d	0.329	0.573
		SIM8d	0.249	0.499
	PhytoExpr	CIM7d	0.179	0.485
		SIM8d	0.098	0.388
	DeepWheat	CIM7d	0.352	0.602
		SIM8d	0.323	0.568
<i>Oryza sativa</i>	Xpresso	Yong leaf	0.444	0.667
		Root	0.492	0.702
	PhytoExpr	Yong leaf	0.374	0.622
		Root	0.351	0.647
	DeepWheat	Yong leaf	0.528	0.729
		Root	0.559	0.751
<i>Zea mays</i>	Xpresso	Ear	0.456	0.675
		Tassel	0.427	0.665
	PhytoExpr	Ear	0.158	0.431
		Tassel	0.258	0.535
	DeepWheat	Ear	0.410	0.643
		Tassel	0.560	0.750

Table S2. Pearson correlation coefficients (PCC) and coefficients of determination (R^2) between predicted and experimentally measured gene expression levels across different plant tissues. CIM7d, 7-day callus induction medium; SIM8d, 8-day shoot induction medium.

Tissue	Type	Track Signal		Coordinate Region	
		PCC	R^2	PCC	R^2
Spike	TIS	0.78	0.6	0.93	0.64
	H3K27ac	0.72	0.52	0.9	0.51
	H3K27me3	0.62	0.38	0.86	0.47
	H3K36me3	0.62	0.38	0.74	0.3
	H3K4me3	0.8	0.65	0.97	0.71
Vernalized Leaf	TIS	0.65	0.42	0.86	0.46
	H3K27ac	0.65	0.42	0.83	0.36
	H3K27me3	0.63	0.38	0.86	0.47
	H3K36me3	0.7	0.48	0.82	0.47
	H3K4me3	0.65	0.42	0.73	0.25
Leaf	TIS	0.68	0.47	0.83	0.35
	H3K27ac	0.46	0.21	0.76	0.19
	H3K27me3	0.61	0.37	0.85	0.46
	H3K36me3	0.53	0.28	0.77	0.28
	H3K4me3	0.77	0.6	0.9	0.57
9-DAP Seed	TIS	0.79	0.62	0.94	0.67
	H3K27ac	0.54	0.29	0.75	0.21
	H3K27me3	0.31	0.1	0.69	0.22
	H3K36me3	0.61	0.37	0.72	0.3
	H3K4me3	0.79	0.62	0.82	0.43
7-DAP Seed	TIS	0.72	0.52	0.85	0.43
	H3K27ac	0.43	0.18	0.72	0.16
	H3K27me3	0.36	0.13	0.69	0.28
	H3K36me3	0.73	0.53	0.75	0.39
	H3K4me3	0.79	0.63	0.85	0.48
5-DAP Seed	TIS	0.72	0.51	0.86	0.45
	H3K27ac	0.58	0.32	0.79	0.25
	H3K27me3	0.3	0.09	0.71	0.17
	H3K36me3	0.7	0.49	0.79	0.39
	H3K4me3	0.79	0.63	0.89	0.54

Table S3. Pearson correlation coefficients (PCC) and coefficients of determination (R^2) for predictions and tests of epigenomic signal in dependent test sets. TIS indicates Tn5 transposome integration sites in ATAC-seq. DAP, days after pollination.

Tissues	Xpresso		PhytoExpr		Deepwheat	
	R^2	PCC	R^2	PCC	R^2	PCC
Spike	0.322	0.2599	0.393	0.637	0.557	0.756
Leaf	0.567	0.510	0.289	0.558	0.443	0.666

Table S4. Performance of different models in predicting gene expression across multiple tissues in the Chinese Spring wheat variety.