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SIMULATIONS ON DIFFERENT GRAPEVINE CULTIVARS WITH THE IVINE CROP GROWTH MODEL

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INTRODUCTION

The crop growth model IVINE (Italian Vineyard Integrated Numerical model for Estimating physiological values) was developed to simulate grapevine phenological and physiological processes and it was originally optimized only for cv. Nebbiolo. The IVINE model requires a set of meteorological data as boundary conditions, moreover informations about the vineyard and the cultivar are also required as input data. The main model outputs are: the timing of phenological stages, the leaf development, the yield, the berry sugar concentration and the predawn leaf water potential. Recently IVINE model has been calibrated and validated also on different grapevine varieties (cv. Barbera, cv. Merlot). We will present here the results of these preliminary simulations of grapevine growth processes executed using datasets assembled in the frame of MACSUR2 project.

MATERIALS AND METHODS

The input datasets used for simulations on Barbera and Merlot have been assembled in the frame of the MACSUR project (phase 2). Meteorological data for Barbera cv. have been taken in two vineyards located in Piedmont region, from 2008 to 2010 season:

Cocconato (45° 05' 20" N, 8° 02' 26" E, 311 m a.s.l.), soil type: silty clay loam

Fubine sites (44° 57' 49" N, 8° 25' 52" E, 210 m a.s.l.), soil type: clay loam

Meteorological data for Merlot cv. have been taken in a vineyard located in France, for 2004 and 2005 seasons:

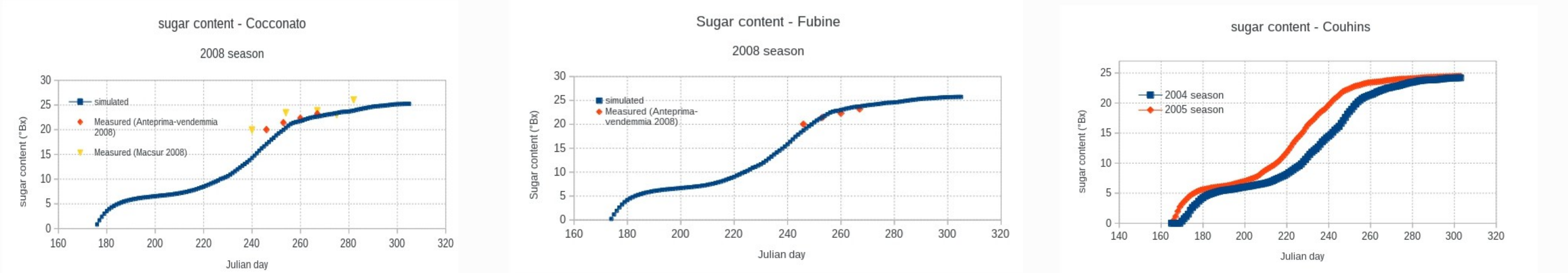
Couhins (44.75° N, 0.56° W, 23 m a.s.l.), soil type: loam

The meteorological databases assembled in the vineyards stations have been used as input data for the run of the land surface model UTOPIA (University of Torino model of land Process Interaction with Atmosphere). IVINE input data of soil temperature and soil water content were taken from the output of UTOPIA model while other input data were directly taken from the meteorological datasets.

An intercomparison between simulated data and in-field measured data has been done with the specific aim of calibrate and validate the model on Barbera and Merlot varieties.

RESULTS AND DISCUSSION

The main output variables analyzed are the phenological phases and the berry sugar concentration. The results of the intercomparison between simulated and measured data are presented.



In Cocconato site the simulated berry sugar content resulted close to the in-field measured values in the final part of the season while in the central part it was underestimated.

In Fubine site, simulated and measured values resulted to be close and the trend was well reproduced.

In Couhins site (France), two vegetative seasons have been compared. The graph clearly shows that the IVINE model was able to simulate the different evolution of sugar accumulation, depending on season meteorological conditions.

Phenological Stage Cocconato	Year	Simulated Julian day	Simulated BBCH	Measured Julian day	Measured BBCH
Bud-break	2008	92	7	122	15
	2009	98		92	7
	2010	110		138	15
Flowering	2008	162	65	150	61
	2009	149		145	63
	2010	159		154	60
Fruit-set	2008	167	71	202	77
	2009	154		191	75
	2010	163		176	75
Beginning of ripening	2008	230	81	223	79
	2009	217		202	77
	2010	225		209	79
Veraison	2008	236	83	244	83
	2009	222			
	2010	232			

In Cocconato site is evident an anticipation of the Julian day of simulated fruit-set stage particularly during the 2008 and 2009 vegetative seasons, and of veraison stage during the 2008 season.

Phenological Stage Couhins	Year	Simulated Julian day	Simulated BBCH	Measured Julian day	Measured BBCH
Bud-break	2004	108	7	114	7
	2005	104		108	7
Flowering	2004	160	65	157	65
	2005	153		152	65
Fruit-set	2004	163	71		
	2005	158			
Beginning of ripening	2004	230	81		
	2005	219			
Veraison	2004	233	83		83
	2005	222		220	83

In Couhins site a slight anticipation of bud-break simulated stage can be observed during the two analyzed seasons; while for the other analyzed BBCH stages measured and simulated Julian days are quite close.

Phenological Stage Fubine	Year	Simulated Julian day	Simulated BBCH	Measured Julian day	Measured BBCH
Bud-break	2008	91	7	120	16
	2009	97		105	12 – 13
	2010	109			
Flowering	2008	160	65	142	57
	2009	147		138	55
	2010	157			
Fruit-set	2008	165	71	171	71-73
	2009	152		159	73-75
	2010	161			
Beginning of ripening	2008	227	81	214	79
	2009	214		208	81
	2010	221			
Veraison	2008	233	83		
	2009	219		225	83
	2010	227			

In Fubine site there is a slight anticipation of Julian day of simulated stages of fruit-set (2008 season) and veraison (2009 season), and a delay of beginning of ripening simulated stage during 2008 and 2009 seasons.

CONCLUSIONS

The crop growth model IVINE, originally developed for Nebbiolo variety, has been calibrated for Barbera cv and Merlot cv. The IVINE model seems able to represent the evolution of growth processes in these two varieties. Eventual other available measured data collected in different vegetative season or in different sites could improve the calibration of the model and allow an higher accuracy on model outputs.

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