PERFORMANCE OF A NEW MODEL FOR PREDICTING END OF FLOWERING DATE (BBCH 69) OF GRAPEVINE (Vitis Vinifera L.)

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The end of flowering date (BBCH 69) is an important phenological stage for grapevine (Vitis Vinifera L.), in fact up to this date the growth is focused on the plant and gradually passes on the berries through fruit set. The aim of this study is to perform a model to predict the date of the end of flowering (BBCH69) for some grapevine varieties. This research carried out using three cultivars of grapevine (Maceratino, Montepulciano, Sangiovese) in three different locations (Macerata, Morrovalle and Potenza Picena), places of an equal number of wine farms for the time interval between 2006 and 2013.
In order to have reliable temperatures for each location, the data of 6 weather stations near these farms have been interpolated using cokriging methods with elevation as independent variable. The procedure to predict the end of flowering date starts with an investigation of cardinal temperatures typical of each grapevine cultivar. In fact the analysis is characterized by four temperature thresholds (cardinals): minimum activity temperature (TCmin = below this temperature there is no growth for the plant), lower optimal temperature (TLopt = above this temperature there is maximum growth), upper optimal temperature (TUopt = below this temperature there is maximum growth) and maximum activity temperature (TC max = above this temperature there is no growth). Thus this model take into consideration maximum, mean and minimum daily temperatures of each location, relating them with the four above mentioned cultivar temperature thresholds. In this way it has been obtained some possible cases (32) corresponding to as many equations, depending on the position of temperatures compared with the thresholds, in order to calculate the amount of growing degree units (GDU) for each day. Several iterative tests (about 1000 for each cultivar) have been performed, changing the values of temperature thresholds and GDU in order to find the best possible combination which minimizes error between observed and predicted days from budburst to end of flowering. It has been assessed the minimization of error for the predicted dates compared with real ones, calculating some statistical indexes as root mean square error, mean absolute error and coefficient of variation. The procedure led to the identification of four cardinal temperatures and the amount of GDU for each cultivar between BBCH01 (budburst) and BBCH69 (end of flowering).
In conclusion, this research has achieved some goals such as the plant response to temperature (same cardinal temperatures for Maceratino and Sangiovese but higher ones for Montepulciano), the interval ranging of growing degree units (from 35 to 38) and the differences between observed and predicted days (ranged from 2 to 3.5), for each grape varieties.