IRRIGATION EFFECTS ON SOIL ATTRIBUTES AND GRAPEVINE PERFORMANCE IN A 'GODELLO' VINEYARD OF NW SPAIN

M. Fandiño[1], E. Trigo-Córdoba[1,2], E.M. Martínez[1], Y. Bouzas-Cid[2], B.J. Rey[1], J.J. Cancela[1], J.M. Mirás-Avalos[2]

[1] GI-1716. Dpto. Ingeniería Agroforestal. Universidad de Santiago de Compostela. Escuela Politécnica Superior, Campus Universitario s/n, 27002, Lugo, Spain

[2] Estación de Viticultura e Enoloxía de Galicia, Leiro (Ourense), Spain

XUNTA DE GALICIA
CONSELLERÍA DO MEDIO RURAL E DO MAR
Estación de Viticultura e Enoloxía de Galicia

INSTITUTO GALEGO DA CALIDADE ALIMENTARIA
INGACAL

INTRODUCTION

Irrigation systems are increasingly being used in Galician vineyards. However, a lack of information about irrigation management can cause a bad use of these systems and, consequently, reductions in berry quality and loss of water resources. In this context, experiences with Galician cultivars may provide useful information.

OBJECTIVE

To assess the effects of irrigation on soil attributes, grapevine performance and berry composition of *Vitis vinifera* (L.) cv. 'Godello' in Galicia (NW Spain).

MATERIALS AND METHODS

Study site

Location: A Rúa (D.O. Valdeorras, NW Spain) (lat. 42º 23' 59'' N, long. 7° 7' 15'' W, alt. 320 m, slope 18%)

Growing seasons: 2012 and 2013

Plant material: Commercial 'Godello' (*Vitis vinifera* L.) vineyard (Fig. 1). Plants were 15 years old and vertically shoot positioned, grafted on 110R. Spacings: 2 m x 1 m (5000 plants ha^{-1})

Soil: 46.2% sand, 31% silt and 22.8% clay, pH (H_2O) 4.94 and 2.16% organic matter. Soil depth was 1.2 m

Climate: From April to October 2012, 16,3 °C average temperature and 354 mm total rainfall. From April to October 2013, 16,8 °C average temperature and 316 mm total rainfall (Fig. 2)

Experimental design and measurements

Treatments: rain-fed (R), surface drip irrigation (DI) and subsurface drip irrigation (SDI)

Field measurements: Vine midday leaf and stem water potentials were measured between bloom (end of May) and harvest (early-September). Stomatal conductance was measured at midday. Clusters per plant, yield per plant, average cluster weight and pruning weight were recorded

Laboratory determinations: Physical and chemical characteristics of soil. Soluble solids, pH, total acidity and amino acids on the grapes at harvest

Statistical analysis: ANOVA using the irrigation treatment as factor

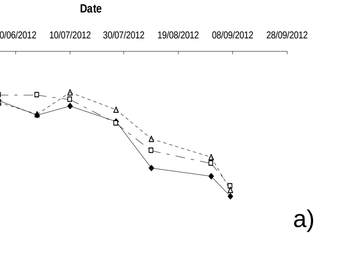

Fig. 1. Study site

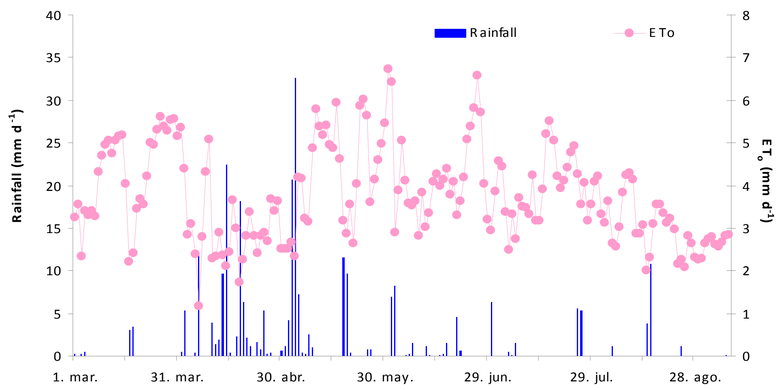

Fig. 2. Temporal dynamics of the daily rainfall and daily potential evapotranspiration (ETo) over the 2012 growing season

RESULTS

Soil attributes did not significantly vary due to the irrigation treatments (Table 1).

Treatment	Sand	Silt	Clay	pH (water)	pH (KCl)	Ca	Mg	Na	K	Al	CICe	Al	P	O.M.	C	N	C/N
	%					cmol kg^{-1}						%	mg kg^{-1}	%			
2012																	
R	44.05	32.63	23.32	5.20	4.20	1.58	0.44	0.45	0.53	0.82	3.83	23.28	17.21	2.14	1.24	0.11	11.83
DI	44.62	33.87	21.51	4.71	3.80	1.20	0.18	0.43	0.52	1.20	3.54	34.92	22.17	2.18	1.27	0.11	11.04
SDI	45.91	31.05	23.04	4.71	3.97	0.96	0.19	0.46	0.59	1.22	3.42	36.01	26.37	2.19	1.27	0.12	10.76
2013																	
R	42.00	35.20	22.80	5.15	4.08	0.89	0.22	0.07	0.59	1.17	2.93	39.74	17.91	2.26	1.31	0.12	10.68
DI	44.50	30.60	24.90	5.14	4.10	0.96	0.24	0.07	0.63	1.20	3.10	38.86	18.52	2.42	1.41	0.14	9.84
SDI	42.10	34.40	23.50	5.30	4.21	1.26	0.31	0.09	0.69	0.92	3.25	28.31	20.01	2.40	1.39	0.13	10.86

Table 1. Soil attributes for the different treatments (2012-13)

Treatment	Nº Clusters	Yield (kg $plant^{-1}$)	Cluster weight (g)	Pruning weight (kg $plant^{-1}$)
2012				
R	22.18	2.89	130.31	0.70
DI	19.44	2.94	144.97	0.86
SDI	21.57	3.50	152.47	0.67
2013				
R	21.32	3.20	142.73	0.68
DI	20.79	3.69	170.98	0.77
SDI	26.68	4.18	152.77	0.73

Table 2. Yield components and pruning weight for the different treatments (2012-13)

SDI plants yielded more than those R due to both a greater number of clusters and to heavier clusters. Pruning weight was significantly higher in SI plants (Table 2).

Fig. 3. Stem water potential for the three treatments over the 2012 (a) and 2013 (b) growing seasons

Treatment	Probable alcohol grade (% vol)	Total acidity (g L^{-1})	pH	Amino acids (ppm)
2012				
R	13.65	6.45	3.20	715.93
DI	13.30	6.95	3.18	833.32
SDI	12.90	7.85	3.14	622.63
2013				
R	14.35	6.20	3.33	551.13
DI	14.20	6.10	3.33	588.43
SDI	14.10	6.85	3.26	571.95

Table 3. Berry composition for the different treatments (2012-13)

Berry composition was similar for the three treatments except for the amino acids content, which was higher under SDI (Table 3).

Stem water potentials were significantly lower for R plants on certain dates over the season (Fig. 3). Stomatal conductance was similar for the three treatments in 2013 (Fig. 4).

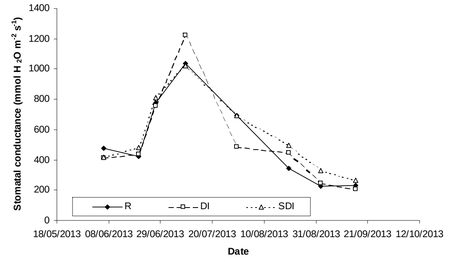

Fig. 4. Stomatal conductance for the three treatments over the 2013 growing season

These results may be helpful for a sustainable management of irrigation in Galician vineyards.

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