

## RESVEROTROL

Resverotrol is a chemical compound that is found in red grapes. Recent studies show this substance to be beneficial to health by lowering cholesterol and preventing cell oxidation, an important process in the prevention of cancer.

In addition to organic grapes having higher levels of this compound it has also been shown that the indigenous grape varieties of the Veneto region have a naturally high level. Resverotrol also remains active and is stimulated by the appassimento phase.

Scientific studies are still being conducted and research by Azienda Agricola Tedeschi is published below. The article can also be viewed at:

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### RESEARCH ON RESVERATROL CONTENT OF F.LLI TEDESCHI ESTATE GRAPES AND WINES

#### INTRODUCTION

The debate between wine and health is almost as ancient as wine itself and is still going strong. Pliny, the 1st century A.D. Latin author, wrote that "wine enhances the strength, blood and complexion of men. A small amount of wine is good for the nerves, regenerates the stomach, excites the appetite, is diuretic, helps sleep and stops vomit".

Antique citations have, since that time, gradually been supported by confirmations coming from science. A team of French doctors has recently demonstrated that moderate red wine consumption has extremely interesting effects on the blood of man, such as a reduction in platelet aggregation tendencies and an increased quantity of cholesterol HDL, both of which are factors that protect against heart disease.

Phenol compounds, and hydroxylated stilbenes in particular, such as resveratrol (3,4,4' tri-hydroxystilbene) and one of its glucosides, the piceid, are among the natural compounds involved in lipid metabolism and important from the pharmacological point of view.

In nature we find *Polygonum cuspidatum* and *Polygonum multiflorum*, plants used in traditional Oriental medicine to cure diseases such as hyperlipemia and arteriosclerosis. At the present time 4 (all monomer) stilbene compounds have been found in wine.

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Interest in these compounds has continued to grow: according to the Medline data bank (dedicated exclusively to medical-pharmaceutical information), the term "resveratrol" is to be found in 174 papers published in the period from 1966 to 17 March 2000, with the number of papers distributed as follows over time:

1966-1990: 10  
1991-1995: 18  
1996-1999: 134

#### THE BENEFICIAL EFFECT OF PHENOLIC COMPOUNDS IN WINE

Antioxidant effect: it has been shown that low concentrations of these compounds (1 mM) have high antioxidant properties on the polyunsaturated fat content of low density lipoproteins (LDL).

Oxidation of these latter fats is a crucial stage in the pathogenesis of arteriosclerosis and a diet rich in antioxidants can delay this pathology.

Resveratrol, in addition to acting as an antioxidant, is also:

- an important inhibitor of platelet aggregation
- an important inhibitor of serotonin secretion
- a compound with anti-cancer chemo-preventive properties
- important for its role in lipid metabolism.

Studies are still underway to demonstrate its protective role.

#### HOW TO ENHANCE THE RESVERATROL CONTENT IN THE WINE

Several authors have demonstrated that resveratrol content in grapes and, subsequently, in wine depends on a series of factors including the cultivar, the health of the grapes, their ripeness, wine making techniques, steeping times, the number of pumpings over, oxyreduction conditions and type of ageing. Several experimental studies have shown that the winemaking techniques that achieve the highest resveratrol content in red wines are:

- long maceration times and a large number of pumpings over;
- addition of antioxidants to the grapes before destemming;
- avoidance of strong clarification treatments based on bentonite, gelatine and caseinate;
- avoidance of carbon or PVPP treatments.

Good acidity, a suitable sulphur dioxide content and cold storage help with long-term preservation of resveratrol in wine.

#### THE F.LLI TEDESCHI ESTATE WINEMAKING TECHNIQUES

Innovations have been brought to traditional production technologies to achieve a greater quantity of stilbenes in finished products made from the classic grape varieties of the Valpolicella Classico zone, without abandoning traditional techniques but rather by simply using more easily controlled and automated systems to help traditional winemaking from the physical and mechanical standpoints.

- Refrigeration cells have been built to favor healthy and natural passerillage raising of grapes by controlling the humidity in the air. Mold growth on the grapes seems, in fact, to degrade part of the phenolic content of the grapes by production of laccase by *Botrytis cinerea*.

- Automatic fermentors have also been purchased to favor and facilitate control over movement of the solid masses in must: both of these are important factors for extracting increased amounts of phenols from the skins.

## RESEARCH ON THE TEDESCHI ESTATE GRAPES

In 1998 vintage the grapes used to make Amarone and Recioto Tedeschi were analysed in two different moments by HPLC technique during the passerillage raisining to measured the resveratrol content (Mattivi F., Reniero F., Korhammer S., 1995. Isolation, characterization, and evolution in red wine vinification of resveratrol monomers. J.Agric. Food Chem.,43). The F.lli Tedeschi Estate repeated the same test on the 1999 vintage grapes in three different moments: at the beginning, after two months and at the end of the passerillage raisining process four months later.

The results confirm that the quantity of resveratrol in its various forms is different for each of the grape varieties tested: Corvina, Corvinone and Rondinella. Same conclusion can be deducted for the total resveratrol content. Corvina (figure 1) is the richest variety at the beginning and at the end of the passerillage raisining process, although the increase of the concentration of resveratrol during drying resulted to be lower compared to the other two varieties. Rondinella variety (figure 2) is at the harvesting the naturally poorest in resveratrol content, but during drying the total resveratrol concentration increases to three times as much the initial quantity.

The increase appears particularly evident in the last month of drying. This fact is due to the peculiar organic characteristics of the Rondinella berry which is very small and its skin allows such a little osmotic exchange that usually it dries only in the last period of passerillage raisining. The Corvinone variety (figure 3) has the biggest berry. So the osmotic exchange is greater in this case and the drying becomes more continuous and uniform throughout the process. On the other hand the concentration of resveratrol in the same phase grows steadily during the entire process.

All the varieties tested do not content cis resveratrol both at the beginning and at the end of passerillage raisining: usually cis resveratrol, present in the wine, is formed by isomerization from trans resveratrol and hydrolysis of its glucoside. The results from this test cycle confirm that the Tedeschi Estate grapes from Valpolicella zone are particularly rich in resveratrol and the presence of a high resveratrol content in all the grapes is particularly high at the end of passerillage raisining: the final concentrations of total resveratrol in the raisin largely exceed the values predictable on the basis of water loss and are due both grape concentration and new synthesis from sugar.

At this stage it's important to know exactly how to use this potential when making and preserving the wine to maintain the same grapes characteristics in our young and our fully mature wines.

Corvina, Rondinella and Corvinone images : Variation of resveratrol content in its various forms during the passerillage raising

Results confirm a high resveratrol content in the wines. We have tested Amarone Capitel Monte Olmi 1998: table 1 gives its contents of the various forms of resveratrol, indicating data for various types of wines produced by the F.lli Tedeschi Estate.

Amarone wine from 1998 vintage, made using the grapes indicated above, has an exceptional total resveratrol content, equal to 19,26 mg/l. Trans-resveratrol has a particularly high content, as well as glucoside cis-resveratrol. This is a reserve form of resveratrol that is, with time, hydrolysed and isomerised into trans-resveratrol, the most interesting form from the pharmacological viewpoint. Test results, given in these tables, indicate high overall contents for all the Amarone wines that were examined: all products have total resveratrol content that exceed 10 mg/l, except Amarone Classico 1996.

Resveratrol content seems to diminish with ageing although the glucoside cis-resveratrol content remains high. Amarone is not a wine with a very high total acidity and the free sulfur dioxide content normally decreases due to combination with contents of the product during ageing in the bottle. These conditions favor oxidation of polyphenols in general and, consequently, of resveratrol.

Therefore it could be best to drink Amarone while it is relatively young, since at that time it is rich in resveratrol that probably does not remain stable over a long period of time.

This has always been the policy of the Tedeschi Estate and is now finding scientific confirmation. High resveratrol contents are found not only in wines made from raisins but also from wines made using fresh grapes. Valpolicella Capitel Lucchine 1999, a young wine, made using traditional vinification in red wine, has an overall resveratrol content of about 11 mg/l.

While it contains less trans resveratrol than Amarone wine it has a good amount of glucoside cis-resveratrol which is a precursor, as stated above, of the trans form. Capitel San Rocco Rosso 1996 and 1997, made using traditional Veronese repressing techniques, have an overall resveratrol content like that of the Valpolicella 1999 wine, with a higher percentage of trans resveratrol and a lower percentage of cis-resveratrol in the 1997 vintage. Also Valpolicella Capitel dei Nicalò 1997 has a high overall resveratrol content (more than 10 mg/l). The results confirm that all the wines of F.lli Tedeschi Estate are rich in resveratrol.

## CONCLUSIONS

We can affirm that grapes of F.lli Tedeschi Estate from the Valpolicella area are particularly rich in resveratrol, a phenolic compound with important pharmacological effects. The winemaker's challenge, then, is to know exactly how to benefit from this potential when making and ageing the wine in order to preserve these positive grape characteristics in our young and fully mature wines. The grapevine data given in table 1 shows the effects of proper application of this combination of quality grapes and winemaking technology.

## TABLE:

Resveratrol content of F.lli Tedeschi Estate wines. Glucoside trans resveratrol is expressed as mg/l of trans-resveratrol and glucoside cis-resveratrol is expressed as mg/l of cis-resveratrol.

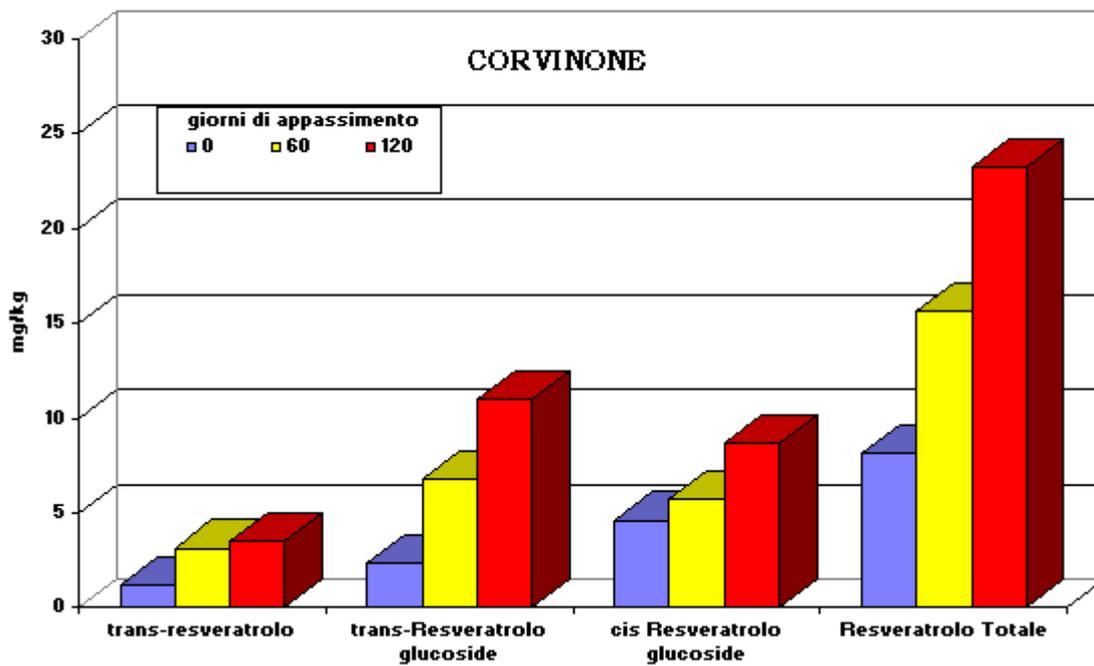
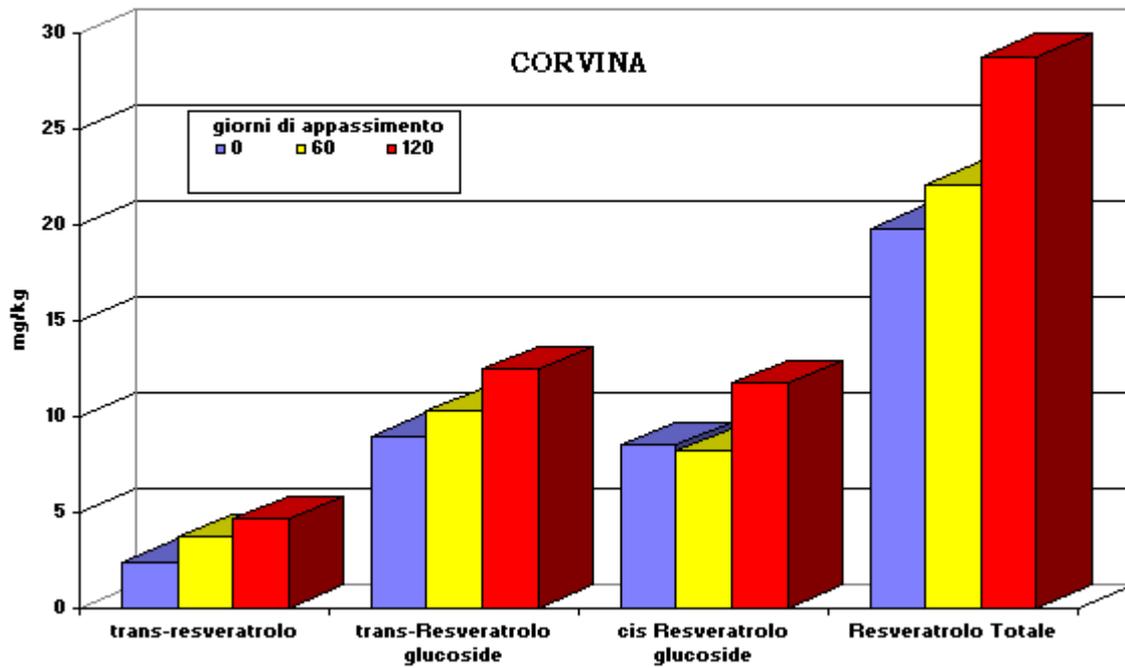
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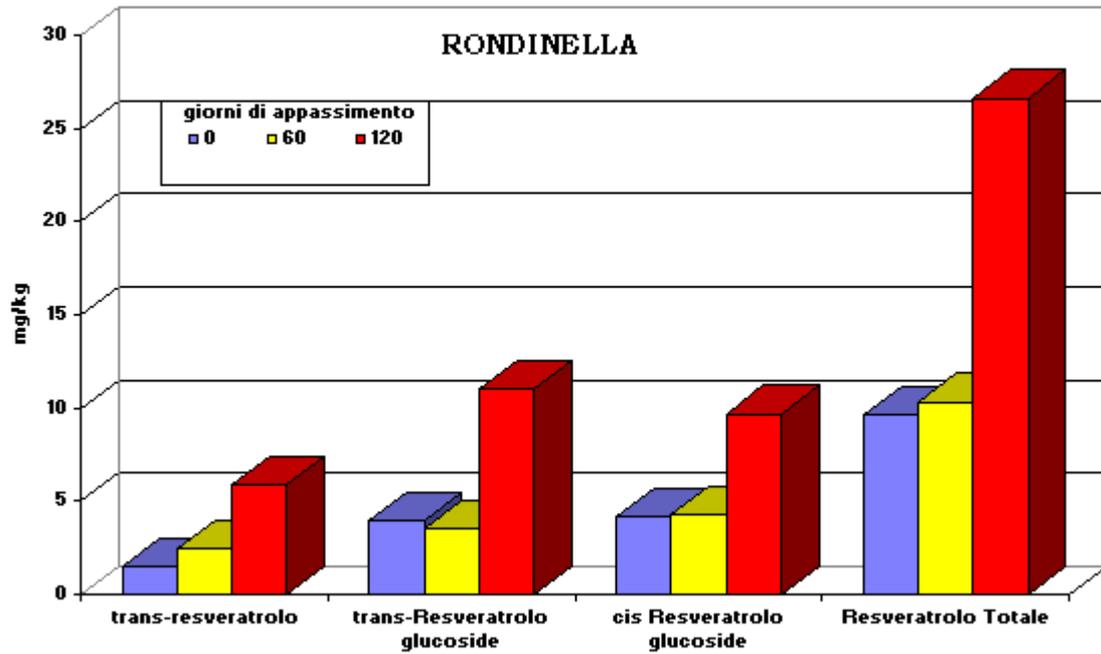
		<i>trans-resveratrolo</i>	<i>trans-Resveratrolo glucoside</i>	<i>cis Resveratrolo glucoside</i>	<b>Resveratrolo Totale</b>
<b>CORVINA</b>	<b>0</b>	2.38	8.95	8.46	<b>19.79</b>
	<b>60</b>	3.7	10.23	8.17	<b>22.1</b>
	<b>120</b>	4.6	12.42	11.74	<b>28.76</b>
<b>CORVINONE</b>	<b>0</b>	1.19	2.33	4.63	<b>8.15</b>
	<b>60</b>	3.15	6.77	5.73	<b>15.65</b>
	<b>120</b>	3.48	11.04	8.68	<b>23.2</b>
<b>RONDINELLA</b>	<b>0</b>	1.52	3.97	4.16	<b>9.65</b>
	<b>60</b>	2.5	3.53	4.31	<b>10.34</b>
	<b>120</b>	5.93	11.01	9.69	<b>26.63</b>

### **Resveratrolo Totale**

	<b>0</b>	<b>60</b>	<b>120</b>
<b>CORVINA</b>	19.79	22.1	28.76
<b>CORVINONE</b>	8.15	15.65	23.2
<b>RONDINELLA</b>	9.65	10.34	26.63

	<b>0</b>	<b>60</b>	<b>90</b>
<b>c tR</b>	2.38	3.7	4.6
c tRgluc	8.95	10.23	12.42
c cRgluc	8.46	8.17	11.74
c tot	<b>19.79</b>	22.1	28.76
C tR	1.19	3.15	3.48
C tRgluc	2.33	6.77	11.04
C cRgluc	4.63	5.73	8.68
C tot	8.15	15.65	23.2
R tR	1.52	2.5	5.93
R tRgluc	3.97	3.53	11.01
R cRgluc	4.16	4.31	9.69
R tot	9.65	10.34	26.63





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