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Supplementary Material: *Functional Plant Biology*

Supplementary Material

Barley plants carrying the altered function *Sln1d* allele display modified responses to low phosphorus supply: implications for phosphorus utilisation efficiency

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Table S1. Formulae used to estimate internal phosphorus (P) utilization efficiency,the relative effect on biomass accumulation, the specific absorption rate (SARP) and the relative growth rate (RGR)

PUtEo, PUtEu, PUtEe and PUtEi are P utilization indicators. *Wj*: Dry weight in the "*j*" organ (shoot or root) or in the whole plant for the relative effect on biomass accumulation, *Qj*: Amount of P in the j organ, *cj*: concentration of P in the j organ. The superscripts "*f*" and "*i*" denote final and initial harvests, respectively. The subscript "*d*" and "*w*" denote not-well-supplied (suboptimal P-supply) and well-supplied with P, respectively. *dt* is the time elapsed between harvests, *dW* and *dQ* correspond, respectively, to the total dry weight and the total amount of P accumulated by plants between final and initial harvests. The subscript *r* denotes the root. The value of Wr used to calculate SARP corresponds to (*Wrf*+*Wri*)/*2*

Indicator	Algorithm	Units
PUtEo	Wj^f/Qj^f	$g\ DW\ mmol^{-1}P$
PUtEu	Wj^f/cj^f	$g^2\ DW\ mmol^{-1}P$
PUtEe	$(Ln(Wj^f)-Ln(Wj^i))/(cj^f\ dt)$	$g\ DW\ mmol^{-1}P\ d^{-1}$
PUtEi	$(dWj/dt)/Qj^f$	$g\ DW\ mmol^{-1}P\ d^{-1}$
Relative effect on biomass accumulation	Wj_d^f/Wj_w^f	*unitless*
Specific absorption rate of P (SARP)	$(dQ/dt)Wr^{-1}$	$\mu mol\ g^{-1}RDW d^{-1}$
Relative growth rate (RGR)	$(Ln(Wf)-Ln(Wi))/dt$	d^{-1}

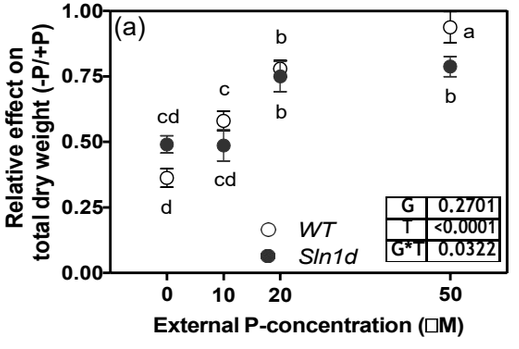

Fig. S1. Effect of long-term exposure (21 days) to a wide range of external P-supplies on the quotient between the dry weight for a given P-supply and that determined at 500 μM P in WT and *Sln1d* plants. Data correspond to the mean value of four replicates ± s.e. Data obtained in factorial ANOVA are shown indicating the p values obtained for the Genotype (G), the level of P-supply (T) as well as for their interaction (G*T). Results labelled with the same letter indicate that no statistically significant differences ($P < 0.05$) were detected.

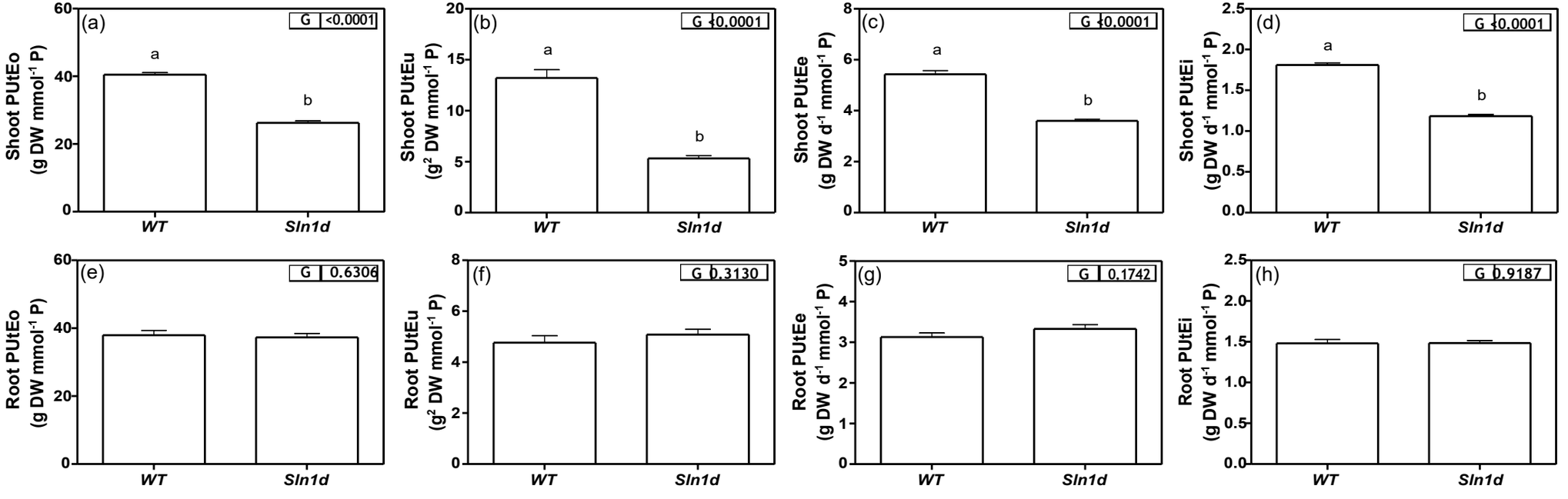

Fig. S2. Phosphorus utilization efficiency (PUtE) indicators for WT and *Sln1d* plants grown in a –P medium (no P addition). (a, b, c and d) correspond to shoots, while (e, f, g and h) to roots. (a, e), PUtEo; (b, f), PUtEu; (c, g), PUtEe and (d, h), PUtEi. Data correspond to two experiments (n = 8 in each experiment) ± s.e. Data obtained in one-way ANOVA are shown indicating the P-values obtained for the Genotype (G).

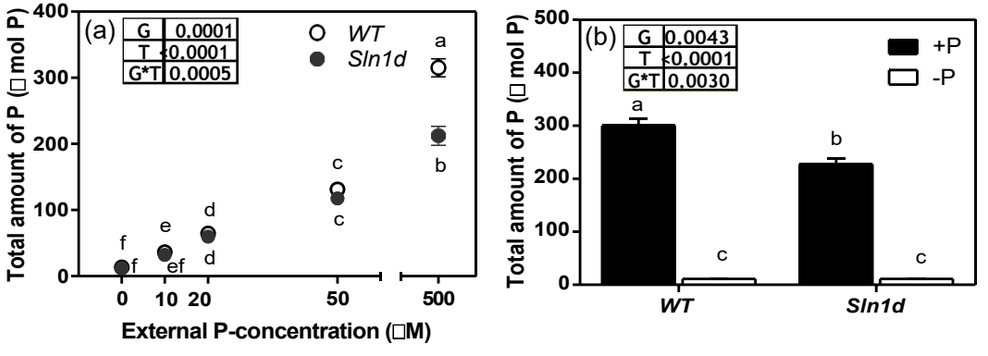

Fig. S3. (a) Amount of P accumulated in WT and *Sln1d* plants after 21 days of exposure to a wide range of external P-supplies. Empty circles correspond to WT plants, while filled circles correspond to *Sln1d* plants. Data correspond to the mean value of four replicates ± s.e. (b) Data obtained for plants grown in the presence (500 μM, black) and the absence of P (–P, white) are shown. Data correspond to two experiments (n = 8 in each experiment) ± s.e. Data obtained in factorial ANOVA are shown indicating the p values obtained for the Genotype (G), the level of P-supply (T) as well as for their interaction (G*T). Results labelled with the same letter indicate that no statistically significant differences ($P < 0.05$) were detected.

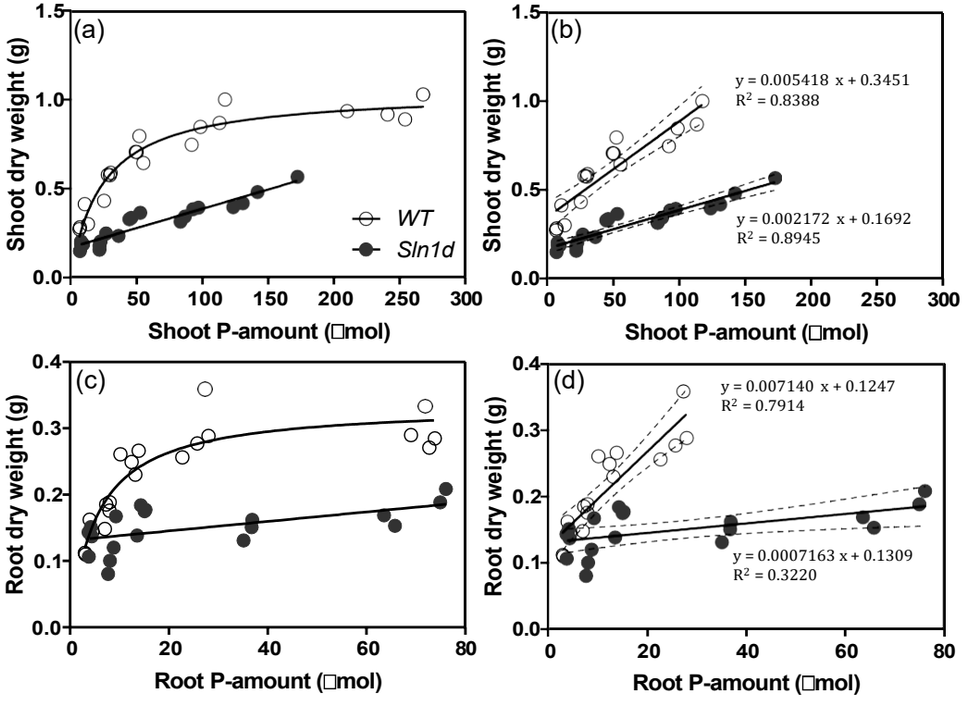

Fig. S4. Plot of the dry weight accumulated against the internal amount of P in shoots (a, b) and roots (c, d) of WT and *Sln1d* plants as obtained after a long-term exposure (21 days) to a wide range of external P-supplies. Empty circles correspond toWT plants, while filled circles correspond to *Sln1d* plants. Values obtained for linear regressions within the near linear range are given in (b) and (d), for shootsand roots, respectively.

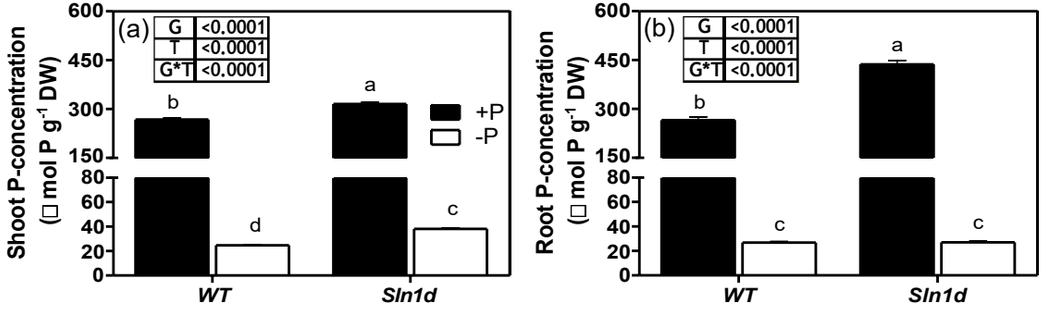

Fig. S5. Concentration of P in shoots (a) and roots (b) of WT and *Sln1d* plants grown in the presence of 500 μM P (+P, black) or in the absence of P (no P addition, –P, white) for 21 days. Data correspond to two experiments (n = 8 in each experiment) ± s.e. Data obtained in factorial ANOVA are shown indicating the p values obtained for the Genotype (G), the level of P-supply (T) as well as for their interaction (G*T). Results labelled with the same letter indicate that no statistically significant differences ($P < 0.05$) were detected.

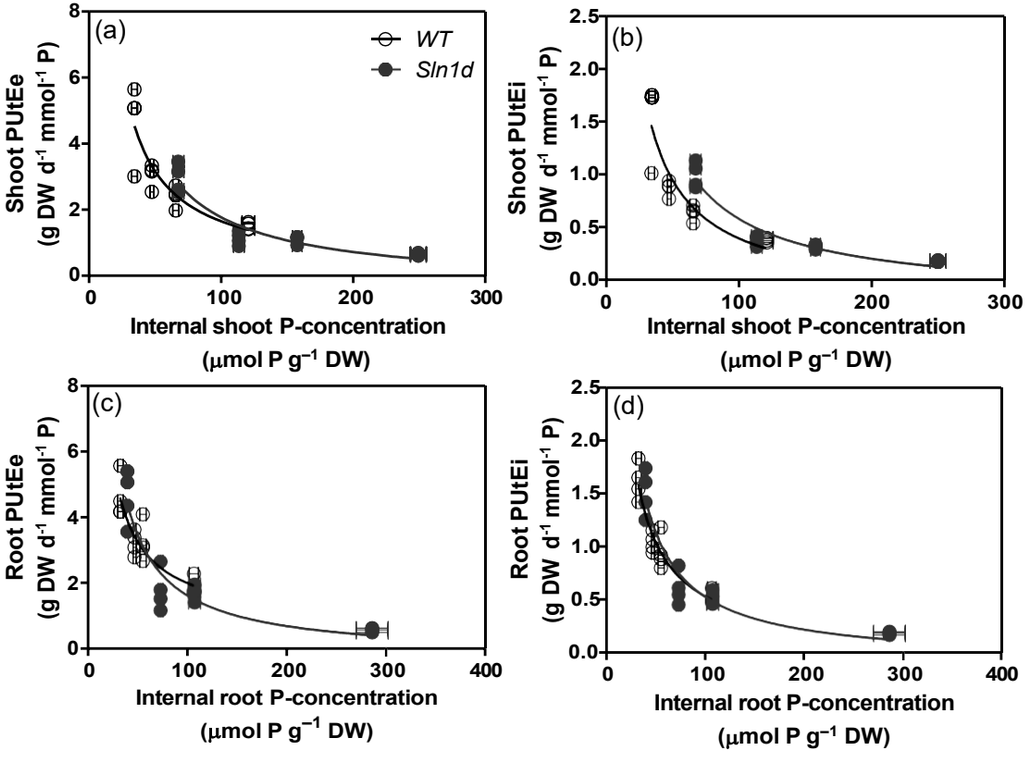

Fig. S6. Phosphorus utilization efficiency (PUtE) dynamic indicators determined in shoots and roots of WT and *Sln1d* plants plotted against the internal concentration of P measured on d 15 since the beginning of treatments. Empty circles correspond to WT plants, while filled circles correspond to *Sln1d* plants. (a) and (b) Shoot PUtEe and PUtEi, respectively. (c) and (d) Root PUtEe and PUtEi, respectively. Definitions of PUtEe and PUtEi are given in Table S1.

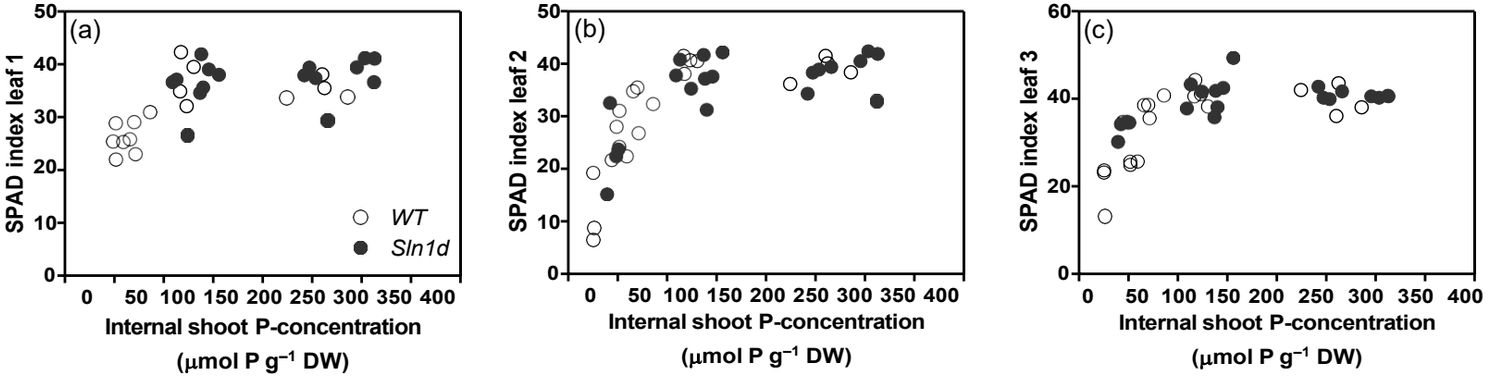

Fig. S7. SPAD index plotted against the concentration of P in the shoots of WT and *Sln1d* plants exposed to different P supplies. Empty circles correspond to WT plants, while filled circles correspond to *Sln1d* plants.

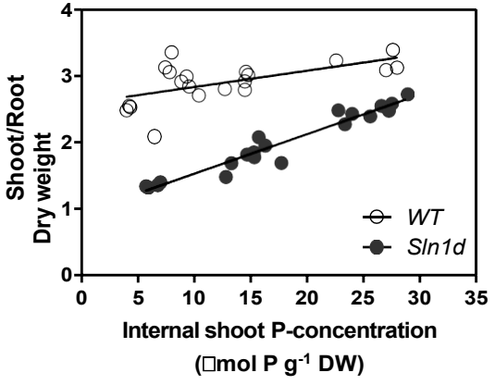

Fig. S8. Shoot:root dry matter quotient plotted against the internal shoot P-concentration in WT and *Sln1d* plants. Empty circles correspond to WT plants, while filled circles correspond to *Sln1d* plants.

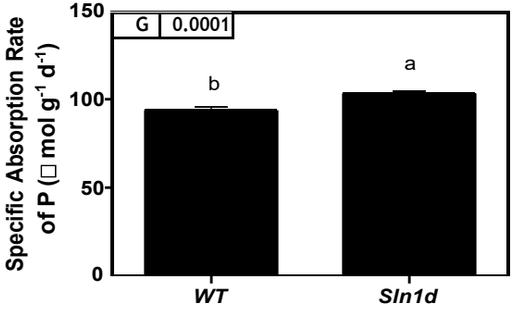

Fig. S9. Specific absorption rate of phosphorus by WT and *Sln1d* plants grown in the presence of 500 μM P for 21 d. Data correspond to two experiments (n = 8 in each experiment) ± s.e. Data obtained in one way ANOVA is shown indicating the p value obtained for the Genotype (G).