GRUPPI QUESITI ESTRATTI ALLA PROVA ORALE DEL 23.12.2022 DEL CONCORSO PUBBLICO, PER ESAMI, A N. 1 POSTO DI CATEGORIA C, POSIZIONE ECONOMICA C1, AREA TECNICA, TECNICO-SCIENTIFICA ED ELABORAZIONE DATI, PER LE ESIGENZE DELLA SEDE DISTACCATA DI AVELLINO (SEZIONE DI SCIENZE DELLA VIGNA E DEL VINO) DEL DIPARTIMENTO DI AGRARIA DELL'UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II (COD. RIF. 2224)

GRUPPO QUESITI 1

1) Principali vitigni a bacca bianca della Campania
2) Tecniche di vinificazione delle uve bianche
3) Dati i seguenti valori: 0,76; 1,23; 2.64; 0,89; 1,01; inserirli in una colonna excel e calcolarne la somma

QUESITO IN LINGUA INGLESE DA LEGGERE E TRADURRE

Fruit Ripening in *Vitis vinifera* L.: Responses to Seasonal Water Deficits

MARK A. MATTHEWS[1]* and MICHAEL M. ANDERSON[2]

The response of fruit ripening to vine water status was investigated in a hillside Cabernet franc vineyard in the North Coast region of California. Treatments were imposed by drip irrigation at 2 X the standard practice rate (continual) to maintain high water status, by withholding water before (early deficit) or after (late deficit) veraison, or by withholding water throughout most of the season (full deficit). Midday leaf water potential of continual vines decreased from approximately –0.3 MPa before bloom to –1.13 MPa at veraison and to -1.32 MPa at harvest. Leaf water potentials of early deficit and late deficit vines were approximately 0.3 MPa more negative than continual vines at veraison and harvest, respectively. After veraison, water status of early deficit vines recovered to the level of continual vines. These moderate differences in water status at different phenological stages altered fruit composition at harvest. The concentrations of phenolics in juice and dermal extracts and of anthocyanins in dermal extracts were increased by all treatments which withheld water. Malate concentrations were significantly lower in treatments which imposed low vine water status before veraison. Low vine water status after veraison increased proline concentration significantly. There were no treatment effects on the onset of veraison, the duration of ripening, juice pH, or potassium levels, and little difference in °Brix or titratable acidity. Thus, irrigation to obtain seasonal water deficits may offer a cultural control of winegrape composition without significant effects on the time required to reach maturity.

KEY WORDS: water stress, irrigation, malate, proline, phenolics, potassium

The North Coast region of California is recognized for the production of premium winegrapes. In this region, many vineyards are irrigated weekly, while others are totally dependent upon stored soil water. Plantings have expanded from the valley floors, where soils are often of adequate depth and some growers have ample irrigation water, to the hillsides where soils are shallow and reservoirs limited. Hence, the water status of vines is likely to vary among vineyards and during the season.

It is clear that water status affects a myriad of plant functions (4). The importance of understanding physiological responses to water status is magnified in wine grapes, where the composition of fruit challenges yield as the primary parameter of productivity. However, there are no reports of vine responses (*e.g.*, growth or fruit composition) to irrigation or to vine water status in North Coast vineyards. Indeed, the role of vine water status in determining the reproductive development and composition of winegrapes is, in general, not known (27,33). Therefore, this study was conducted to determine the extent to which reproductive development, including the ripening process, is sensitive to vine water status. In this paper, we report that the levels of selected juice solutes of potential importance in winemaking respond differentially to seasonal water deficits.

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This research was conducted at the University of California, Davis.

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Materials and Methods

The site of the study was selected for its shallow, light soil (gravelly loam), southwestern aspect, premium winegrape variety, and vine uniformity. Six-year-old vines (*Vitis vinifera* L., cv. Cabernet franc on Ganzin (A × R1) rootstock) in a commercial hillside (approx. 20% grade) vineyard near Saint Helena, California, were cultured and irrigated as previously described (15). Briefly, irrigation was supplied weekly by a drip system at approximately 45 L/vine in the standard practice treatment (SP) and at 90 L/vine/week in all other treatments. In the SP and continual (C) treatments, water was supplied throughout the season. Water was withheld before veraison in the early deficit (ED) treatment, withheld after veraison in the late deficit (LD) treatment, and applied twice (2 wk) before veraison and twice (2 wk) before harvest in the full deficit (FD) treatment. The total volume of water applied per vine was approximately 320, 640, 730, 820, and 1500 L in the FD, ED, SP, LD, and C treatments, respectively. No measureable rain occurred during the treatment period in any season. (Total evapotranspiration during the growing season for a full-canopied vineyard can be estimated roughly from the work of Pruitt *et al.* (23) as 3000 L/vine during treatment application). Treatments were applied to three-row × seven-vine plots. Data were collected only from the middle five vines of the middle row. Each treatment was replicated five times.

Midday leaf water potential was determined with a pressure chamber as previously described (15). Two or three leaves per replicate plot were sampled; a total of 10 to 15 leaves were used to estimate treatment water potential for each sample date.

The air temperature at a central, internal site in

GRUPPO QUESITI 2

1) Descrivere un vino DOCG campano
2) Tecniche di vinificazione delle uve rosse
3) Dato il seguente testo:
“In questo studio pluriennale condotto in Trentino sono stati analizzati alcuni parametri fisiologici e biochimici legati alla senescenza fogliare della vite.”
- GIUSTIFICARLO E IMPOSTARE UN’INTERLINEA DOPPIA E, INFINE, SALVARE IL FILE SUL DESKTOP

ùQUESITO IN LINGUA INGLESE DA LEGGERE E TRADURRE

Effect of Water Stress on the Reproductive Performance of Shiraz (*Vitis vinifera* L.) Grafted to Rootstocks

Catherine M. Kidman,[1,2] Sandra Olarte Mantilla,[1] Peter R. Dry,[1,3]
Michael G. McCarthy,[4] and Cassandra Collins[1]*

Abstract: An experiment was conducted in the Barossa Valley, South Australia, to examine the effect of rootstocks on reproductive performance of Shiraz (*Vitis vinifera* L.) under water stress. Vines were grown on own roots or grafted to 110R, 1103P, 99R, Ramsey, Schwarzmann, or 140Ru. Vines either were unirrigated or irrigation was applied at 56 to 128 mm/ha across three seasons. Water stress (Ψ_{pd} < 0.8 MPa) was apparent in the unirrigated vines from veraison onward. The absence of irrigation strongly influenced vine growth and performance. Pruning weight, cane weight, and cane number were all reduced as a consequence of zero irrigation. Yields were reduced in unirrigated treatments due to a reduction in cluster number, cluster weight, and berry weight rather than fruit set or berry number. Unirrigated Ramsey was the only rootstock able to maintain yield comparable with irrigated rootstocks. Unirrigated own roots performed well in the first season but not in the second and third seasons when water stress had a negative effect on yield. Millerandage, coulure, and seedless berry numbers were the main reproductive parameters found to have a negative impact on yield and both own-rooted and grafted vines were as susceptible to these parameters. Season had a greater influence than either rootstock type or irrigation. These findings have significant implications for regions facing future drought and declining water supplies.

Key words: rootstocks, fruitfulness, fruit set, reproductive performance, water stress

Water use efficiency is critical for the sustainability of viticulture. The majority of the world's grapegrowing regions are in Mediterranean-type climates, which are characterized by warm-hot temperatures and require irrigation throughout the growing season. However, water supplies are becoming increasingly limited and grapevines are more commonly experiencing water stress during the growing season (Green et al. 2008). Increased climate variability is likely to result in periods of water shortages, resulting in the management of grapegrowing regions with less water to optimize vine and fruit growth. Severe water stress may be detrimental to production and quality at various stages of grapevine growth (Hardie and Considine 1976). For many grapegrowing regions worldwide, there is an increased requirement to minimize irrigation-water application, limit the severity of water stress on the grapevine, and produce economically sustainable yields of desirable quality (Green et al. 2008).

The effect of water deficit on reproductive development has been well documented (Matthews et al. 1987, Matthews and Anderson 1989, Poni et al. 1993, McCarthy 1997). Early and late season water deficits can be detrimental to the development of both the current and the following season's crop (Matthews and Anderson 1989, Petrie et al. 2004). Bud fruitfulness was shown to decline under deficit irrigation for the varieties Cabernet franc, Shiraz, and, in one season, Thompson Seedless through a reduction in shoot number or a low shoot internode number when treatments received 0 and 0.2 times the water used by vines grown in a weighing lysimeter (Matthews and Anderson 1989, Petrie et al. 2004, Williams et al. 2009). However, fruitfulness has been shown to overall increase with deficit irrigation through improved light interception to developing buds (Williams et al. 2009) and under minimal and mechanical pruning, as fruitful buds will burst in preference to less fruitful buds, increasing the number of inflorescence per shoot for Shiraz (Petrie et al. 2004). Furthermore, a mild water deficit may increase fruitfulness through improved light interception to the developing buds through a decrease in foliage (Keller 2005, Williams et al. 2009).

Early season water deficits can interfere with pollination and fertilization and can cause poor fruit set and/or abscission of inflorescences (Alexander 1965, Keller 2005) and result in fewer berries per cluster (Rogiers et al. 2004). Water

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GRUPPO QUESITI 4

1) Principali vitigni internazionali a bacca rossa coltivati in Italia
2) Principali aspetti biochimici coinvolti nei processi fermentativi
3) Dato il seguente testo:
"In questo studio pluriennale condotto in Trentino sono stati analizzati alcuni parametri fisiologici e biochimici legati alla senescenza fogliare della vite."
- TRASFORMARLO IN GRASSETTO E IMPOSTARE UN'INTERLINEA DOPPIA E, INFINE, SALVARE IL FILE SUL DESKTOP

QUESITO IN LINGUA INGLESE DA LEGGERE E TRADURRE

Review

Grapevine quality: A multiple choice issue

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Table grapes
Canopy management
Cultural practices

ABSTRACT

Over decades, the concept of grape quality has evolved emphasizing its multidisciplinary nature and that the same "desired quality" might correspond to even strikingly different compositional patterns. The review takes a long journey throughout the multiple factors impinging on grape quality, not excluding also sections devoted to table grapes. It starts with a through survey on the genetic factors influencing grape quality focusing on diversity in different compositional traits (sugar, organic acid, pH, phenolics and aromas) relating to cultivars and clones. Then, most recent knowledge about the effects of soil characteristics, nutrients, light, temperature and water availability, as standalone factors or in interaction, on grape quality are summarized. The more applied section of the review introduces the very much debated yield-quality relationship that, over years, is being interpreted with more flexibility and with greater consensus for an "optimal yield range" that within a given context can anyway reach the desired quality. The impact of the main summer pruning operations (leaf removal, shoot and cluster thinning, shoot trimming) is reviewed and special care taken to highlight most recent contributions with adjusted summer pruning developed to either adapt to climate change issues or to induce specific composition patterns. Review ends with a quick survey on methods nowadays available for fast, non-destructive grape composition assessment.

1. Introduction

Finding a shared definition of "quality" for wine grapes is still a formidable task simply because quality, being dependent upon individual wine taste, stylistic preferences, vintage variation and a number of other factors, is tremendously subjective. Based on a given final wine target, grape "quality" often reflects quite different "optimal maturity or ripening patterns" and "quality" can exist in every category of wine, from box and jug wines to the very expensive and exclusive premium wines.

Thus, optimal grape maturity would correspond to a strikingly different grape composition depending upon the wine styles (e.g. fresh white sparkling vs. aged reds) and its identification in time is the crucial decision. Total soluble solids (TSS) concentration is still the most used parameter to assess ripening and, in several cases, to tag grape prices. The validity of sugar level as an estimator of berry function is not under debate and recent findings have shown that, in cultivars such as Merlot (Bondada et al., 2017) and Chardonnay (Tillbrook and Tyerman, 2008) a level of 24–25 °Bx likely sets the threshold beyond which a further TSS increase is primarily due to berry dehydration or deterioration. Such threshold is indeed cultivar dependent though; in Shiraz berries attained maximum mass at about 20 °Bx and then started to shrink; conversely, cv. Muscat Gordo Blanco showed no phloem impedance until 27 °Bx (Coombe and McCarthy, 2000). Unfortunately, a TSS-derived good "maturity level" does not necessarily correspond to the best overall maturity and in some years the grapes will be ripe and have a distinct varietal character at 20 °Bx while another year they may still not have a ripe varietal character at 23 °Bx (Barnuud et al., 2014). The decoupling between technological maturity parameters (i.e. sugar, acids or their ratio), phenolic maturity (i.e. quantity and quality of all tannins and pigments) and aromatic ripeness (i.e. typical olfactory features reached without appearance of untypical ageing or excessive

GRUPPO QUESITI 5

1) Descrivere un vitigno campano
2) Differenze tra lieviti autoctoni e selezionati
3) Dati i seguenti valori: 0,76; 1,23; 2.64; 0,89; 1,01; inserirli in una colonna excel, disporli in ordine crescente e in una cella adiacente moltiplicare ciascun numero per 2.

QUESITO IN LINGUA INGLESE DA LEGGERE E TRADURRE

Implications of a Climate-Changed Atmosphere on Cool-Climate Viticulture

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ABSTRACT

The impact of anthropogenic global warming on viticulture has been thoroughly studied. However, many of the climate projections are limited by the resolution of the models that cannot resolve mesoscale weather patterns, which heavily influence grape production. In this work, data were gathered from the National Center for Atmospheric Research wherein a high-spatiotemporal-resolution (4 km× 4 km, 1 h) Weather Research and Forecasting (WRF) Model was run from October 2000 to September 2013 over North America using observed data, and again using the atmospheric chemistry of CMIP5 ensemble mean of the RCP8.5 greenhouse gas emission scenario, creating a pseudo–global warming (PGW) model. Such models are capable of resolving the mesoscale influences that most climate models cannot. Contrasting the observed results to the PGW results allows users to compare "what happened" to "what could have happened." This analysis was applied to four cool-climate viticultural regions in the United States: two in Michigan, one in upstate New York, and one in Oregon. In the PGW run, hours exposed to extreme heat (>32°C) increase by orders of magnitude. Growing season degree-day (GDD) accumulations increase between 783 and 1057 base 10°C in comparing the models, while growing season average temperatures increase between 4.05° and 5.53°C. Precipitation patterns were also studied. The four regions would no longer classify as "cool climate" and would see growing seasons similar to some of the most productive warm-climate wine-producing regions. The authors consider the opportunities and challenges presented by the potential climate shift for cool-climate and warm-climate viticultural regions.

1. Introduction

Cool-climate viticulture occurs in a region where the average growing season temperature, calculated between the months of April and October, is reported in the range of 13°–15°C (Jones et al. 2010). These cooler-climate areas typically accommodate grape varieties of the *Vitis vinifera* species that are more cold resistant while also being more able to mature fruit with reduced warm summer temperatures and a short season (Gladstones 1992). In particular, grapevines planted in such a climate must be cold hardy to withstand typical temperatures of −18°C during the winter (Zabadal et al. 2007). As the vines come out of dormancy in spring, newly formed buds must avoid temperatures below −1°C in order to prevent potential frost damage, which can limit the potential fruit production of the season (Zabadal and Andresen 1997; Schultze et al. 2016a). After avoiding damaging temperatures in the winter and spring periods, the vines must contend with extreme or fluctuating temperatures during the summer. While most grape varieties have at least some tolerance to extreme heat, varietals traditionally grown in cool-climate viticultural regions of the world are very sensitive to frequent extreme high temperature events. Grape quality is affected by solar radiation and rainfall, frost intensity and duration, temperature variability, and humidity levels during the growing season: temperatures of 25°–30°C, wind speed of less than 4 m s^{-1}, and relative humidity of between 60% and 70% are fundamental for efficient vine photosynthetic activity and consequently fruit maturation (Hunter and Bonnardot 2011).

Worldwide, there are a number of cool-climate viticultural regions: the Mosel or Baden regions in Germany, the Champagne region of France, Christchurch region of New Zealand, Hobart region of Australia, and the Innsbruck region of Austria. All those regions currently

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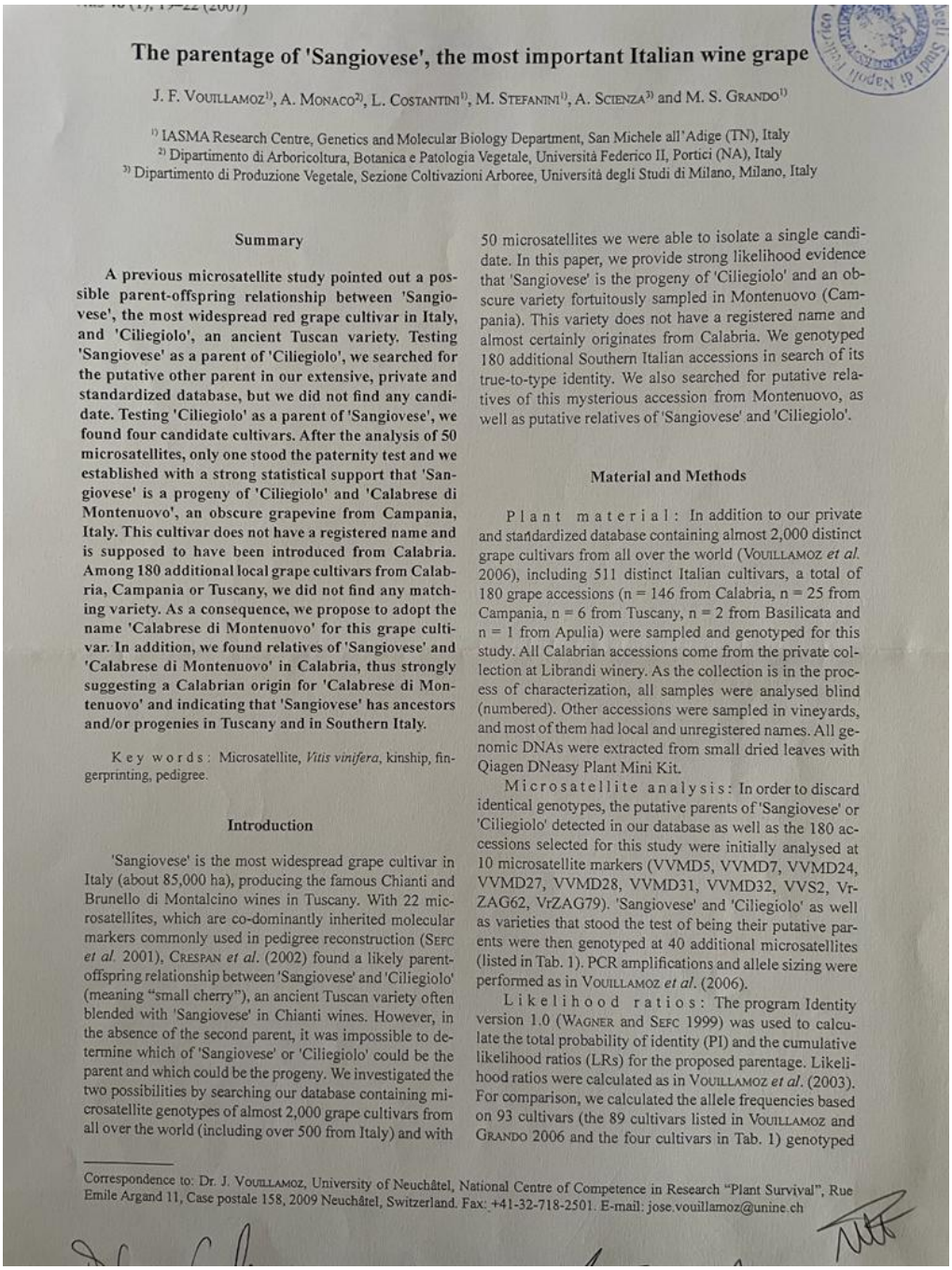
GRUPPO QUESITI 6

1) Quali sono i sistemi di allevamento della vite
2) Perché si usa l'anidride solforosa nel vino?
3) Dato il seguente testo:
"In questo studio pluriennale condotto in Trentino sono stati analizzati alcuni parametri fisiologici e biochimici legati alla senescenza fogliare della vite."
- TRASFORMARLO IN CORSIVO E TRASFORMARE IL CARATTERE IN ARIAL E, INFINE, SALVARE IL FILE SUL DESKTOP

QUESITO IN LINGUA INGLESE DA LEGGERE E TRADURRE



The parentage of 'Sangiovese', the most important Italian wine grape

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Summary

A previous microsatellite study pointed out a possible parent-offspring relationship between 'Sangiovese', the most widespread red grape cultivar in Italy, and 'Ciliegiolo', an ancient Tuscan variety. Testing 'Sangiovese' as a parent of 'Ciliegiolo', we searched for the putative other parent in our extensive, private and standardized database, but we did not find any candidate. Testing 'Ciliegiolo' as a parent of 'Sangiovese', we found four candidate cultivars. After the analysis of 50 microsatellites, only one stood the paternity test and we established with a strong statistical support that 'Sangiovese' is a progeny of 'Ciliegiolo' and 'Calabrese di Montenuovo', an obscure grapevine from Campania, Italy. This cultivar does not have a registered name and is supposed to have been introduced from Calabria. Among 180 additional local grape cultivars from Calabria, Campania or Tuscany, we did not find any matching variety. As a consequence, we propose to adopt the name 'Calabrese di Montenuovo' for this grape cultivar. In addition, we found relatives of 'Sangiovese' and 'Calabrese di Montenuovo' in Calabria, thus strongly suggesting a Calabrian origin for 'Calabrese di Montenuovo' and indicating that 'Sangiovese' has ancestors and/or progenies in Tuscany and in Southern Italy.

Key words: Microsatellite, *Vitis vinifera*, kinship, fingerprinting, pedigree.

Introduction

'Sangiovese' is the most widespread grape cultivar in Italy (about 85,000 ha), producing the famous Chianti and Brunello di Montalcino wines in Tuscany. With 22 microsatellites, which are co-dominantly inherited molecular markers commonly used in pedigree reconstruction (Sefc *et al.* 2001), Crespan *et al.* (2002) found a likely parent-offspring relationship between 'Sangiovese' and 'Ciliegiolo' (meaning "small cherry"), an ancient Tuscan variety often blended with 'Sangiovese' in Chianti wines. However, in the absence of the second parent, it was impossible to determine which of 'Sangiovese' or 'Ciliegiolo' could be the parent and which could be the progeny. We investigated the two possibilities by searching our database containing microsatellite genotypes of almost 2,000 grape cultivars from all over the world (including over 500 from Italy) and with 50 microsatellites we were able to isolate a single candidate. In this paper, we provide strong likelihood evidence that 'Sangiovese' is the progeny of 'Ciliegiolo' and an obscure variety fortuitously sampled in Montenuovo (Campania). This variety does not have a registered name and almost certainly originates from Calabria. We genotyped 180 additional Southern Italian accessions in search of its true-to-type identity. We also searched for putative relatives of this mysterious accession from Montenuovo, as well as putative relatives of 'Sangiovese' and 'Ciliegiolo'.

Material and Methods

Plant material: In addition to our private and standardized database containing almost 2,000 distinct grape cultivars from all over the world (Vouillamoz *et al.* 2006), including 511 distinct Italian cultivars, a total of 180 grape accessions (n = 146 from Calabria, n = 25 from Campania, n = 6 from Tuscany, n = 2 from Basilicata and n = 1 from Apulia) were sampled and genotyped for this study. All Calabrian accessions come from the private collection at Librandi winery. As the collection is in the process of characterization, all samples were analysed blind (numbered). Other accessions were sampled in vineyards, and most of them had local and unregistered names. All genomic DNAs were extracted from small dried leaves with Qiagen DNeasy Plant Mini Kit.

Microsatellite analysis: In order to discard identical genotypes, the putative parents of 'Sangiovese' or 'Ciliegiolo' detected in our database as well as the 180 accessions selected for this study were initially analysed at 10 microsatellite markers (VVMD5, VVMD7, VVMD24, VVMD27, VVMD28, VVMD31, VVMD32, VVS2, VrZAG62, VrZAG79). 'Sangiovese' and 'Ciliegiolo' as well as varieties that stood the test of being their putative parents were then genotyped at 40 additional microsatellites (listed in Tab. 1). PCR amplifications and allele sizing were performed as in Vouillamoz *et al.* (2006).

Likelihood ratios: The program Identity version 1.0 (Wagner and Sefc 1999) was used to calculate the total probability of identity (PI) and the cumulative likelihood ratios (LRs) for the proposed parentage. Likelihood ratios were calculated as in Vouillamoz *et al.* (2003). For comparison, we calculated the allele frequencies based on 93 cultivars (the 89 cultivars listed in Vouillamoz and Grando 2006 and the four cultivars in Tab. 1) genotyped

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GRUPPO QUESITI 7

1) Differenze tra il metodo Guyot e il metodo Cordone Speronato
2) Da quale vitigno è prodotto il Brunello di Montalcino. Descrivere brevemente il vitigno
3) Dati i seguenti valori: 0,76; 1,23; 2.64; 0,89; 1,01; inserirli in una colonna excel, disporli in ordine decrescente e in una cella adiacente dividere ciascun numero per 2.

QUESITO IN LINGUA INGLESE DA LEGGERE E TRADURRE

Phenological Sensitivity of Cabernet Sauvignon to Water Stress: Vine Physiology and Berry Composition

Boris Basile,[1]* Jordi Marsal,[2] Mercè Mata,[2] Xavier Vallverdú,[2] Joaquim Bellvert,[2] and Joan Girona[2]

Abstract: There is little information on the sensitivity of berry composition to early-season water stress and how it compares to the effects of late-season stress. This study aimed to quantify the effects of water stress on berry growth and composition of Cabernet Sauvignon grapevine at three phenological stages: anthesis to fruit set, fruit set to veraison, and veraison to harvest. Potted vines were used to facilitate imposing water stress early in the season. Four irrigation levels (0%, 25%, 50%, and 100% of calculated crop evapotranspiration, ET_c) were applied and midday leaf water potential and leaf gas exchange were measured. Berry composition was evaluated by measuring titratable acidity and concentrations of soluble solids, anthocyanins, and polyphenols. Water stress decreased net CO_2 exchange rate and vine green leaf area. Berry composition significantly correlated with the vine water status, but the nature of the relationship depended on the phenological stage and on the parameter measured. Berry composition (in terms of concentration of anthocyanins and polyphenols) was improved when no water stress occurred from anthesis to fruit set (irrigation replacing 100% of ET_c), with mild water stress between fruit set and veraison (irrigation replacing 25% and 50% of ET_c), and with moderate to severe water stress in postveraison (irrigation replacing 0% of ET_c).

Key words: anthocyanins, polyphenols, soluble solids, leaf abscission

The effect of water stress on berry growth and composition depends on the phenological stage at which irrigation is withheld (Matthews and Anderson 1989, Girona et al. 2009). Research has typically considered two broad phenological stages: preveraison and postveraison. That is the case for Cabernet Sauvignon, which is popular in dry areas such as California, Australia, and Spain. Yet the available information is not conclusive on how Cabernet Sauvignon berry composition is affected even considering only two broad phenological stages.

Berry soluble solids concentration (SSC) and wine quality scores were reported as significantly higher for vines exposed to deficit irrigation (DI) during postveraison (Bravdo et al. 1985), although plant water status was not measured. Severe water stress (midday stem water potential of -1.40 to -1.50 MPa), applied during both pre- and postveraison, reportedly increased wine color intensity and concentrations of phenols and anthocyanins compared to irrigated control (Ferreyra et al. 2004). In a different study, severe water stress (leaf water potential [Ψ_{leaf}] values of -1.45 MPa) during early postveraison did not affect berry anthocyanin concentration at harvest (Castellarin et al. 2007a). One study reported that preveraison DI slightly decreased juice color compared to postveraison DI; there were no consistent significant effects of timing of DI on other berry composition parameters (SSC, titratable acidity, or pH) (Keller et al. 2008).

The inconsistencies in the above results may be related to differences among studies in the timing of water stress, its severity, and duration. In addition, preveraison water stress is a long period that spans from flowering to fruit set and finishes at veraison. The sensitivity of berry composition to water stress might vary across the preveraison period. To the best of our knowledge, for Cabernet Sauvignon there is no comprehensive study that relates a broad range of water status values to berry composition for phenological stages from flowering to fruit set and fruit set to veraison as compared to postveraison. For other cultivars, there is also no information available about the effects of early-season water stress on berry composition at harvest. In one study where water stress was applied to Cabernet franc for 22 days starting from anthesis, yield was decreased but berry composition was not affected (Hardie and Considine 1976).

Our research was conducted in Catalonia, Spain, which is a dry area (average annual rainfall of 377 mm for 2000–2008)

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IL SEGRETARIO DELLA COMMISSIONE
F.TO GIANNIELLO NICOLA