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Temperature impact on viticulture phenological stages in Croatia under present climate condition

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As many studies shows, temperature is key element that affects grapevine growth. Global warming and temperature rise shifted grapevine phenology in many vineyard regions worldwide. Also, temperature and precipitation extremes can effect wine quality and yield. In Croatia, viticulture represents one of the most important branches of agriculture in the economical and traditional sense. Therefore, it is important to study changes in vine growth, as well as impact of meteorological parameters on it, so that it can be used to predict suitability and growth under future climate.

In this study, dates of beginning of 3 phenological phases (budburst, flowering and veraison), as well as harvest dates, collected from wineries across country, were analyzed. Results show earlier appearances of almost all phases, regardless of variety. With rise of temperature, the duration between two phases is shorted and that leads to an earlier harvest.

Also, 5 agrometeorological indices (Growing degree day, Winkler index, Huglin index, Cool night index and Dryness index) in two 30 year long period (1961-1990, 1991-2020) were calculated from meteorological data collected from 74 meteorological stations in Croatia. A spatial interpolation was applied on results and maps were made at 1-km resolution. Maps show significant changes in temperature indices between two periods. This raises the possibility of growing new varieties in certain regions, but also hints that grapevine could be cultivated in new regions.

In addition, temperature impact on the phenological phases is studied. Relationship between begging of the phases and mean daily temperate averaged over period that precede is calculated. Also, multi-linear regression between start dates of phenological phases and monthly averages of minimum, maximum and mean temperature is calculated, so that the best correlation could be determined. Results show a good correlation between dates and temperature, which can be valuable indicator for even more significant changes in vine growth in future.