SUPPLEMENTARY DATA

Supplementary information

This file contains supplementary information to the article titled *"Berry sugar accumulation and softening dynamics in a slow ripening genotype and its response to hormone application"*. The list below summarizes the information contained in this file.

Due to large size, the supplementary tables are available in a private Figshare repository at https://figshare.com/s/2ee1f7ea28375b134a37.

Supplementary figures

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Table S11 Model parameters of logistic regression curves fitted to TSS data treated with abscisic acid and submitted to water stress (Experiment 5).

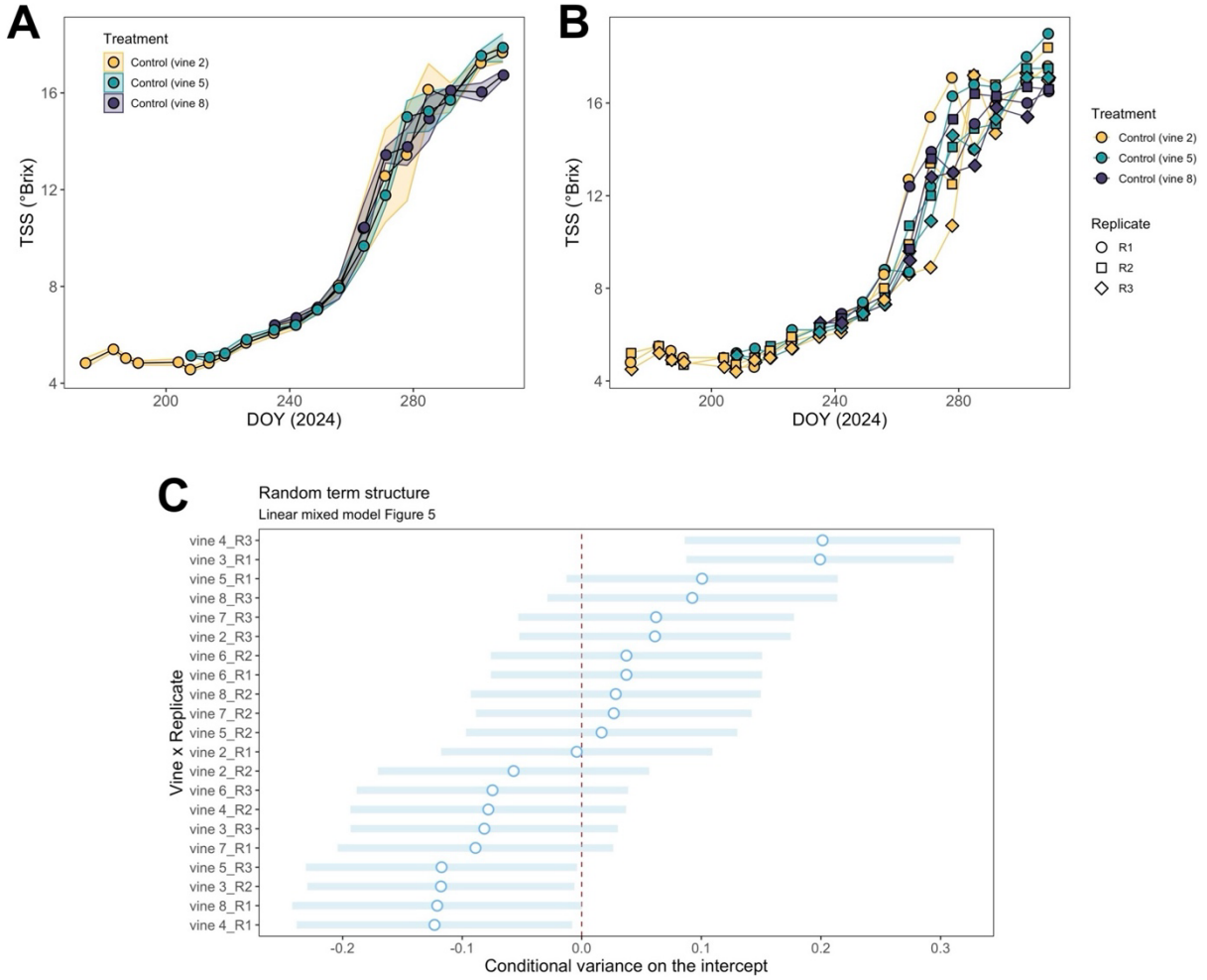


Figure S1. Representation of vine and sampling position variability.

Representation of variability across vines and replicates that supports sampling individual vines in this study. ***A)*** *Comparison of Total Soluble Solids (TSS) curves of three different control vines in 2024. P-values for a linear mixed model with vine and replicate fitted as random terms:* $p_{DOY} \leq 0.001$; $p_{Treatment} = 0.965$; $p_{DOYxTreatment} = 0.693$. *Data are presented as means ± SE (n = 3). Colors differentiate between vines in a 10-vine set: vine 2 (yellow), vine 5 (teal), vine 8 (purple).* ***B)*** *Comparison of TSS curves for each vine and replicate within the vine in 2024. Colors are as described in* ***A*** *and shapes represent replicates within vines.* ***C)*** *Random term structure for the linear mixed model utilized to analyze data reported in* ***Figure 5****. The conditional variance on the intercept is shown for each vine x replicate combination.*

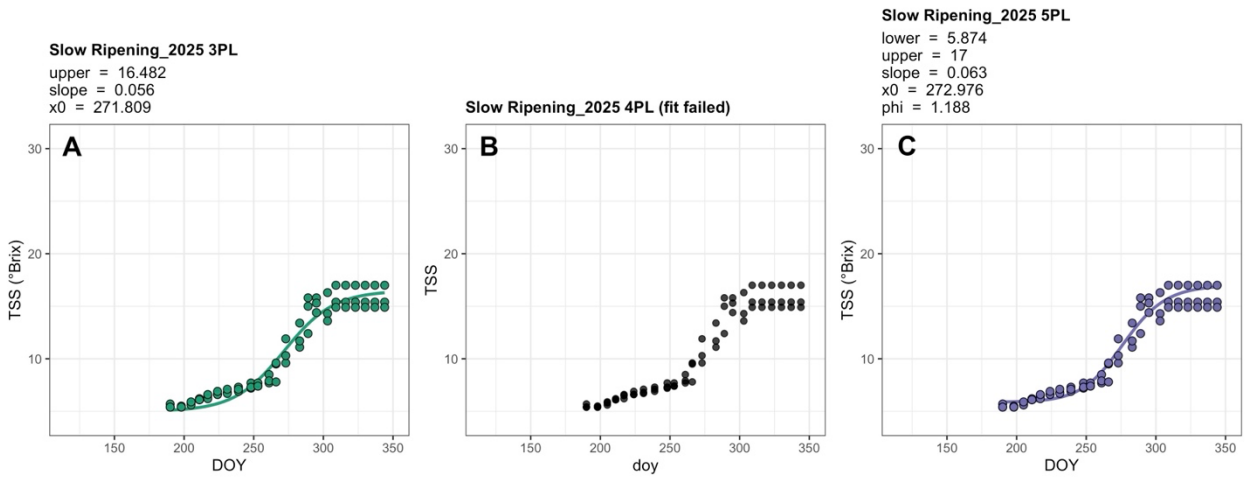


Figure S2. Comparison of sigmoid model fits for slow ripening TSS data.

Comparison of different sigmoid curves fitted to Total Soluble Solids (TSS) observations. Three fits are shown for TSS data collected for the slow ripening genotype in 2025: ***A)*** *three-parameter logistic regression (3PL);* ***B)*** *four-parameter logistic regression (4PL) and* ***C)*** *five-parameter logistic regression (5PL). Colors discriminate between models. For each model, estimated parameters are shown above the panel. No estimates are provided if the model did not converge (middle chart, as reported in the title). Abbreviations: DOY, day of the year; lower, lower asymptote; φ, asymmetry coefficient; upper, upper asymptote;* x_0*, inflexion point.*

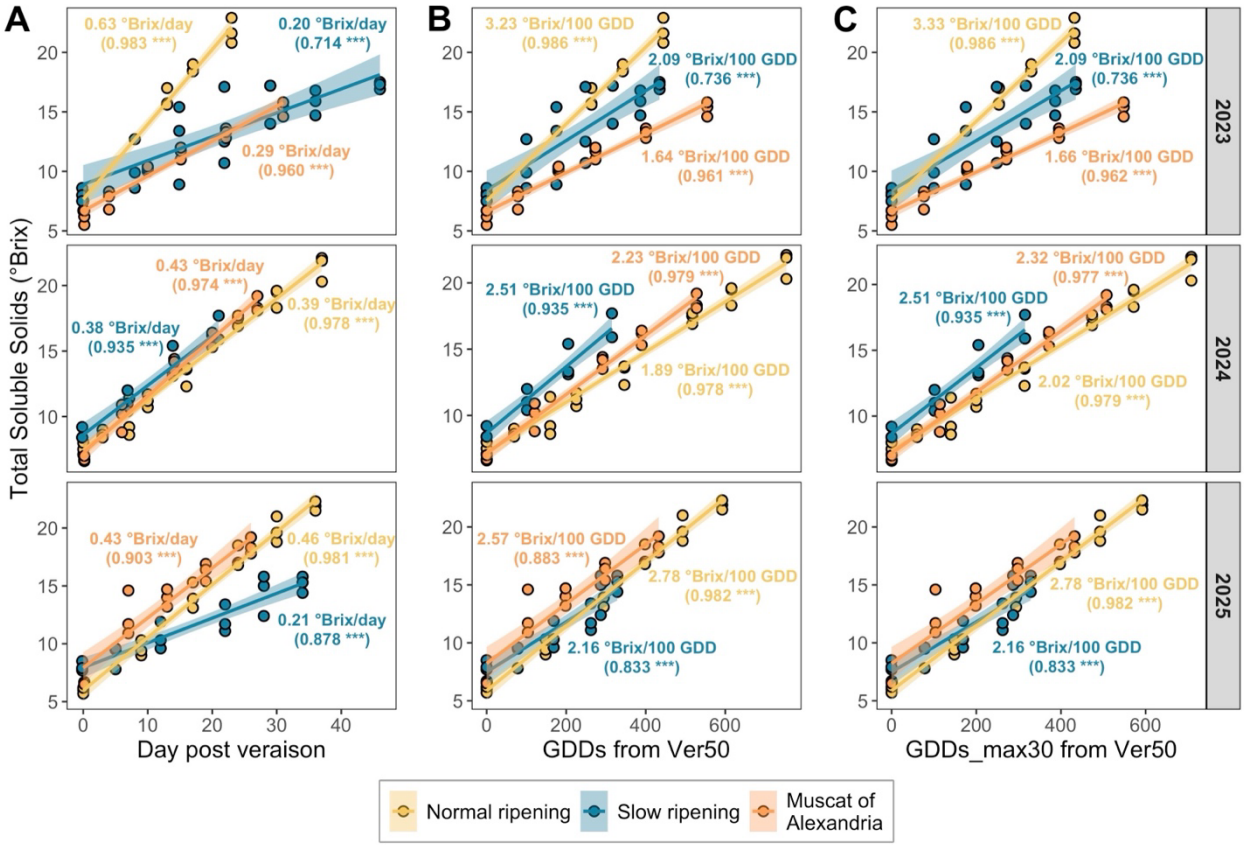


Figure S3. Linear fits of TSS accumulation by genotype and year in the active sugar accumulation phase using the chronological and thermal scale.

Linear models explaining changes in Total Soluble Solids (TSS, in °Brix) for three genotypes in three consecutive years (2023-2025) against three different scales: ***A)*** *Days post 50% veraison (Ver50),* ***B)*** *Growing Degree Days (GDDs) from Ver50 and* ***C)*** *modified GDDs with upper threshold of 30 °C (GDDs_max30) from Ver 50. Points represent TSS observations for three replicates at each time point. Lines and shaded ribbons represent linear fits and the standard error of the fit. Colors differentiate between genotypes each year: Normal ripening (yellow); Slow ripening (blue) and Muscat of Alexandria (orange). For each fit, the text reports the slope (TSS/day or TSS/100 GDD) followed by the R^2 value and significance of the model in parentheses. Abbreviations: GDDs, growing degree days; TSS, Total Soluble Solids; Ver50, 50% veraison based on firmness curves.*

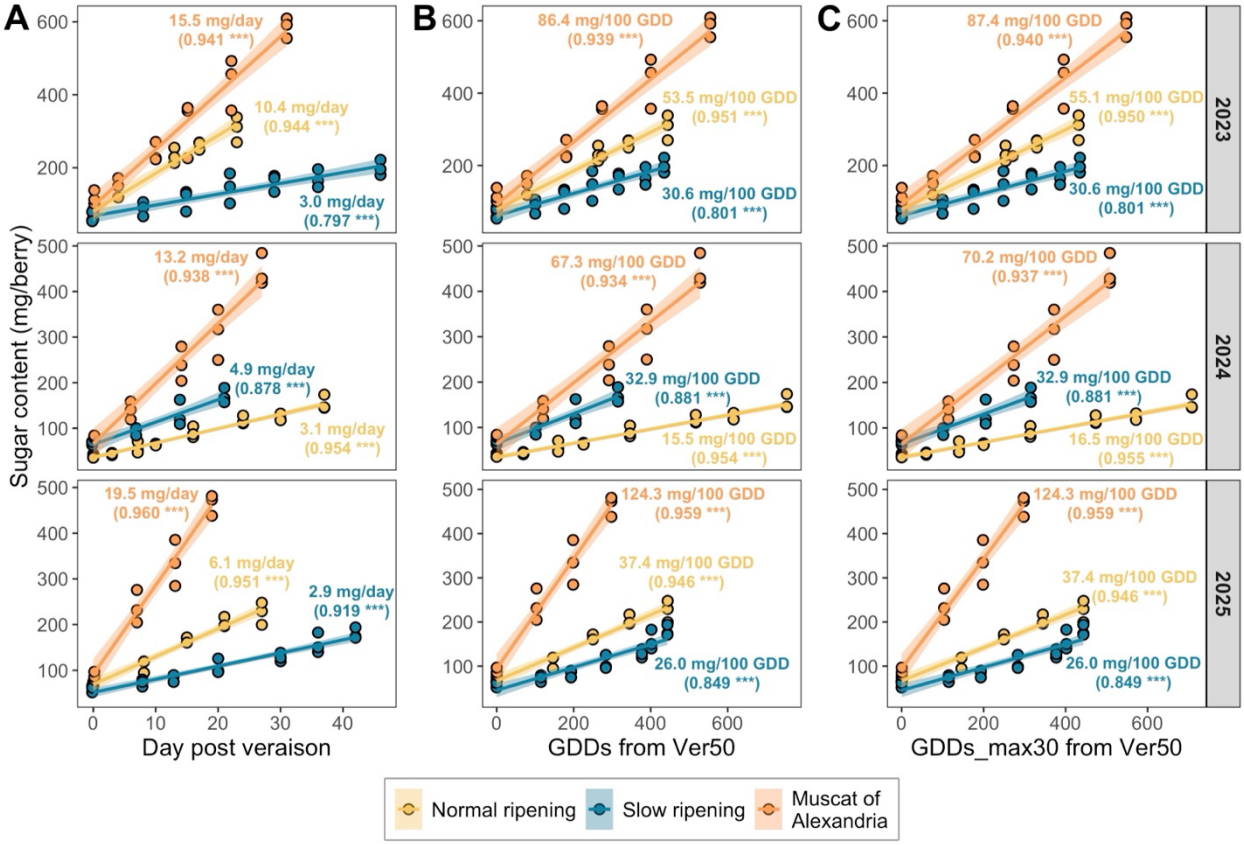


Figure S4. Linear fits of sugar loading rates by genotype and year in the active sugar accumulation phase using the chronological and thermal scale.

Linear models explaining changes in sugar content (in mg/berry) for three genotypes in three consecutive years (2023-2025) against three different scales: ***A)*** *Days post 50% veraison (Ver50),* ***B)*** *Growing Degree Days (GDDs) from Ver50 and* ***C)*** *modified GDDs with upper threshold of 30 °C (GDDs_max30) from Ver 50. Points represent sugar content estimates calculated from berry weight and Total Soluble Solids for three replicates at each time point. Lines and shaded ribbons represent linear fits and the standard error of the fit. Colors differentiate between genotypes each year: Normal ripening (yellow); Slow ripening (blue) and Muscat of Alexandria (orange). For each fit, the text reports the slope (mg/day or mg/100 GDD) followed by the* R^2 *value and significance of the model in parentheses. Abbreviations: GDDs, growing degree days; Ver50, 50% veraison based on firmness curves.*

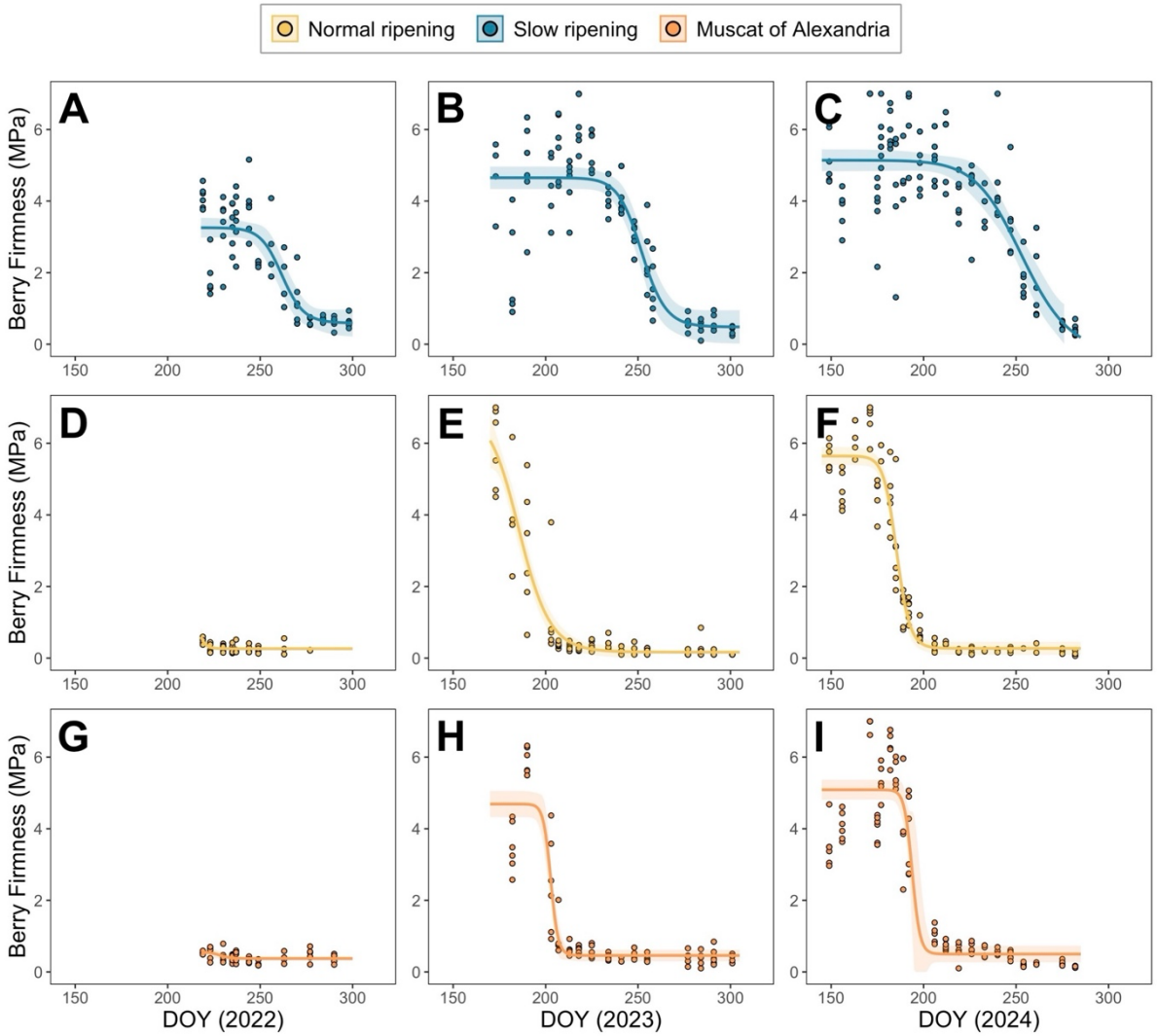


Figure S5. Inverse sigmoid curves fitted to berry firmness data for the calculation of softening parameters.

*Inverse sigmoid curves fitted to firmness data for three genotypes across three years. Genotypes are displayed in rows and differentiated by color: slow ripening (SR, blue, **A**-**C**), normal ripening (NR, **D**-**F**) and Muscat of Alexandria (orange, **G**-**I**). Years are represented in columns: 2022 (**A**-**D**-**G**), 2023 (**B**-**E**-**F**) and 2024 (**C**-**F**-**I**). Points are raw firmness measurements, lines and ribbons represent fits and their respective standard error.*

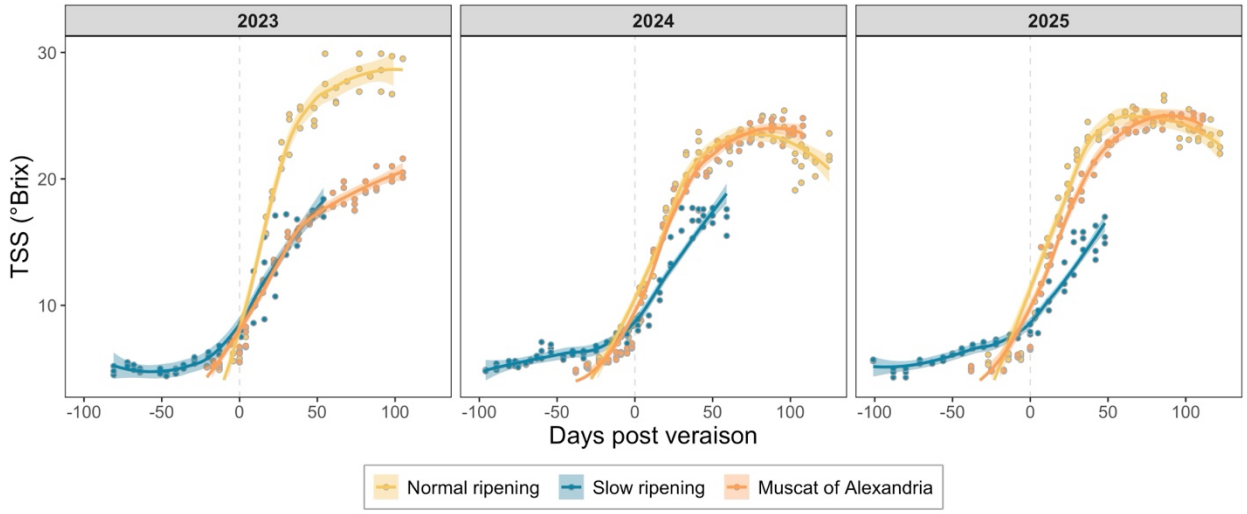


Figure S6. TSS accumulation curves by genotypes aligned using the days post veraison scale.

Sugar accumulation curves by genotype aligned using the days post veraison scale. Ver50, calculated from softening curves, was used to transform dates into the corresponding days post veraison. Colors differentiate between genotypes in 2023 (left) , 2024 (middle) and 2025 (right): normal ripening (NR, yellow), slow ripening (SR, blue) and Muscat of Alexandria (orange). Points represent TSS values for each genotype and replicate (n = 3 per time point) and lines and ribbons represent fits and standard error using the smoothed conditional means plotting method. Abbreviations: TSS, total soluble solids.

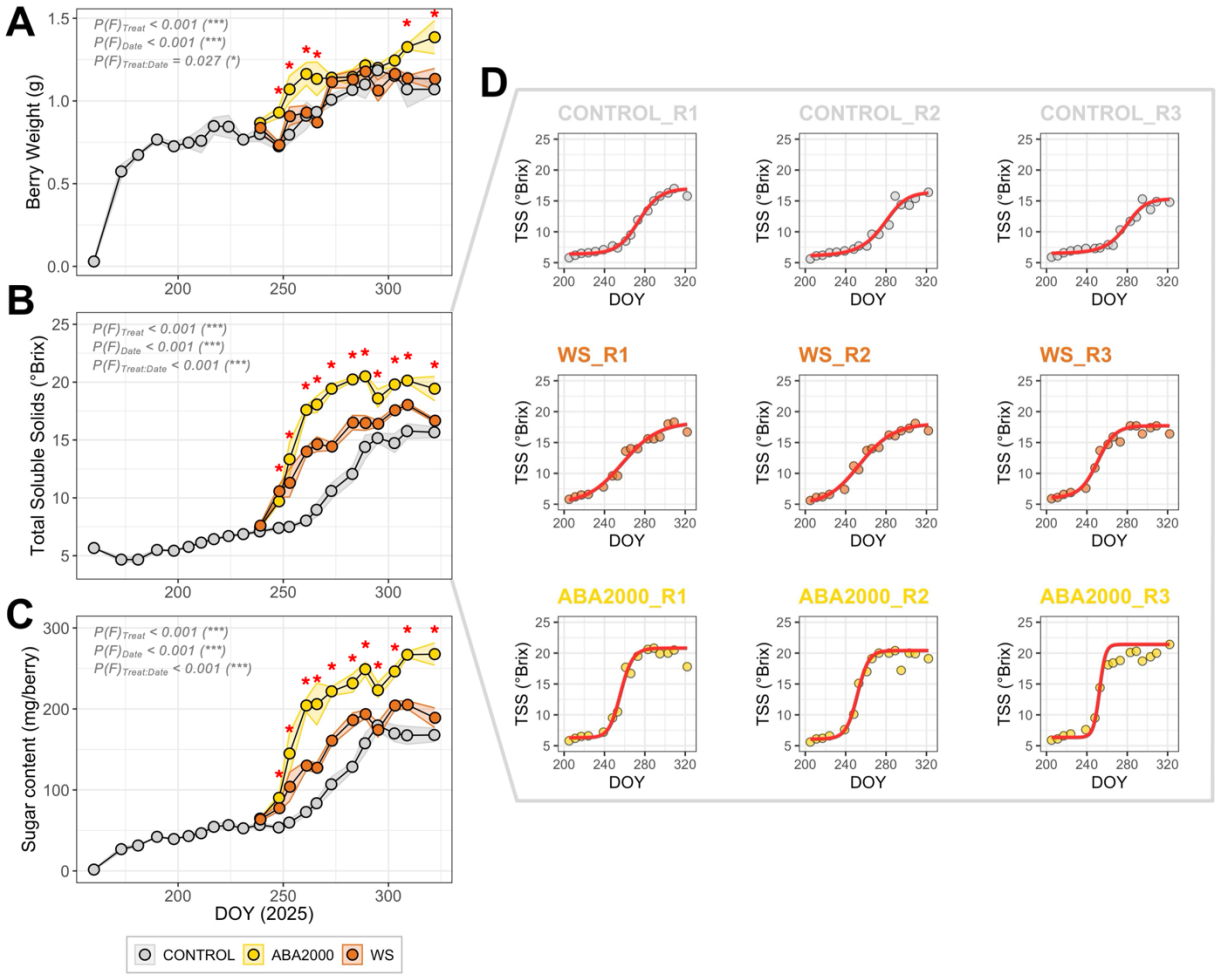


Figure S7. Effect of ABA application and water stress on berry weight, TSS and sugar content kinetics for the slow ripening genotype.

Response of slow ripening fruit to abscisic acid (ABA) and water stress (WS) treatments: ***A)*** *berry weight;* ***B)*** *Total Soluble Solids (TSS) and* ***C)*** *sugar content per berry. In* ***A-C****, points and ribbons represent means ± SE (n = 3). Treatments were initiated right after the first sampling which served as a baseline (DOY 239). Asterisks denote significant differences between treatment means at each date according to ANOVA followed by Tukey's adjusted post hoc test at α < 0.05. P(F) values for single and interactive treatments are reported in each chart.* ***D)*** *Five-parameter sigmoidal fits of TSS observations for each treatment and replicate. Across the board, colours differentiate between treatments: Control (untreated, grey); Abscisic acid at 2000 mg/L (ABA2000, yellow); water stress (WS, orange). Abbreviations: DOY, day of the year, Treat, treatment; TSS, total soluble solids.*