Regression analysis between VineLOGIC-predicted versus observed values for key variables

Purpose

The aim was to provide a snapshot of the performance of the VineLOGIC model, published through the CSIRO Data Access Portal (https://doi.org/10.25919/5eb3536b6a8a8), by regressing model-predicted values for phenology, yield and yield component variables, against values from the three datasets (WNRA0103, WNRA0305 and WNRA0506) provided with this collection.

Methods

Linear regression models have been used to compare VineLOGIC-predicted versus observed values for budburst, flowering, veraison and maturation dates, yield, berry and bunch fresh weights and berry anthocyanin concentration. We have used data from the 9, 9 and 11 treatments in the WNRA0103, WNRA0305 and WNRA0506 datasets, respectively (total = 29 treatments), except for berry anthocyanin concentration where treatments involving the red berried varieties, Cabernet Sauvignon and Shiraz, were used (n = 25). For the phenology variables, involving dates, the dates were converted to day-of-year values.

Results

The results of regression analyses are shown in the following Table. Statistically significant relationships ($p<0.05$) were obtained between predicted and observed values for budburst date, yield, berry and bunch weights and berry anthocyanin content. Relationships between predicted and observed values for flowering and maturation dates were not significant, while veraison was borderline. The variance between predicted and observed increases from budburst through to maturation, e.g. the predicted dates relative to observed dates for budburst, flowering, veraison and maturation across all treatments ranged from 'days early' to 'days late' of -8 to +3, -12 to +9, -12 to +21 and -23 to +42 days, respectively. Budburst and veraison dates in VineLOGIC are respectively when 50% of buds have burst and 50% of berries softened/changed colour, while flowering date is time to first flower. Measured values in the data sets are at 50% budburst, flowering and veraison.

Variable	Adjusted R^2	Probability (p)	Slope	Constant
Budburst date	0.728	<0.001	0.926	18.3
Flowering date	ns	ns	0.173	257.1
Veraison date	0.096	0.056	0.371	13.3
Maturation date	ns	ns	0.474	51.4
Vine Yield (kg/vine)	0.247	0.004	0.483	14742
Yield (kg/ha)	0.258	0.003	0.493	10.6
Berry FW (g)	0.405	<0.001	0.760	0.4
Bunch FW (g)	0.586	<0.001	0.839	22.9
Anthocyanin (mg/berry)	0.298	0.003	0.307	0.8

ns = not significant; FW = fresh weight

Further comparative options

Further comparison between model predicted and measured values for key variables is possible using a test script included with the VineLOGIC source code publication (https://doi.org/10.25919/5eb3536b6a8a8). The test script allows the model to be run against treatments in a VIX file obtained from any of the WNRA0103, WNRA0305 or WNRA0506 data sets, generating output and optionally comparing against expected output.