



Climate variability and wine quality over Portuguese regions

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The relationship between the characteristics of wine and its geographic origin is frequently used to explain the hierarchy of high-quality wines. Port wine is produced from grapes grown in selected areas of the Douro valley, in Portugal, the so-called Região Demarcada do Douro, the first wine-producing region of the world (dating from 1758). The Douro region presents distinctive climatic, topographic and soil characteristics. Moreover Portugal possesses a large array of native varieties, producing an abundant diversity of different wines. The most protected wines, produced only with some authorised grape varieties in the demarcated regions, are labelled D.O.C. (Denominação de Origem Controlada, similar to the French Appellation d'Origine Contrôlée (AOC)) which secures a superior wine quality.

Recent warming trends in Portugal are associated with the significant increase in the frequency and duration of heat waves, and the increase in the frequency of hot days and tropical nights, especially in spring and summer, together with a significant decrease in the frequency of cold waves and frost days (Santo et al., 2014). Moreover a predominantly negative tendency in precipitation indices was also found (de Lima et al., 2014). These trends and associated changes in temperature and precipitation regimes may exert strong influences on agriculture systems.

In this work we have performed an analysis of the distinct behaviour of several meteorological fields in vintage versus non-vintage years for Port Wine on one hand and Alentejo and Dão/Bairrada DOC regions on the other hand, during the period spanning from 1964-1995. The relative importance of maximum and minimum temperature, precipitation and frost days is assessed for each individual month of the vegetative cycle and their importance to the wine quality is evaluated. Furthermore, composites of 500 hPa geopotential height and sea level pressure fields over the Euro Atlantic region are also compared for years characterized in each region by high/low quality wines. Finally, we also investigated how climate variability is related to DOC wine quality for different regions using North Atlantic Oscillation (NAO) index.

Results reveal a strong dependence of wine quality for all regions on maximum temperature and precipitation during spring and summer (the growing season) as expected. However the role of temperature on wine quality seems to be distinct among the diverse regions probably due to their different climate zoning. Moreover, it is shown that the differences associated with high/low quality wine are in agreement with different synoptic fields patterns.

Our results suggest that this type of analysis may be used in developing a tool that may help anticipating a vintage/high quality year, based on already available seasonal climate outlooks.

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