

Development of a Methodological Framework for Synchronizing Wine Events Using Viticultural Climate Indices – A Case Study of Fruška Gora (Serbia)



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Planning the calendar of wine events is crucial for the development of competitive and sustainable wine tourism, yet a systematic approach enabling objective evaluation of the temporal distribution of events in relation to the climatic potential of a destination is lacking. The main objective of this paper is to develop and validate a methodological framework that integrates viticultural climate indices with the analysis of wine event calendars, thereby establishing objective criteria for the strategic positioning and enhancement of wine destinations.

The proposed methodological framework is based on three phases. The first phase involves the application of K-means cluster analysis to determine the climatic homogeneity of the studied area, establishing a foundation for further analysis. The second phase involves the computation of fundamental viticultural climatic indexes, which include the Winkler Growing Degree Days (GDD) Index, the Huglin Index, and the Cool Night Index, in order to identify the optimal climatic periods, which are of great importance in the phenological growth of the vine as well as in tourist activities. The third phase involves the quantification of the level of synchronization between the identified optimal climatic periods and the wine events calendar, which is done by classifying four synchronization levels.

The proposed methodological framework is divided into three phases. The first phase consists of the application of K-means cluster analysis to verify the climatic homogeneity of the study area. The second phase includes the calculation of some of the most important viticultural climatic indices, namely the Winkler Growing Degree Days (GDD) Index, the Huglin Index, and the Cool Night Index. The calculation of these indices is necessary to determine the optimal climatic window that is important for the phenolic development of the grapevine as well as for tourist activity. The third phase includes the quantification of the degree of synchronization between the optimal climatic window and the wine events using four categories of synchronization.

The methodological framework developed in this paper allows organizers, tourism organizations, and policy makers to objectively assess existing event calendars, find opportunities to optimize them, and prolong the tourist season by strategic planning in transitional periods. The limitation of the research is related to the fact that it is focused on one region, while the future research directions include extending the framework to the comparative analysis of several wine destinations and taking into consideration long-term climate projections to increase the adaptive capacity in wine tourism.

Keywords: methodological framework, Fruška gora (Serbia), wine destination management, climate-based assessment, event scheduling, K-means algorithm