

Spatial distribution of symptomatic grapevines with esca disease in the Madrid region (Spain)

CRISTINA REDONDO ¹, M. LUISA TELLO ¹, ARÁNZAZU AVILA ¹ and ELOY MATEO-SAGASTA ².

¹ Plant Pathology Laboratory, Instituto Madrileño de Investigación Agraria y Alimentaria (I.M.I.A.), Autovía de Aragón, km 38.200, Apdo. 127, Alcalá de Henares 28800, Madrid, Spain

² Cátedra de Patología Vegetal, Escuela Técnica Superior de Ingenieros Agrónomos, Universidad Politécnica de Madrid, Ciudad Universitaria s/n, Madrid 28040, Spain.

Summary. From 1998 to 2001 three vineyards in the three areas Arganda, San Martín de Valdeiglesias and Navalcarnero, included in the vine-growing region “Wines of Madrid”, were surveyed for esca incidence and spatial distribution of infected vines. Individual vines were recorded as “diseased” when they showed esca symptoms, both in summer surveys (symptoms on leaves, weak growth, short branches growth) and in winter surveys (necrosis of trunk and main branches). Data recorded over several years in the same vineyard and data from different vineyards in the same year were compared in order to study disease spread and possible primary sources of infection. Our results showed that: i) esca foliar symptoms were discontinuous from year to year; ii) the distribution of infected vines in the vineyard was random and, iii) the disease was not spread between adjacent vines.

Key words: *Vitis vinifera* L., epidemiology, grapevine trunk disease.

Introduction

Grapevine (*Vitis vinifera* L.) is one of the most important crops, historically and economically, in Spain. In the Madrid region, grape-growing covers some 20,000 ha, which represents 8% of the total crop of the region. They are included in the vine-growing region “Wines of Madrid” which is subdivided into three areas: Arganda, Navalcarnero and San Martín de Valdeiglesias. Over the last few years, an increasing number of vineyards in Spain have been affected by esca (esca proper, Graniti *et al.*, 1999) including the Madrid region.

The present report describes the spatial distribution of vines with esca in the vineyards in the Madrid region. Detection of esca was based on the presence of leaf symptoms appearance in the same vineyard over several years and in different vineyards in individual years. Weather data were also recorded in order to study the influence of environmental factors on disease incidence and spread.

Materials and methods

Since 1998 a vineyard from each of the three locations, Valdilecha in Arganda area, Navalcarnero in Navalcarnero area, and San Martín de Valdeiglesias in San Martín de Valdeiglesias area, was monitored.

The vineyard in Arganda was monitored for four years, from 1998 to 2001, those in Navalcarnero

Corresponding author: C. Redondo
Fax: +34 91 8879494
E-mail: cristina.redondo@imia.comadrid.es

and San Martín de Valdeiglesias were surveyed in 2000 and 2001. Individual plants in these vineyards, from 30 to 60 years old and “gobelet” system pruned, were recorded as “diseased” when they showed esca symptoms both in the summer survey (September: characteristic symptoms on leaves, weak growth, short branches) and in winter (February: necrosis of trunk and main branches due to apoplectic stroke; trunks that showed necrosis in the cutting wounds produced by cultural practices; presence of basiodiocarps on the trunk and main branches, mainly of the species *Fomitiporia punctata*, *Stereum hirsutum*, *Trametes versicolor*). For each vineyard a two-dimensional map was prepared.

To identify any pattern in the distribution of symptomatic vines, we tested the null hypothesis that the average distance between symptomatic vines was not significantly different from the average distance between vines when locations were assigned at random (Cortesi *et al.*, 2000). Randomization was performed 1000 times for each test.

Weather data (temperature, relative humidity, rainfall and solar radiation) from 1997 to 2000 were provided by weather stations located in the areas surveyed.

Results and discussion

Vines with esca were found in all three vineyards (Fig. 1, Table 1). In the Arganda vineyard esca incidence (% vines with symptoms) was very low in 1998 (0.5%), 1999 (0.9%) and 2000 (1.5%), but in 2001 it increased suddenly and unexpected-

ly to 18.6%. If for all the survey years after 1998 both vines with symptoms in that year and all those vines that had been symptomatic in any previous survey year or years were counted, the cumulative incidence so obtained increased steadily: 1.0% in 1999, 2.1% in 2000, and 17.2 in 2001. In the Navalcarnero vineyard both the annual incidence (19.9% in 2000, 21.9% in 2001) and the cumulative incidence (31.8%) were higher than in the Arganda vineyard (Fig.1, Table 1). In the San Martín de Valdeiglesias vineyard the cumulative incidence (2000 + 2001) did not exceed 16.0%.

An examination of weather data revealed that rainfall was higher in winter 2000 than in the winters and springs of previous years. The summer of 2001 was cool with low rainfall levels (or relatively dry). These conditions have been reported to be favourable for the appearance of esca leaf symptoms (Surico *et al.*, 2000a).

The two-dimensional maps drawn up for the vineyards at Navalcamero and San Martín de Valdeiglesias show that most plants symptomatic in one year were asymptomatic the next, confirming findings in Italy that external esca symptoms are discontinuous from year to year (Mugnai *et al.*, 1996; Surico *et al.*, 2000a, 2000b).

The statistical analysis indicated that symptomatic grapevines were not aggregated, except in the 1999 survey at Arganda. However in this case the differences between expected and observed distances were only small (observed distances 5% less than expected distances). We can thus confirm the findings of Surico *et al.*, (2000b) that esca is not transmitted between adjacent vines.

Table 1. Annual and cumulated disease incidence (%) from 1998 to 2001, in 3 regions of Madrid (Spain). Average distance between symptomatic vines and expected distance is also reported.

Region	Years surveyed for symptoms	No. of vines		Esca incidence (%)		Rows		Columns		Average distance between symptomatic vines		Expected distance for a random pattern ($P < 0.005$)
		Examined	Symptomatic	Annual	Cumulated	No.	Distance	No.	Distance	in rows	in columns	
Arganda	1998	806	4	0.50		40	3.1	36	3.1	34.8	44.38	40.6
	1999	780	7	0.90	1.02	40	3.1	36	3.1	36.2	39.56	39.3
	2000	754	11	1.46	2.12	40	3.1	36	3.1	35.1	42.61	41.3
	2001	731	136	18.60	17.23	40	3.1	36	3.1	17.58	14.63	15.1
Navalcarnero	2000	815	162	19.88		32	3	37	3	12.72	13.61	12.7
	2001	779	171	21.95	31.84	32	3	37	3	12.96	13.45	13.9
S. Martin Vld	2000	825	67	8.12		53	3	17	3	15.52	25.46	26.8
	2001	825	64	7.76	15.4	53	3	17	3	15.5	29.19	29.3

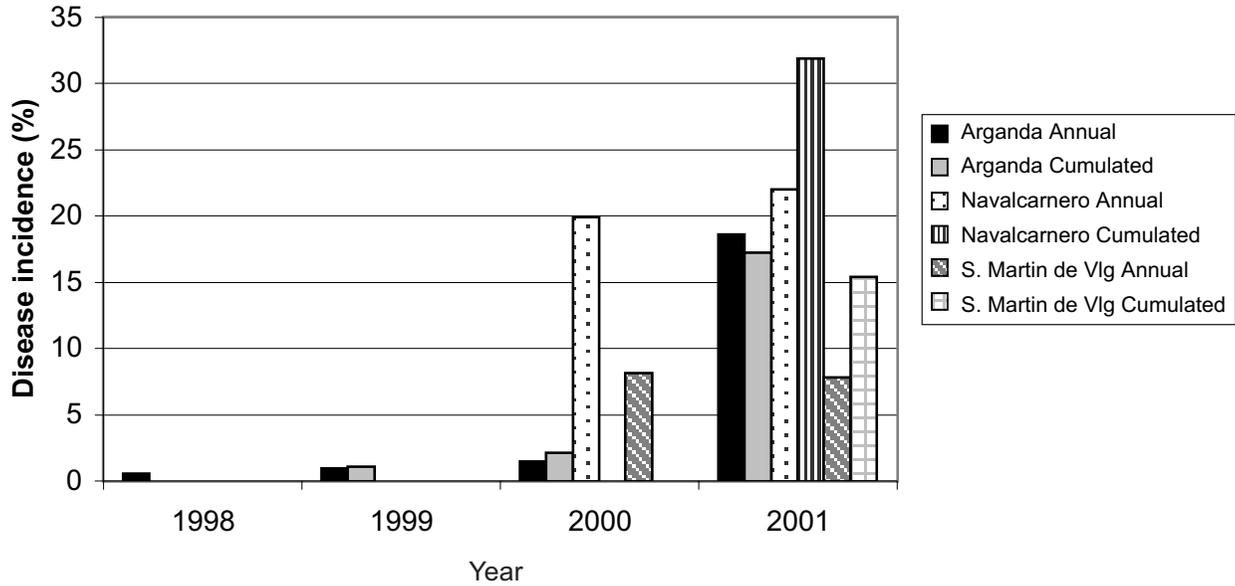


Fig. 1. Annual and cumulated esca incidence at Arganda, Navalcarnero and San Martín de Valdeiglesias.

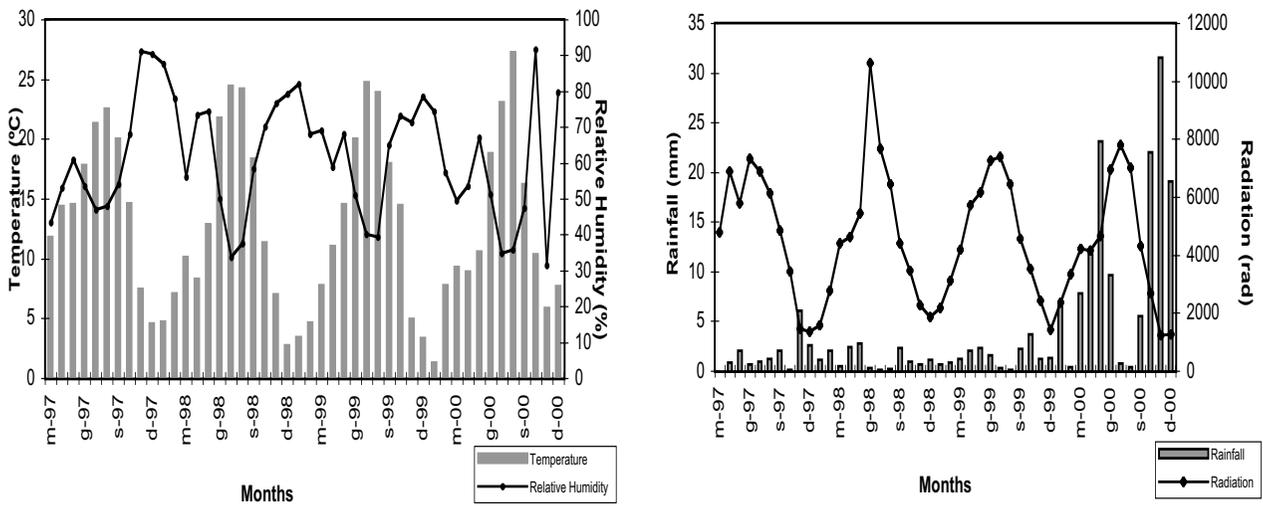


Fig. 2. Weather parameters: mean monthly temperature (°C), relative humidity (%), rainfall (mm) and solar radiation (rad.). Data collected from 1997 to 2000.

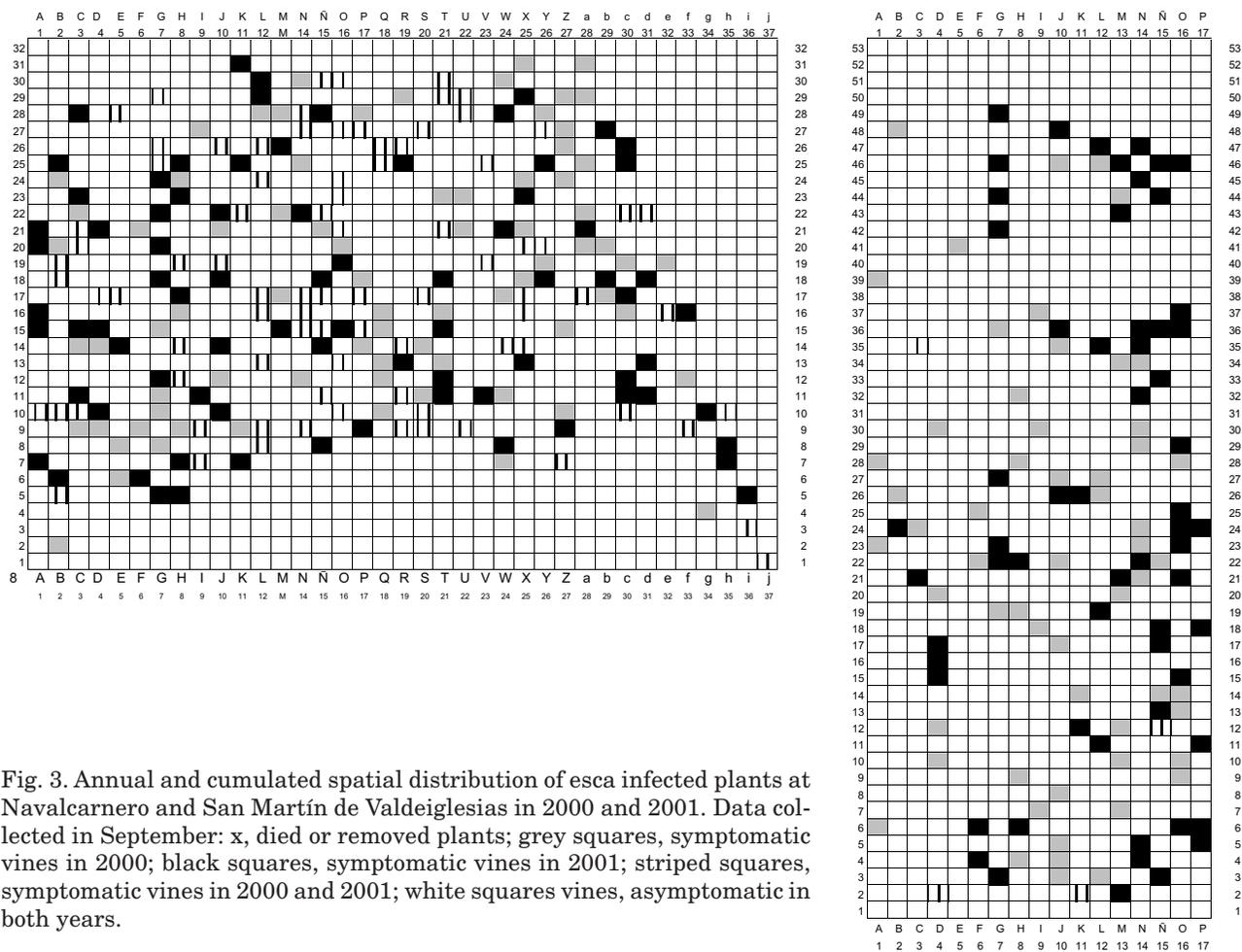


Fig. 3. Annual and cumulated spatial distribution of esca infected plants at Navalcarnero and San Martín de Valdeiglesias in 2000 and 2001. Data collected in September: x, died or removed plants; grey squares, symptomatic vines in 2000; black squares, symptomatic vines in 2001; striped squares, symptomatic vines in 2000 and 2001; white squares vines, asymptomatic in both years.

Literature cited

Cortesi P., M. Fischer and M.G. Milgroom, 2000. Identification and spread of *Fomitiporia punctata* associated with wood decay of grapevine showing symptoms of esca. *Phytopathology* 90(9), 967–972.
 Graniti A., G. Surico and L. Mugnai, 1999. Considerazioni sul mal dell’esca e sulle venature brune del legno della vite. *Informatore Fitopatologico* 49(5), 6–12.
 Mugnai L., R. Imbriani and G. Surico, 1996. Study on the

incidence and severity of grapevine esca disease in some vineyards in Tuscany. *Informatore Fitopatologico*, 46, 50–56.
 Surico G., G. Marchi, F.J. Ferrandino, P. Braccini, and L. Mugnai, 2000a. Analysis of the spatial spread of esca in some Tuscan vineyards (Italy). *Phytopathologia Mediterranea* 39, 211–224.
 Surico G., G. Marchi, P. Braccini, and L. Mugnai, 2000b. Epidemiology of esca in some vineyardas in Tuscany (Italy). *Phytopathologia Mediterranea* 39, 190–205.

Accepted for publication: December 18, 2001