Grapevine Berry Phenolic Compounds in Relation with Plant Water Status

Phenolische Substanzen in Weinbeeren in Abhängigkeit von der Wasserversorgung

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Grape derived secondary metabolites are the principal sources of wine aroma, flavor, color and taste. Most of available data about phenolics are concerned mature berries. Nevertheless, the contribution of flavonols in metabolism may be important, not only in red berries, but especially in green, when the berries are most susceptible to different kind of stresses. The changes in phenol composition in green berries, under water stress conditions (Ojeda *et al.*, 2001; in press) and with different training systems (Kraeva *et al*, 2001; submitted) have been observed

We studied the black grapevine varieties *Vitis vinifera* L cv. Syrah and Grenache noir. The experiments were carried at different stages of grape growth in controlled conditions (adult plants grown in containers with a drip irrigation) and in the vineyard (terroir effect). The training systems were ˆLyre¤ and ˆEspalier¤ pruned as cordon. The plant water status was estimated by predawn leaf water potential (table 1).

Table 1: Plant water status was estimated by predawn leaf water potential. Syrah are irrigated adult vines in pot : (T) = controlled vines; (S) = stressed vines. Grenache are vines in experimental vineyard : (NI) = non irrigated vines (terroir reference); (I) = irrigated vines in the same terroir.

Varieties	**Predawn leaf water potential (Ψ_b) from anthesis to véraison**	**Predawn leaf water potential (Ψ_b) from véraison to maturity**	
Syrah	**≤ –0,2 Mpa**	**T**	**S**
		≤ –0,2 Mpa	**≥ –0,6 Mpa**
Grenache	**≤ –0,3 Mpa**	**I**	**NI**
		± –0,4 Mpa	**± –0,6 Mpa**

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The effects of plant water status on berry growth was studied (Ojeda *et al*, 1998, 1999 and 2001). Water deficit did not affect cell division as we have shown by DNA extraction profiles. Reduction of berry size and berry weight was caused exclusively by a decrease of pericarp volume. Thus water deficit increased the skin-to-pulp ration, which has important consequence on both phenolic biosynthesis and concentration.

Water deficit level occurred during véraison to maturity period stimulate the flavonol biosynthesis (Figure 1). The training system, in relation with bunches microclimate, could modify the berry phenolic composition (Kraeva *et al*, 2001; submitted).

The flavonol compounds are synthesised in the epidermal cells of berry skin and sequestered as various glycosides in the central vacuoles. Flavonols are synthesised in the epidermis. The quercetin (a major flavonol compound) is predominantly present in the glycosylated form in grape berries (Price *et al.*, 1995). It has been suggested that these glycosides act as UV screening compounds, helping to protect the plant tissue from damage, but also against pathogens (Dai *et al.*, 1995a Deloire *et al.*, 1998). Moreover, we have shown (Kraeva *et al.*, 2001, submitted) the role of flavans and flavonols against the elicitation with salicylic acid (SA), which was known to enhanced oxidative stress and induced defense reaction in plants (Chen *et al.*, 1993).

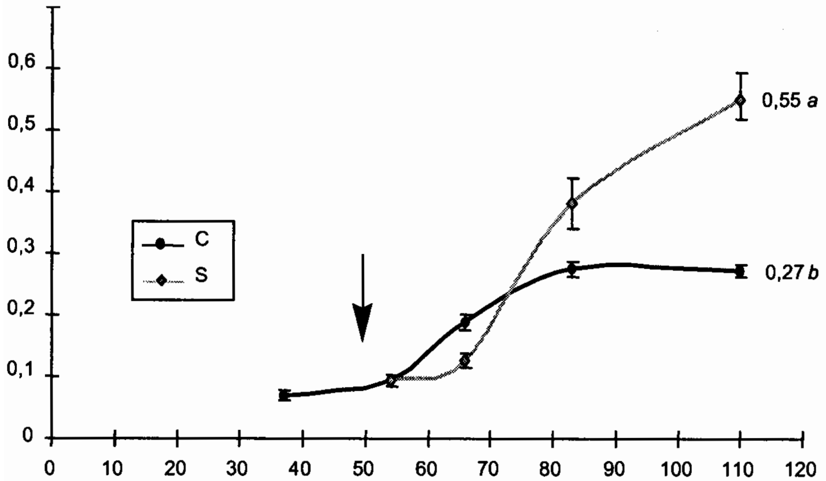

Figure 1: Flavonols content expressed in mg rutin equivalent, of Syrah berries of control plants and of plants affected by to water deficit treatment. *C = control (100% ETP). S = water deficit between veraison and maturity (30% ETP). The arrow indicate the onset of veraison (softening of 10% of the berries).*

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