Temperature-based phenology modelling for the grapevine

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Abstract

Historical phenology records have indicated that advances in key developmental stages such as budburst, flowering and veraison are linked to increasing temperature caused by climate change. Using phenological models the timing of grapevine development in response to temperature can be characterized and projected in response to future climate scenarios.

We explore the development and use of grapevine phenological models and highlight several applications of models to characterize the timing of key stages of development of varieties, within and between regions, and the result of projections under different climate change scenarios. The following aspects were evaluated: (1) importance of defining modelling objectives, (2) an understanding of database characteristics and how this may influence modelling outcomes, (3) the accuracy of models compared to observations, (4) the influence of the quality of phenological observations on model development and (5) the importance of calibrating a maximum the varieties for specific models. The challenges of the different modelling approaches and strengths and limitations of the outputs are discussed, particularly in the context of climate change projections.

Combining the results of these separate approaches highlights the opportunities and limitations of different modelling solutions and how different modelling approaches are needed to understand how temperature influences grapevine development depending on objectives, and that tools are available to help us better evaluate the potential effects of climate change on grapevine development.

Keywords: grapevine, phenology, temperature, climate change, modelling.