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Research Note

Composition of grapes from cv. Trebbiano romagnolo affected by Esca

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Introduction: Cryptogamic diseases of the wood and, in particular, esca have gained increased attention both for the intensity of damage and the spread even in newly established vineyards. Its aetiology is related to two recognizable basidiomycetes, *Phellinus igniarius* and *Stereum hirsutum*. The former is recognizable by the red-brown or yellow carpofore, which appears on the wood in spring, whereas the *Stereum hirsutum* carpofore is a grey, shaggy, and bracket-shaped structure appearing in autumn (Vercesi 1988). The contemporary presence of at least 5 mycetes (*Cephalosporium* sp., *Phialophora parasitica, Eutypa lata*, *Phellinus igniarius* and *Stereum hirsutum*) has been related to the Esca symptomatology (Larignon 1991).

Wood lacerations caused by viticultural practices or environmental events like frost or hail are the prevalent ways of infection. Mycelia growth causes enzymatic degradation of lignin and affects cellular respiration and protein synthesis (Egger 1988).

The xylem system is seriously degraded and, at the end of this process, it is brown and spongy. Leaves show a yellow-red pigmentation between the vessels that may lead to rapid plant desiccation (acute form). Affected berries present sclerotic spots.

The spread of the disease is rising due to an increasing frequency of summer pruning and mechanical harvesting. The chronic form of Esca allows a 4 to 8-year period of host survival during which plants can yield satisfactorily; for this reason, vinification of partially affected grapes may become more and more probable.

The aim of this work was a preliminary evaluation of the effect of Esca on must composition in the first latent stage of the disease.

Material and Methods: Berry samples from Trebbiano romagnolo were collected from vineyards at the Azienda Naldi in Faenza (Italy). The 2.5 ha vineyard was located in a foothill area (120 m a.s.l.) with a row orientation to south-east. Plant distance was 1.5 m within the rows and 4.0 m between the rows; vines were grafted to Kober 5 BB and the trellis system was Guyot.

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The general appearance of the plants (berry number and size, canopy leaf area, etc.) as well as yield were the same for all vines. The infection started in 1992 and at the sampling date the infection rate was 20 %. The infected plants showed some typical symptoms but only a microscopic examination of the tissue confirmed the presence of Esca.

Sampling was carried out as previously reported (Amati *et al.* 1994). Sound and affected berries were divided into three parts, and stored at –15 °C in air-tight containers.

Analysis of the phenolic composition of must was carried out with berries after removal of petioles and seeds. The samples were homogenized in a Silverson laboratory homogenizer operating under nitrogen atmosphere using a 33 % methanol/water solution in the presence of sulphur dioxide ($K_2S_2O_5$, 400 mg l^{-1}). The other analyses were carried out using distilled water for homogenization. Each homogenate was centrifuged at 2400 *g* for 15 min. Chemical analyses were performed as previously reported (Pallotta *et al.* 1994, 1995). Amino acids were quantified according to Buiatti *et al.* (1989). Each analytical determination was performed in triplicate. Statistics were carried out with the "Statistica" package for Windows.

Results: Berry composition was significantly affected by Esca, most solutes being reduced. In contrast, phenolics and amino acids showed a distinct increase (Table).

Sugar concentration was probably influenced by a decline of the photosynthesis due to reductions of the leaf area.

Among the ions, the low potassium concentration in infected samples is particularly significant. This element is involved in sugar and protein synthesis and in condensation processes and plays a fundamental role in cell permeability. Low potassium concentrations may contribute to the development of Esca. The decrease of ash alkalinity was a direct consequence of the depressed cation uptake of infected plants. Also malic acid was significantly lowered by Esca.

On the contrary, the concentration of phenolics was increased due to the cryptogamic attack (Calzarano and Di Marco 1997).

The total amino acid content in general, and the valine, isoleucine, tyrosine, phenylalanine, glutamine contents in particular showed the most significant variations (Table). It is worth mentioning that some of them are the natural precursors of substances such as phenylethanol alcohol, isobutanol, 3-metyl-1-butanol and 2-metyl-1-butanol, which are very important sensorial characteristics of wine.

Conclusions: In spite of the reduced number of observations and considering that only one grape variety was studied, it becomes obvious that significant modifications of grape must composition occurred due to Esca. Damage of leaves and the vascular system by Esca are supposed to lead to modifications of the must composition; their effects on wine quality are still unclear. The increase of the amino acid content, which affects the metabolism of yeast and the decrease of the cation content, which is important for wine stability, were the most important alterations observed.

Table

Grape composition (average of 3 determinations) of sound and infected material. Values marked with * and ** are significantly different for p = 0.05 and p = 0.01, respectively

		Sound	Infected
Glucose	g·kg^{-1}	69	64 *
Fructose	g·kg^{-1}	82	77 *
Glucose/fructose		0.84	0.83
Ashes	g·kg^{-1}	3.65	3.28
Ash alcalinity	meq·kg^{-1}	49.2	40.2 *
Total acidity	g·kg^{-1}	8.3	8.4
Tartaric acid	g·kg^{-1}	7.1	7.2
Malic acid	g·kg^{-1}	2.9	2.2 *
Citric acid	g·kg^{-1}	0.135	0.133
Succinic acid	g·kg^{-1}	0.206	0.187
Total phenolics	mg·kg^{-1}	499	701 **
Phenolic acids	mg·kg^{-1}	35	42 *
K	mg·kg^{-1}	873	679 **
Ca	mg·kg^{-1}	134	138
Mg	mg·kg^{-1}	92	60 **
Na	mg·kg^{-1}	13	8
Fe	mg·kg^{-1}	traces	traces
Cu	mg·kg^{-1}	3.2	2.6 *
Alanine	mg·kg^{-1}	24.2	21.9
Valine	mg·kg^{-1}	14.2	22.1*
Threonine	mg·kg^{-1}	19.8	22.1
Glycine	mg·kg^{-1}	2.1	2.1
Isoleucine	mg·kg^{-1}	10.2	19 *
Proline	mg·kg^{-1}	73.6	85.5
Leucine	mg·kg^{-1}	15.2	29.1
Serine	mg·kg^{-1}	10.9	14.2
D,L-GABA	mg·kg^{-1}	82.9	112.1 *
Hydroxyproline	mg·kg^{-1}	12.8	11
Methionine	mg·kg^{-1}	8.0	8.1
Asparagine+Aspartic acid	mg·kg^{-1}	27.3	36.6
Phenylalanine	mg·kg^{-1}	12.7	27.8 *
Glutamine+Glutammic acid	mg·kg^{-1}	94.1	153.9 *
Tyrosine	mg·kg^{-1}	0.6	1.5 *
Lysine	mg·kg^{-1}	1.5	2.3
Total amino acids	mg·kg^{-1}	410.1	569.3 *

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