FERTILITY ASSESSMENT IN *VITIS VINIFERA* L., CV. ALVARINHO

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Abstract:

Context and purpose of the study – The Portuguese wine production is characterized by wide yield fluctuations, causing considerable implications in the economic performance of this sector. The possibility of predicting the yield in advance is crucial as it enables preliminary planning and management of the available resources. The present work aims to study and evaluate two different techniques for the assessment of vine fertility.

Material and methods – Based on the fact that the number of inflorescences is established during the first year of the grapevine reproductive cycle and with the aim of evaluating grapevine fertility in cv. Alvarinho, two experimental procedures were performed. First, grapevine bud dissections were made during the dormant stage, in order to count the number of inflorescence primordia and assess the bud fertility potential. At the same time, grapevine canes were collected and placed in a growth chamber. Their development was monitored and, 25 days after, when the inflorescences attained the Separated Flower Buttons stage the fertility of each bud was recorded. In spring, using the same grapevines from where the samples were collected, fertility was assessed in the field and correlation between both was studied. Statistical analysis was performed including logistic and Poisson regression models for dependent data.

Results – Even using high definition observation equipment, the bud dissection technique was highly fallible, not allowing for correct identification of inflorescence primordia. Regarding the second methodology, no statistically significant differences were detected between the fertility observed in the growth chamber and in the field. These findings validate the success of the technique in assessing bud fertility at the pruning stage, 10 months before harvest.

Keywords: Alvarinho, Crop Forecasting, Fertility, Bud, Inflorescence

1. Introduction.

Fertility assessment in *Vitis vinifera* L., cv. Alvarinho

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Introduction & Objectives

The possibility of **predicting the yield** in viticulture is an important aspect in the wine industry since it allows producers to act more accurately and confidently in relation to their investments, price negotiation, management of working hours and the development of marketing strategies (Liu *et al.*, 2013).

The most usual methods for yield estimation are based on counting the number of clusters per vine, the number of berries per cluster and cluster weight which are **time-consuming, require a heavy effort and are not beneficial to the industry** (Serrano *et al.*, 2008).

In the last years, various authors created several indirect methods, from aeropalynological methods to satellite imaging methods, which have been used in order to evaluate the yield of a vineyard.

In order to assess the best potential fertility prediction technique, this work studied two different procedures: **Bud Dissection** and **Growth of grapevine** canes in a G**rowth Chamber**, both according the methodology suggested by Toda (1991).

Materials & Methods

Plant material: In the end of the dormancy period, 20 shoots of Alvarinho variety (PRT52007) were collected. The vineyards were located in Quinta de Azevedo (41°34'14.87"N; -8°32'37.10"W), in Vinhos Verdes Wine Region, and Quinta dos Carvalhais (40°55'81.51"N, -7°78'63.43"W), in Dão Wine Region, both property of SOGRAPE VINHOS, S.A..

Method 1 – Bud Dissection method:

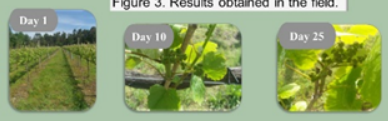
The anatomical cut of the buds was performed, and the inflorescence primordia were observed and counted using a dissecting microscope and magnifying Nikon SMZ100 on a C-DSD230 stationary.

Method 2 – Growth Chamber experiment:

80 canes with one bud each were placed in a tray and held in a growth chamber with 12 hours of light, 80% - 90% relative humidity and an average temperature of 24 °C. After budburst (25 days) the number of inflorescences was recorded. In Spring, the bud fertility of the vines from where the samples were taken was assessed.

Data Analysis: Statistical analysis (Poisson regression models for dependent data) was made in order to assess if the fertility obtained in laboratory environment was significantly different from the one obtained in the field.

Figure 3. Results obtained in the field.



Results

Method 1 – Bud Dissection method:

This technique revealed inappropriate due to the poor results and lack of precision. The high difficulty in identifying inflorescences (Figure 1) led to discard this method. Similar difficulties had been reported by Toda (1991) and Moyer (2015.

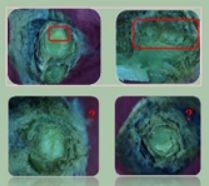


Figure 1. Results of Bud Dissection technique.

Method 2 – Growth Chamber experiment:

A model was established to analyze if the results of this experiment (Figure 2) could be related to the number of inflorescences obtained in the field (Figure 3).

According to table 1, no statistically significant differences between the number of inflorescences in the field and in the growth chamber were found in any of the vineyards (Dão or Vinhos Verdes), p = 0.116.

It can therefore be said that these results validate the experimental methodology of this work as a technique for predicting vineyard fertility potential.

Figure 2. Results of Growth Chamber experiment.

Table 1. Estimated coefficients of Poisson regression model for dependent data selected regarding the number of inflorescences

Variables	Estimate	Standard Error	Statistic Test	P-value
Constant	0,59	0,02	1346,66	***< 0,001***
Dão (vs. VVerdes)	-0,34	0,07	26,17	***< 0,001***
GrowthChamber (vs. Field)	-0,21	0,13	2,47	0,116
Dão × GrowthChamber	-0,71	0,34	4,43	***0,035***

Note: significant effects are those corresponding to the p-values shown in bold and italic.

Conclusions

✓Due to the difficulties in identifiying correctly the total number of inflorescences, the Bud Dissection method was discarded.

✓The Growth Chamber technique seems to be a promising technique for fertility assessment of grapevines.

✓This technique can be used to assess grapevine fertility up to 10 months prior the harvest, supporting the winegrower in his technical and commercial decisions.

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