

Figure S1. Structural equation modelling (SEM, sub-figures A–C) and standardized total effect (D–F) showing the effect of abiotic and biotic factors on RUEs in *A. ordosica*. The numbers beside each arrow are the standardized path coefficients (γ), the solid and dashed line arrows represent the positive and negative effects on the fitted SEM, respectively. All paths in this model are significant (p

< 0.01). Percentages beside the response variables refer to the proportion of variance explained by the model (R^2). The statistical results of the SEM are: (A) WUE , $\chi^2 = 44.6$, $p = 0.689$, and RMSEA (root mean square error of approximation) = 0.001; (B) LUE , $\chi^2 = 51.41$, $p = 0.418$, and RMSEA = 0.026; and (C) NUE , $\chi^2 = 44.76$, $p = 0.093$, and RMSEA = 0.001.

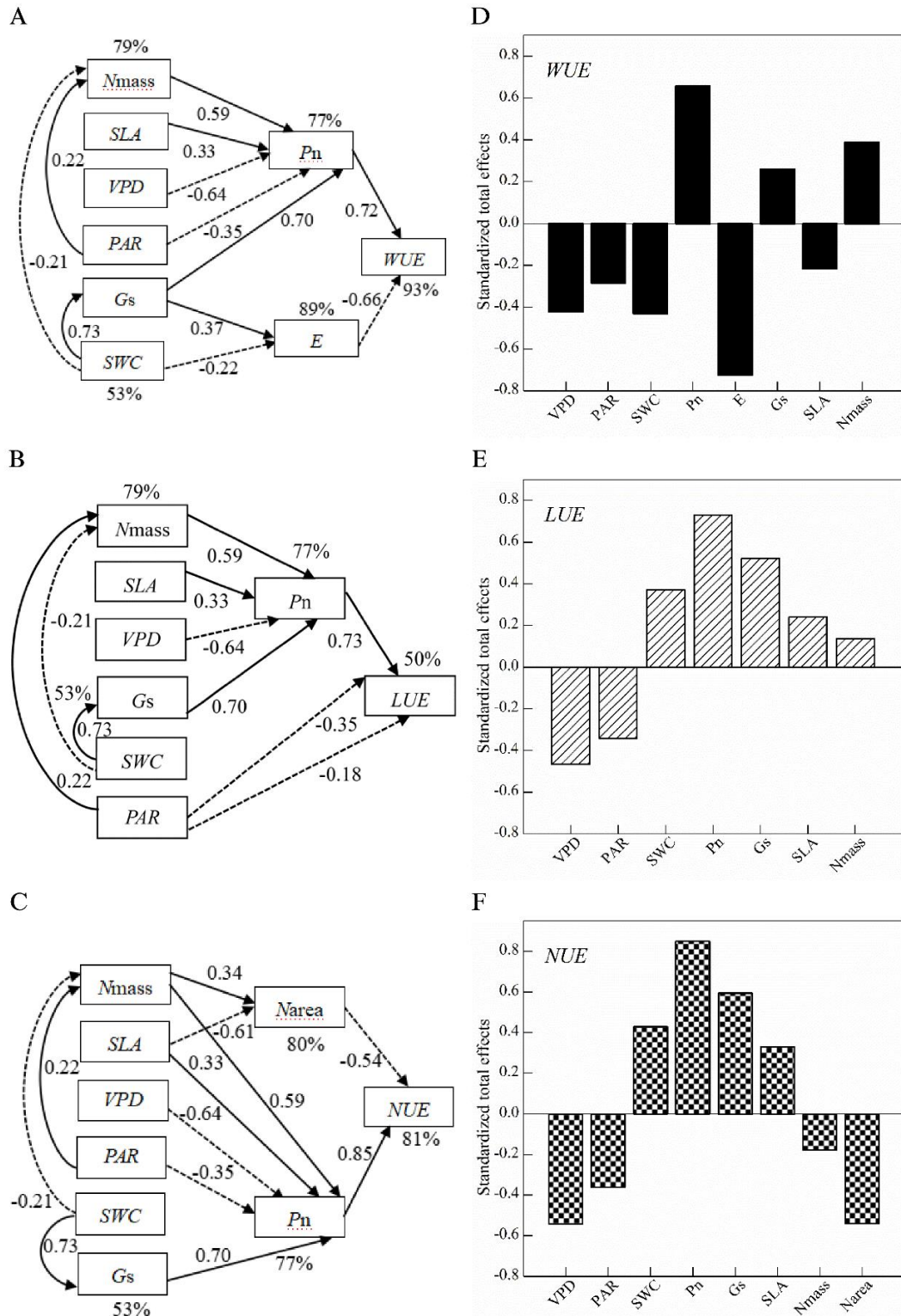


Figure S2. Structural equation modelling (SEM, sub-figures A–C) and standardized total effect (D–F) showing the effect of abiotic and biotic factors on RUEs in *L. secalinus*. The numbers beside each arrow are the standardized path coefficients (γ), the solid line arrows represent the positive and dashed line arrows represent the negative effects on the fitted SEM, respectively. All paths in this model are significant ($P < 0.01$). Percentages beside the response variables refer to the proportion of variance explained by the model (R^2). The statistical results of the SEM are: (A) WUE , $\chi^2 = 32.14$, $p = 0.696$, and RMSEA (root mean

square error of approximation) = 0.001; (B) *LUE*, $\chi^2 = 33.01$, $P = 0.657$, and $RMSEA = 0.001$; and (C) *NUE*, $\chi^2 = 38.97$, $p = 0.381$, and $RMSEA = 0.037$.

Table S1. Partial correlation coefficients between *RUEs* [i.e., water, light, and nitrogen use efficiencies (i.e., *WUE*, *LUE*, and *NUE*)] and biophysical variables of photosynthesis (*Pn*), transpiration (*E*), incident photosynthetically active radiation (*PAR*), and N per unit leaf area (*N_{area}*) from 1 May–30 Sep. 2019 for *A. ordosica* and *L. secalinus*.

<i>RUEs</i>	<i>A. ordosica</i>		<i>L. secalinus</i>	
	Components	PCC	Components	PCC
<i>WUE</i>	<i>Pn</i>	0.89**	<i>Pn</i>	0.78**
	<i>E</i>	−0.58**	<i>E</i>	−0.72**
<i>LUE</i>	<i>Pn</i>	0.49**	<i>Pn</i>	0.46**
	<i>PAR</i>	NA	<i>PAR</i>	NA
<i>NUE</i>	<i>Pn</i>	0.98**	<i>Pn</i>	0.93**
	<i>N_{area}</i>	−0.41**	<i>N_{area}</i>	−0.75**

Note *** denotes $p < 0.01$ and NA for no statistically significant correlation (i.e., $p > 0.20$).