

Grapevine Sugar Concentration Model (GSCM): A decision support tool for the Douro Superior winemaking region

Nicolò Clemente¹, João A. Santos^{1,2}, Natacha Fontes³, António Graça³, Igor Gonçalves⁴ and Helder Fraga^{1,2*}

¹*Centre for the Research and Technology of Agro-Environmental and Biological Sciences, CITAB, Universidade de Trás-os-Montes e Alto Douro, UTAD, 5000-801 Vila Real, Portugal*

²*Institute for Innovation, Capacity Building and Sustainability of Agri-food Production, Universidade de Trás-os-Montes e Alto Douro, UTAD, 5000-801 Vila Real, Portugal*

³*Sogrape, Rua 5 de outubro, 4527, 4430-809 Avintes, Portugal, 4430-809 Avintes, Portugal*

⁴*Associação para o Desenvolvimento da Viticultura Duriense, Edifício Centro de Excelência da Vinha e do Vinho Parque de Ciência e Tecnologia de Vila Real, Régia Douro Park, Portugal*

*corresponding author: hfraga@utad.pt

Supplementary material

Table S1: Three versions of the models used in the present study. All models are performed under cross-validation for each location.

	1 st Version (free d and e)				2 nd Version (d fixed, free e)				3 rd Version (d and e fixed)		
Estates and sugar concentration	RMSE	EFF	e	d	RMSE	EFF	e	d	RMSE	EFF	fSigmoid
TN1 170	2.24	0.91	17.39	-36.11	2.25	0.91	17.38	-30.00	3.22	0.81	78.45
TN1 180	3.59	0.86	16.34	-31.75	3.05	0.86	18.02	-30.00	3.01	0.86	82.80
TN1 190	3.64	0.85	17.97	-30.67	3.62	0.85	17.96	-30.00	3.62	0.85	87.64
TN1 200	5.25	0.79	16.43	-37.98	5.20	0.80	16.32	-30.00	5.08	0.78	92.29
TN1 210	6.02	0.77	16.30	-31.88	5.90	0.78	16.37	-30.00	6.63	0.72	99.78
TN1 220	7.15	0.74	18.35	-37.61	7.10	0.74	18.31	-30.00	7.62	0.70	102.11
TN1 230	8.72	0.70	18.26	-32.25	8.66	0.71	18.30	-30.00	8.78	0.66	105.64
TN2 170	12.25	0.62	24.16	-23.12	12.14	0.63	-0.10	-30.00	17.00	0.27	40.00
TN2 180	10.25	0.63	24.13	-37.64	10.26	0.63	24.09	-30.00	13.48	0.35	44.02
TN2 190	5.14	0.85	24.17	-39.24	5.26	0.85	24.22	-30.00	9.00	0.55	51.19
TN2 200	2.91	0.92	22.16	-16.44	2.70	0.93	22.31	-30.00	4.91	0.76	57.19
TN2 210	1.96	0.92	20.44	-29.71	1.64	0.94	20.84	-30.00	1.86	0.93	64.71
TN2 220	2.16	0.93	19.76	-26.09	1.81	0.95	18.99	-30.00	5.43	0.54	70.75
TN2 230	2.97	0.79	19.58	-29.47	2.49	0.94	19.34	-30.00	5.82	0.74	78.76
TN3 170	2.08	0.91	19.57	-34.25	2.87	0.84	8.60	-30.00	3.17	0.80	65.81
TN3 180	4.90	0.66	19.41	-30.41	2.59	0.87	18.54	-30.00	5.72	0.53	54.26
TN3 190	6.48	0.53	-10.82	-3.32	6.33	0.55	19.65	-30.00	3.17	0.80	50.62
TN3 200	6.96	0.54	19.40	-39.83	6.99	0.54	19.42	-30.00	7.86	0.41	72.29
TN3 210	6.52	0.61	19.40	-32.40	6.54	0.61	19.39	-30.00	7.49	0.48	78.28
TN3 220	4.09	0.85	19.38	-38.54	4.03	0.85	19.40	-30.00	5.32	0.74	83.92
TN3 230	3.12	0.89	20.05	-34.13	3.05	0.91	19.79	-30.00	4.41	0.82	91.23
TF1 170	6.64	0.76	25.03	-37.30	6.66	0.76	24.98	-30.00	8.69	0.60	65.71
TF1 180	3.62	0.87	19.96	-25.16	2.86	0.92	18.37	-30.00	3.68	0.86	74.87
TF1 190	4.82	0.80	18.32	-34.30	4.83	0.80	18.34	-30.00	6.21	0.67	79.17
TF1 200	4.78	0.84	18.41	-39.40	4.79	0.84	18.48	-30.00	5.61	0.78	87.82
TF1 210	6.66	0.76	18.09	-23.07	6.59	0.77	18.50	-30.00	7.14	0.73	96.46
TF1 220	6.11	0.85	19.08	-35.98	6.15	0.85	19.11	-30.00	6.37	0.84	102.81
TF1 230	5.71	0.87	18.55	-39.96	5.59	0.88	18.52	-30.00	5.64	0.87	107.60
TF2 170	10.11	0.74	25.65	-26.56	14.02	0.56	26.80	-30.00	20.04	0.10	55.87
TF2 180	4.98	0.90	26.98	-7.59	7.71	0.62	17.94	-30.00	12.69	0.20	53.67
TF2 190	4.72	0.77	17.60	-24.30	4.28	0.76	17.67	-30.00	7.69	0.42	60.46
TF2 200	2.86	0.87	17.52	-22.50	2.74	0.87	19.45	-30.00	4.09	0.71	72.17
TF2 210	2.85	0.87	23.24	-14.24	1.65	0.96	20.01	-30.00	4.50	0.75	78.86
TF2 220	3.63	0.87	21.24	-21.60	2.74	0.91	22.75	-30.00	5.10	0.78	91.37
TF2 230	5.36	0.91	21.56	-10.39	4.91	0.91	21.55	-30.00	5.25	0.85	96.95

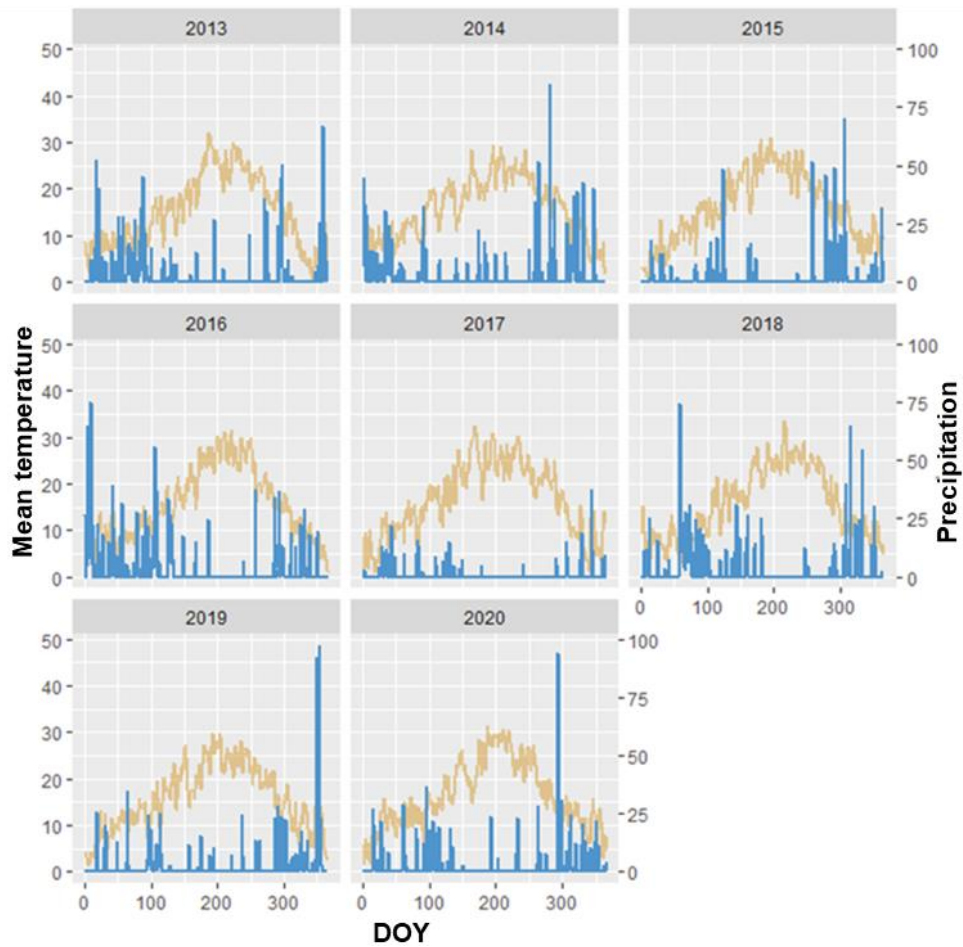


Figure S1: Bagnols & Gaussen diagram for each year separately and for estate TN1. Yellow curves correspond to the daily mean temperature (in °C, left y-axis), while blue bars correspond to the daily total precipitation (in mm, right y-axis).

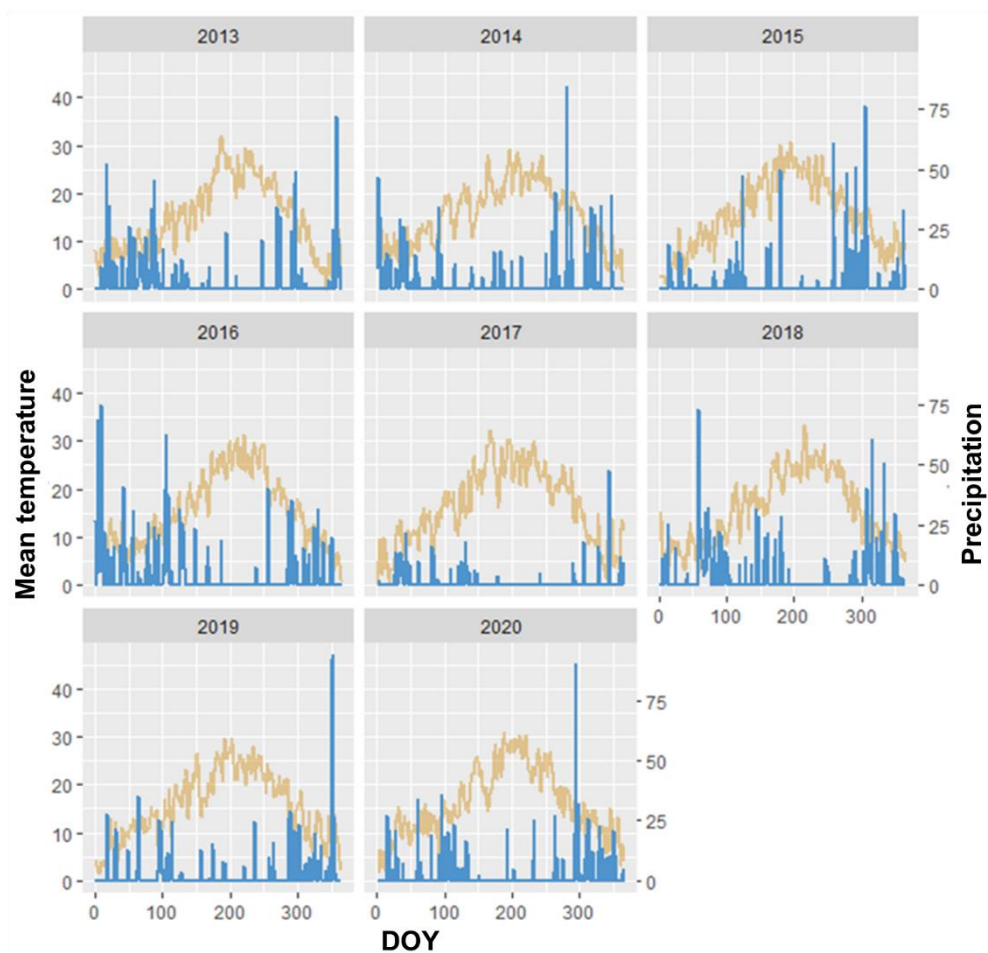


Figure S2: As in Figure S1 but estate TN2.

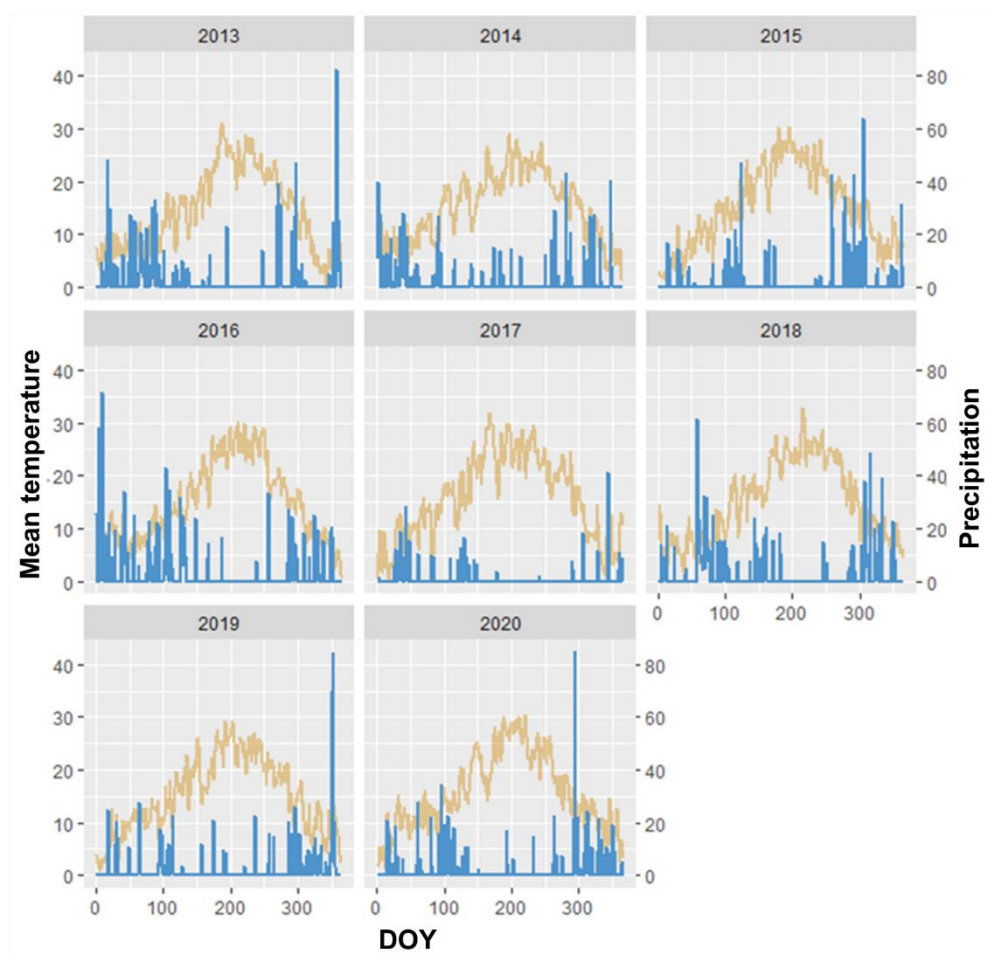


Figure S3: As in Figure S1 but estate TN3.

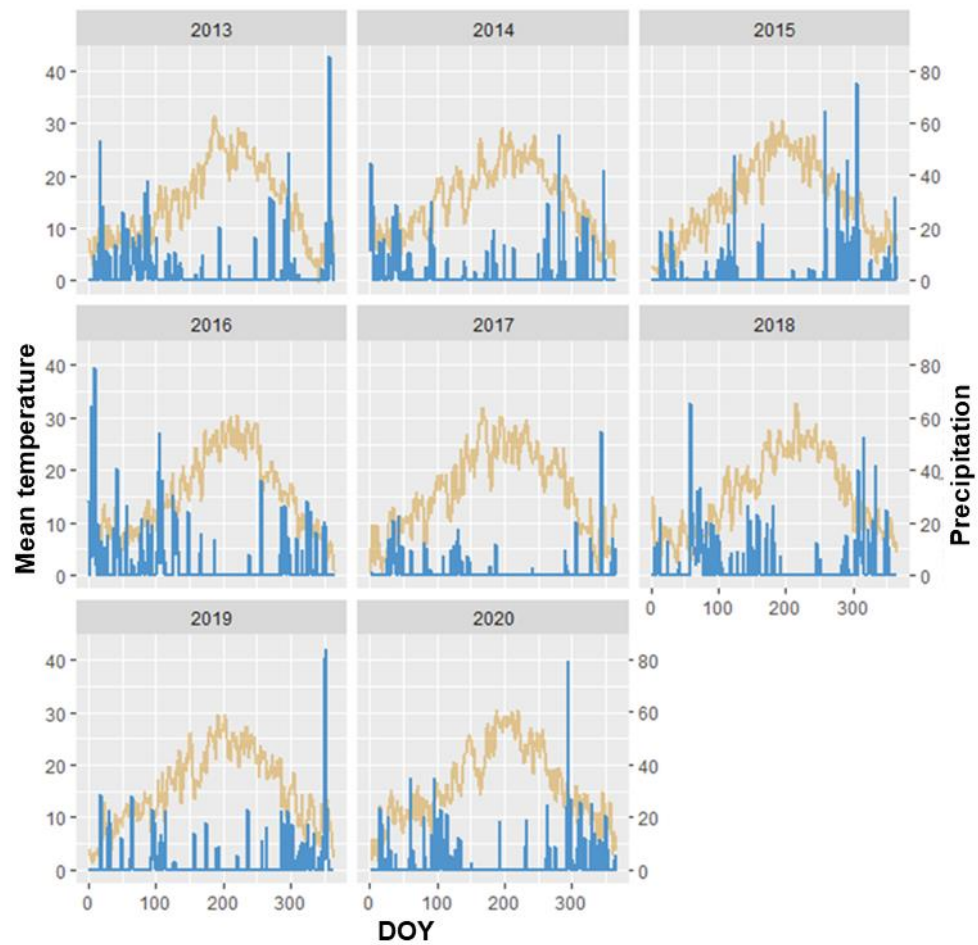


Figure S4: As in Figure S1 but estate TF1.

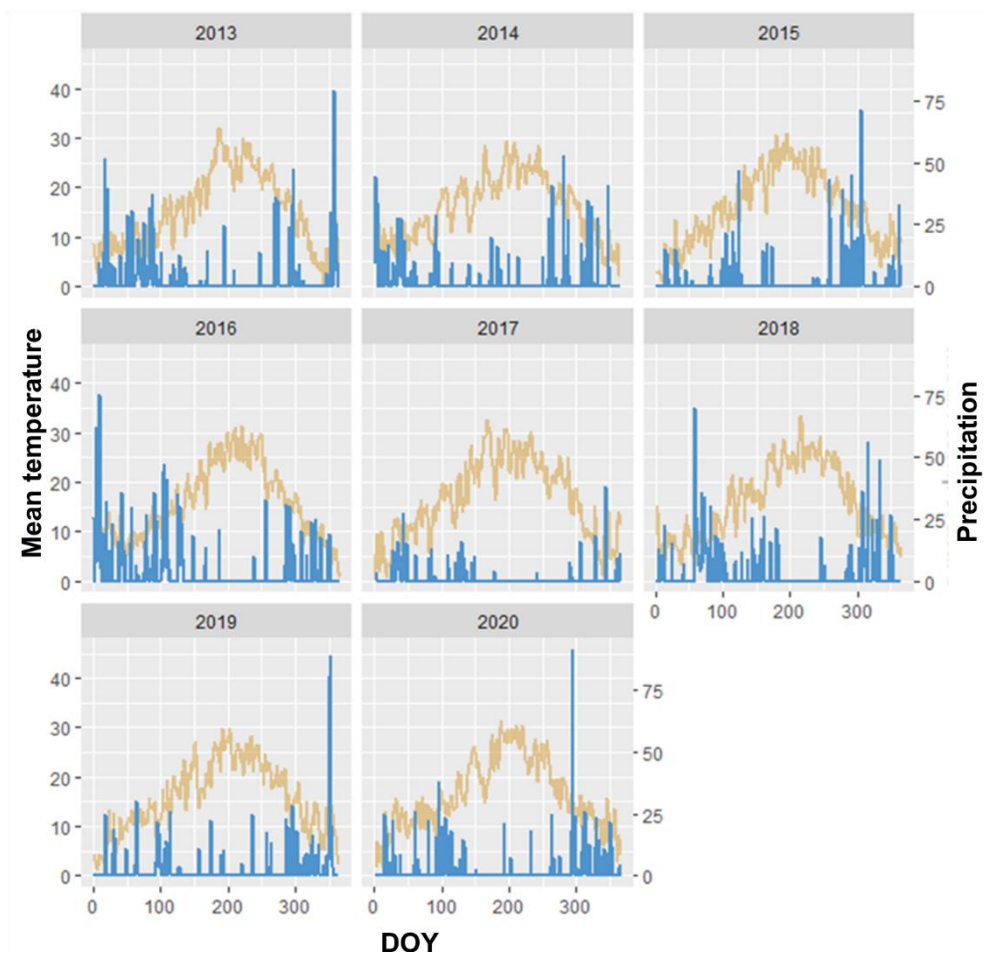


Figure S5: As in Figure S1 but estate TF2.