Supplementary figures and tables for "Phenomic Selection Is a Low-Cost and High-Throughput Method Based on Indirect Predictions: Proof of Concept on Wheat and Poplar"

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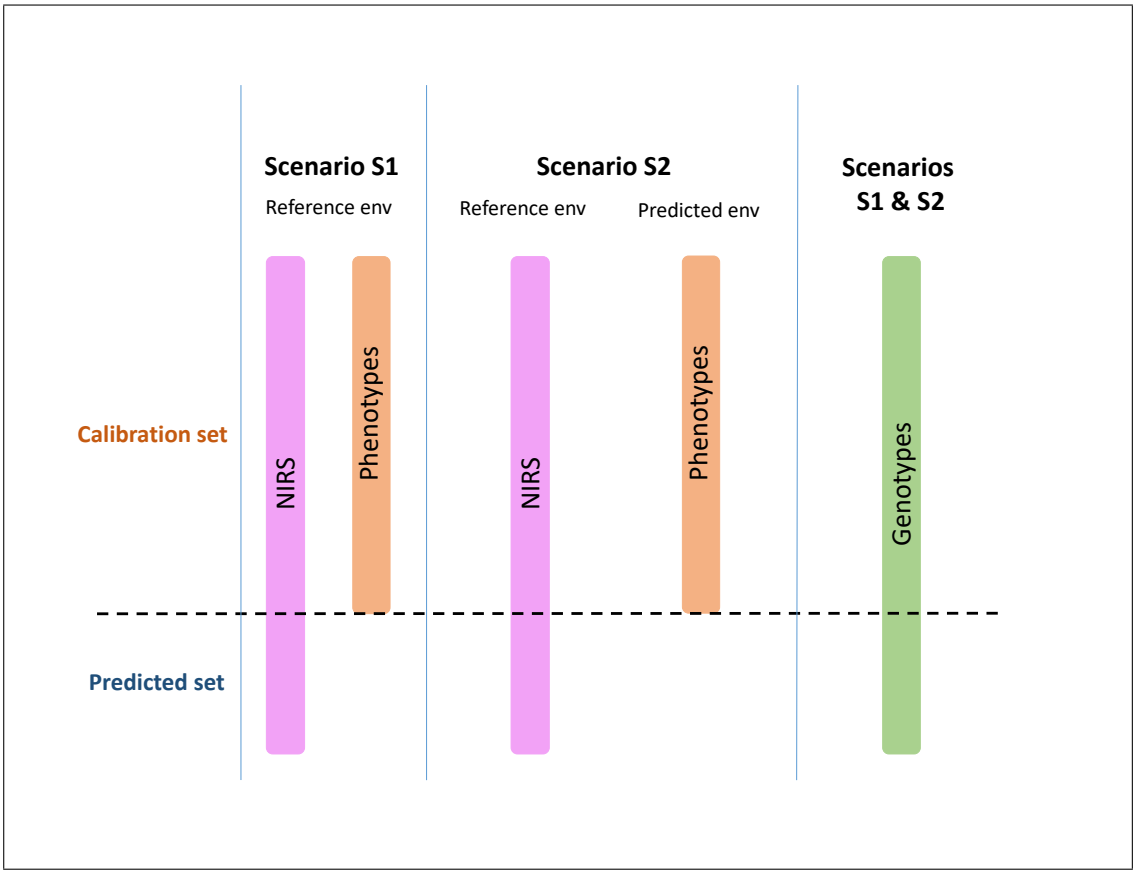
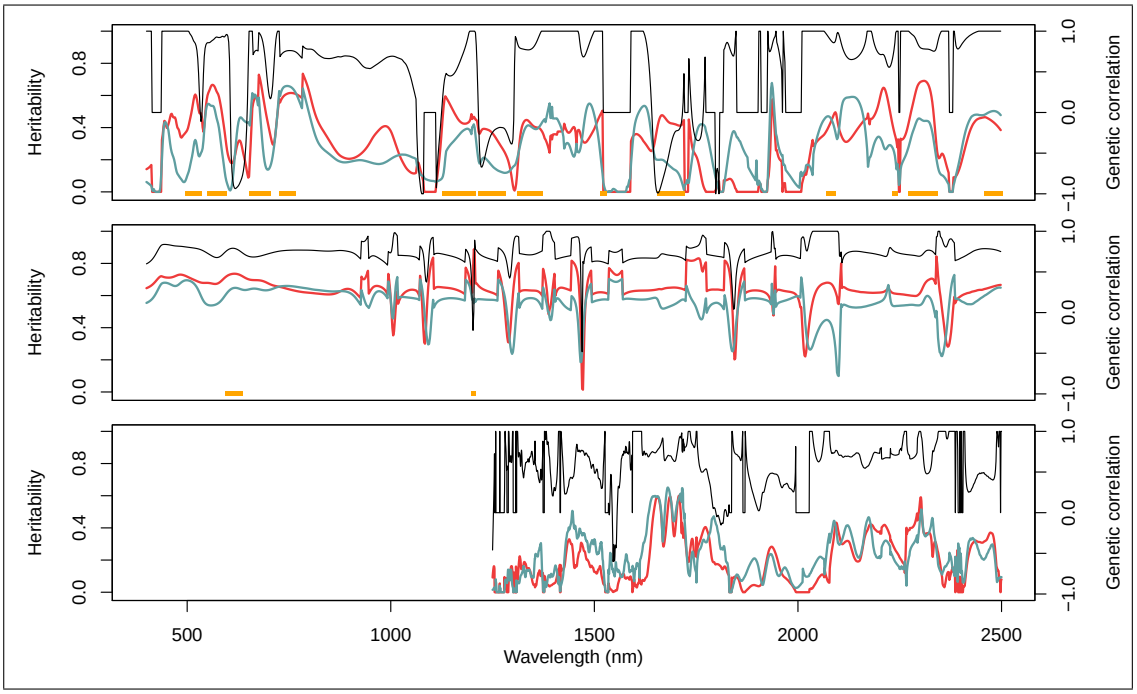
- **Supplementary figure 1:** Illustration of the data used to train the GS and PS prediction models in the cross-validations corresponding to scenarios S1 and S2.
- **Supplementary figure 2:** Genomic heritability (color) and genetic correlation (black) along spectra collected on winter wheat leaves (a), winter wheat grains (b) and poplar wood (c).
- **Supplementary table 1:** Broad-sense heritabilities of the adjusted means.
- **Supplementary table 2:** Increase of expected genetic gain (%) by using PS instead of GS for wheat.
- **Supplementary table 3:** Increase of expected genetic gain (%) by using PS instead of GS for poplar.
- **Supplementary table 4:** Correlations of traits between S1 and S2 environments.



Supplementary Figure 1: Illustration of the data used to train the GS and PS prediction models in the cross-validations corresponding to scenarios S1 and S2.



Supplementary Figure 2: Genomic heritability (color) and genetic correlation (black) along spectra collected on winter wheat leaves (a), winter wheat grains (b) and poplar wood (c). The genotypes were grown under two environmental conditions, unfavorable (red) and favorable (blue). The wavelengths at which absorbance is associated with at least one SNP having a major effect (R^2 higher or equal to 10%) are indicated with orange dots at the bottom of each graph.

Supplementary Table 1: Broad-sense heritabilities of the adjusted means

Species	Location	Year	Treatment	Code environment	Trait identifier	Trait name	Heritability
Wheat	Clermont-Ferrand	2016	Irrigated	IRR	HD	Heading date	0.94
Wheat	Clermont-Ferrand	2016	Irrigated	IRR	GY	Grain yield	0.78
Wheat	Clermont-Ferrand	2016	Drought	DRY	HD	Heading date	0.94
Wheat	Clermont-Ferrand	2016	Drought	DRY	GY	Grain yield	0.75
Wheat	Estrée-Mons	2012	N+	Mon12N+	HD	Heading date	0.97
Wheat	Estrée-Mons	2012	N+	Mon12N+	GY	Grain yield	0.81
Wheat	Estrée-Mons	2012	N-	Mon12N-	HD	Heading date	0.96
Wheat	Estrée-Mons	2012	N-	Mon12N-	GY	Grain yield	0.83
Wheat	Estrée-Mons	2013	N+	Mon13N+	HD	Heading date	0.98
Wheat	Estrée-Mons	2013	N+	Mon13N+	GY	Grain yield	0.85
Wheat	Estrée-Mons	2013	N-	Mon13N-	HD	Heading date	0.99
Wheat	Estrée-Mons	2013	N-	Mon13N-	GY	Grain yield	0.86
Wheat	Clermont-Ferrand	2013	N+	Cle13N+	HD	Heading date	0.98
Wheat	Clermont-Ferrand	2013	N+	Cle13N+	GY	Grain yield	0.86
Wheat	Clermont-Ferrand	2013	N-	Cle13N-	HD	Heading date	0.90
Wheat	Clermont-Ferrand	2013	N-	Cle13N-	GY	Grain yield	0.88
Poplar	Orléans	2011		ORL	HT	Height	0.88
Poplar	Orléans	2011		ORL	CIRC	Circumference	0.86
Poplar	Orléans	2009		ORL	BF	Bud flush	0.96
Poplar	Orléans	2009		ORL	BS	Bud set	0.97
Poplar	Orléans	2009		ORL	RUST	Rust resistance	0.89
Poplar	Savigliano	2010		SAV	CIRC	Circumference	0.92
Poplar	Savigliano	2010		SAV	BF	Bud flush	0.90
Poplar	Savigliano	2010		SAV	BS	Bud set	0.92

Supplementary Table 2: Increase of expected genetic gain (%) by using PS instead of GS for wheat. The expected genetic gain of PS and GS was estimated with the estimated heritabilities, the costs that we experienced (3 €and 35 €for PS and GS, respectively) and the predictive abilities obtained in cross-validation in scenarios S1 and S2. For each combination of scenario, trait, and NIRS data considered (tissue and environment), the increase of expected genetic gain of PS was estimated with the best performing GS model as a reference.

	S1				S2	
	GY-IRR	GY-DRY	HD-IRR	HD-DRY	GY	HD
max	94	222	121	127	81	98
min	-2	113	80	106	-10	60

Supplementary Table 3: Increase of expected genetic gain (%) by using PS instead of GS for poplar. The expected genetic gain of PS and GS was estimated with the estimated heritabilities, the costs that we experienced (2.5 €and 50 €for PS and GS, respectively) and the predictive abilities obtained in cross-validation in scenarios S1 and S2. For each combination of scenario and trait, the increase of expected genetic gain of PS was estimated with the best performing GS model as a reference.

Trait	S1	S2
HT-ORL	89	46
CIRC-ORL	93	29
CIRC-SAV	72	-2
BF-ORL	-66	-24
BF-SAV	-29	-78
BS-ORL	18	-2
BS-SAV	-6	25
RUST-ORL	21	-10

Supplementary Table 4: Correlations of traits between S1 and S2 environments.

Species	Trait	S1 environment	S2 environment					
			Cle13N+	Cle13N-	Mon12N+	Mon12N-	Mon13N+	Mon13N-
Wheat	GY	IRR	0.40	0.40	0.26	0.16	0.32	0.26
Wheat	GY	DRY	0.36	0.30	0.31	0.31	0.35	0.38
Wheat	HD	IRR	0.84	0.84	0.85	0.86	0.87	0.87
Wheat	HD	DRY	0.84	0.84	0.88	0.87	0.86	0.86
			SAV					
Poplar	CIRC	ORL	0.57					
Poplar	BF	ORL	0.85					
Poplar	BS	ORL	0.74					