



GI-1716 – Proyectos y Planificación – Dpt Agroforestry Engineering



Authors:

E.M. Martínez, M. Fandiño, B.J. Rey, J.J. Cancela

Effects of climate variability on irrigation scheduling in white varieties of *Vitis vinifera* of NW Spain

Authors:

E. Trigo-Córdoba, Y. Bouzas-Cid, J.M. Mirás-Avalos



•Estación de Viticultura e Enoloxía de Galicia



INIA Project RTA2011-00041-C02-00

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Wien, 28 April



Irrigated Agriculture: Natural Resources Management for the Sustainability of the Ecosystem Maintaining Productivity

SSS10.10/HS8.3.20



SITE DESCRIPTION

- Galicia, NW Spain
- Commercial vineyards (15 years old)

cv. 'Godello'

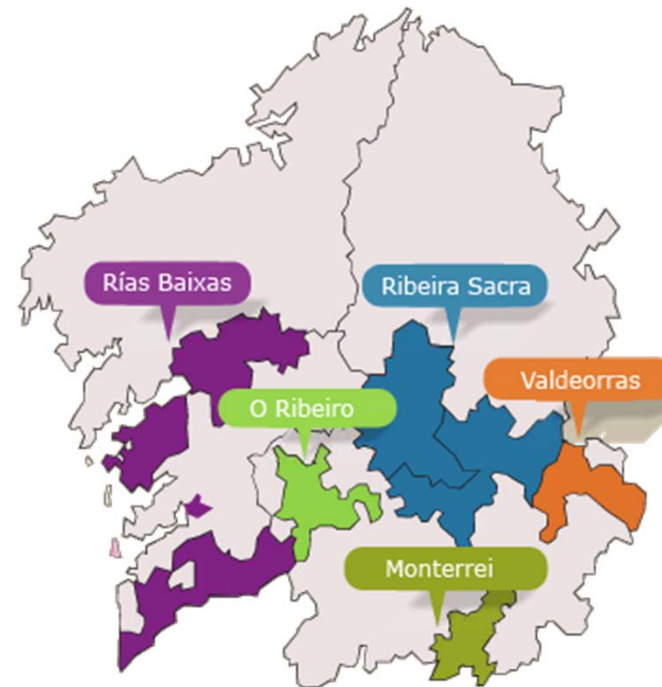
DO Monterrei

DO Valdeorras

cv. 'Albariño'

DO Rías Baixas

DO Ribeiro (Experimental Station)



AIM

- To characterize climate conditions in four Designations of Origin in Galicia – 2012/2013
 - Rainfall distribution
 - Bioclimatic indices
- Physiological effects of soil and irrigation practices in two Galician cultivars of *Vitis vinifera*:
 - Production and
 - Quality

MATERIALS AND METHODS

EXPERIMENTAL DESIGN

- Completely randomized block design - **4 replications (7 plants each)**
- Two treatments: **Rain-fed (R) and Surface Drip Irrigation (DI)**

CLIMATE CHARACTERIZATION

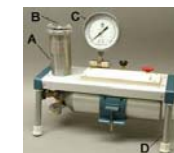
- Nearby agroclimatological stations (Xunta de Galicia)
- Bioclimatic indices:
 - Cool Night Index (CI)
 - Heliothermal Index (HI)
 - Winkler Index (WI) (Tonietto and Carboneau, 2004)
- Growing Degree Days (GDD)

SOIL ATTRIBUTES STUDIED

- Texture, pH and organic matter
- Chemical composition and soil water content (not shown)

PLANT WATER STATUS

- Leaf and stem water potentials at midday - Ψ_{mid} and Ψ_{stem}
(Scholander *et al.*, 1965)



RESULTS AND DISCUSSION - I

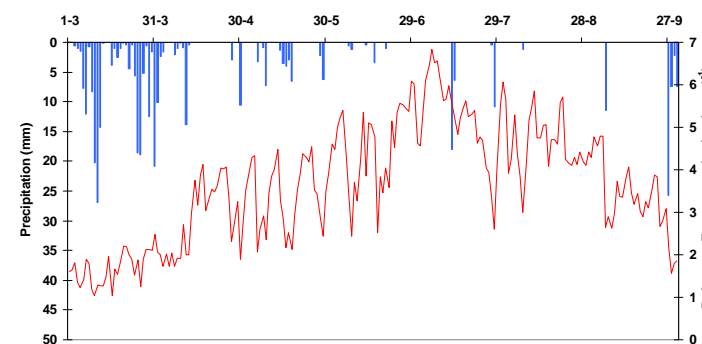
SOIL CHARACTERIZATION

	Sand (%)	Silt (%)	Clay (%)	pH (H ₂ O)	Organic Matter (%)	Soil
Monterrei	57.6	26.0	16.4	5.4	2.0	Sandy-loam
Valdeorras	42.9	33.4	23.7	5.2	2.4	Loam
Rías Baixas	66.7	14.8	18.5	6.6	5.9	Sandy-clay-loam
Ribeiro	63.3	17.7	19.0	6.3	2.8	Sandy-loam



CLIMATE CONDITIONS

	Rainfall (mm)			Average Temperature (°C)		
	2011	2012	2013	2011	2012	2013
Monterrei	-	258.9	159.3	-	15.9	16.8
Valdeorras	138.5	291.1	172.2	18.0	16.8	17.1
Ribeiro	131.2	352.8	269.0	18.5	17.1	17.9
Rías Baixas	209.8	564.0	408.8	18.5	16.9	17.6



Valdeorras – 2012 season

RESULTS AND DISCUSSION - II

BIOCLIMATIC INDICES

	CI		HI		WI	
	2012	2013	2012	2013	2012	2013
Monterrei	7.9	8.8	1886	2085	1200	1371
Valdeorras	12.0	13.0	1857	1975	1361	1467
Ribeiro	11.4	12.3	2980		1540	1581
Rías Baixas	14.8	14.5	2710		1296	1448

NO differences cv. 'Godello'

Temperate warm-temperate (HI)
Very cool night (CI)

cv. 'Albariño' → differences

Ribeiro: Cool nights
Rías Baixas: Warmer nights

GDD - IRRIGATION

	Irrigation (mm)		Irrig / (ET _o -Pre) (%)	
	2012	2013	2012	2013
Monterrei	0	92	0	18
Valdeorras	89	53	20	13
Ribeiro	50	79	16	14
Rías Baixas	8	16	4	4

START
IRRIGATION

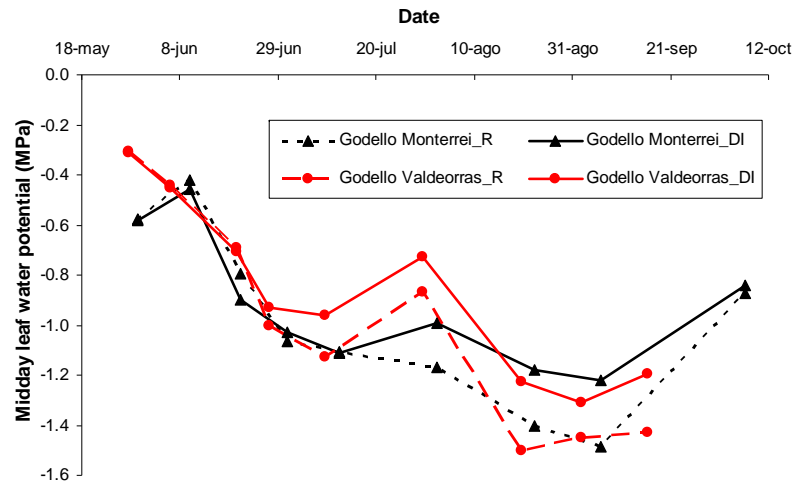
400 GDD
(average)

RDI

RESULTS AND DISCUSSION - III

LEAF WATER POTENTIAL

Ψ_{mid}

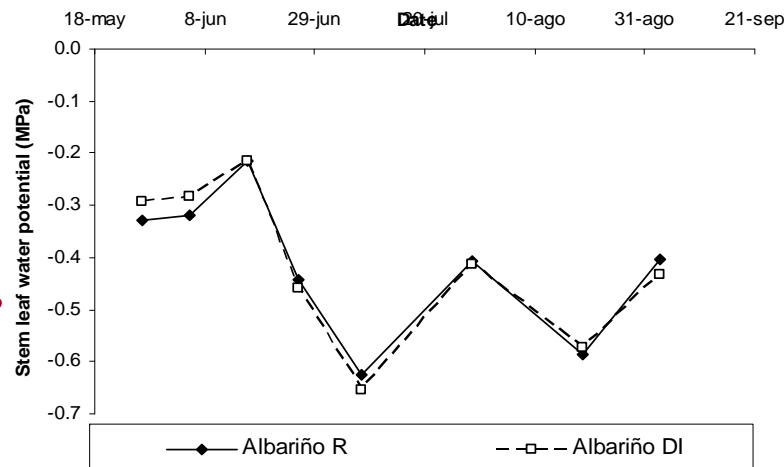


cv. 'Godello'
Parallel evolution Ψ_{mid}

More differences
between Treatments
in DO Monterrei

Ψ_{stem}

“Rías Baixas”



NO DIFFERENCES

Rías Baixas – Ψ_{stem}

Rest DO:
max 0.20-0.36

RESULTS AND DISCUSSION - IV

YIELD PARAMETERS

Yield per vine and number and weights of clusters

Monterrei < kg Rest DO
Yield → DI > R

			Yield (kg vine ⁻¹)		N° Clusters		Average cluster weight (g)	
			2012	2013	2012	2013	2012	2013
Godello	Monterrei	R	1.434	2.475	15.5	19.4	92.5	112.3
		DI	-	-	-	-	-	-
	Valdeorras	R	2.894	3.201	22.2	21.3	130.3	142.7
		DI	2.939	3.691	19.4	20.8	145.0	171.0
Albariño	Ribeiro	R	2.290	3.170	38.6	36.0	59.1	84.1
		DI	2.330	4.010	35.5	41.1	63.7	93.9
	Rías Baixas	R	3.540	6.450	52.1	65.9	62.5	97.8
		DI	3.980	6.570	55.3	74.1	70.0	97.3

QUALITY PARAMETERS

No significant differences

Titrateable acidity (g L⁻¹) DI > R

Probable alcoholic grade (% vol) DI ≈ R

CONCLUSIONS

- Bioclimatic indices

“... Cool Night Index and Winkler Index showed more differences in study DO...”

- Climate conditions affect “Physiological parameters” of Vineyard: HIGH

“...soil physics characteristics were an important factor for the same cultivars...”

“...leaf water potential was a good indicator for different treatments: R & DI...”

- Trigger Irrigation

“...start irrigation when GDD was 400 units...”

“...depth of irrigation enabled to observe higher differences in yield...” ↑↑ Dose

- Yield & Quality

“...slightly yield increases in DI...” “... no differences in must quality...”



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Javier J. Cancela - javierjose.cancela@usc.es

THANK YOU FOR YOUR ATTENTION

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