

Simple Phenolic Compounds in Wine

Table 2-7. Rough estimates of the typical percentages by weight of components of wine grapes at harvest, in juice and in wines.

Class of compound	Berries	Juice	Dry Table Wines	
			From juice	Pomace fermented
Water	74	76	86	85
Inorganic salts	0.5	0.4	0.2	0.2
Carbohydrates	24	23	3	4
Alcohols	0	0	10	10
Acids	0.6	0.7	0.7	0.6
Phenols	0.2	0.01	0.01	0.1
Nitrogenous compounds	0.2	0.1	0.1	0.05
Lipids	0.2	0.01	0.01	0.02
Terpenoids	0.02	0.01	0.01	0.015
Other volatiles	0.01	0.01	0.1	0.1
Miscellaneous	0.1	0.01	0.5	0.1
Total	100	100	100	100

Table 7-3. Total phenol levels in *Vitis vinifera* grapes expressed as Gallic Acid Equivalents (GAE mg/kg)

Component	Red grapes	White grapes
Skin	1,859	904
Pulp	41	35
Juice	206	176
Seeds	3,525	2,778
Total	5,631	3,893

SOURCE: Singleton and Esau 1969.

Table 7-1. Gross phenol composition estimated in mg GAE/L for typical table wines from *Vitis vinifera* grapes.

Phenol class	Source ^a	White wine		Red wine	
		Young	Aged	Young	Aged
Nonflavonoids, total		175	160–260	235	240–500
Cinnamates, derivatives	G,D	154	130	165	150
Low volatility benzene deriv.	D,M,G,E	10	15	50	60
Tyrosol	M	19	10	15	15
Volatile phenols	M,D,E	1	5	5	15
Hydrolyzable tannins, etc.	E	0	0–100	0	0–260
Macromolecular complexes					
Protein-tannin	G,D,E	10	5	5	10
Flavonoids, total		30	25	1060	705
Catechins	G	25	15	200	150
Flavonols	G,D	tr	tr	50	10
Anthocyanins	G	0	0	200	20
Soluble tannins, deriv.	G,D	5	10	550	450
Other flavonoids, deriv.	G,D,E,M	?	?	60?	75?
Total phenols		215	190–290	1300	955–1215

^aD = degradation product; E = environment, cooperage; G = grapes; M = microbes, yeast.

SOURCE: Singleton 1980.

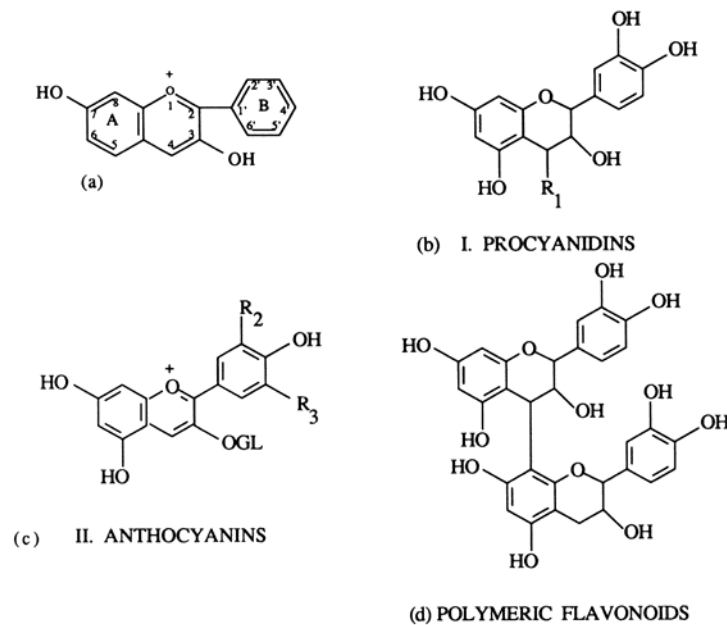


Fig. 7-2. (a) Base structure of typical flavonoid showing rings and numbering system. (b) Parent structures of wine flavonoids. I. Procyanidins: $R_1 = H$ (catechins); $R_1 = OH$ (leucoanthocyanidins); $R_1 = O$ (flavanols). II. Anthocyanins: $R_2, R_3 = OCH_3$ (malvidin); $R_2 = OH, R_3 = H$ (cyanidin); $R_2, R_3 = OH$ (delphinidin); $R_2 = OCH_3, R_3 = OH$ (petunidin); $R_2 = OCH_3, R_3 = H$ (peonidin). (d) Structure of typical dimeric flavan structures found in wine.

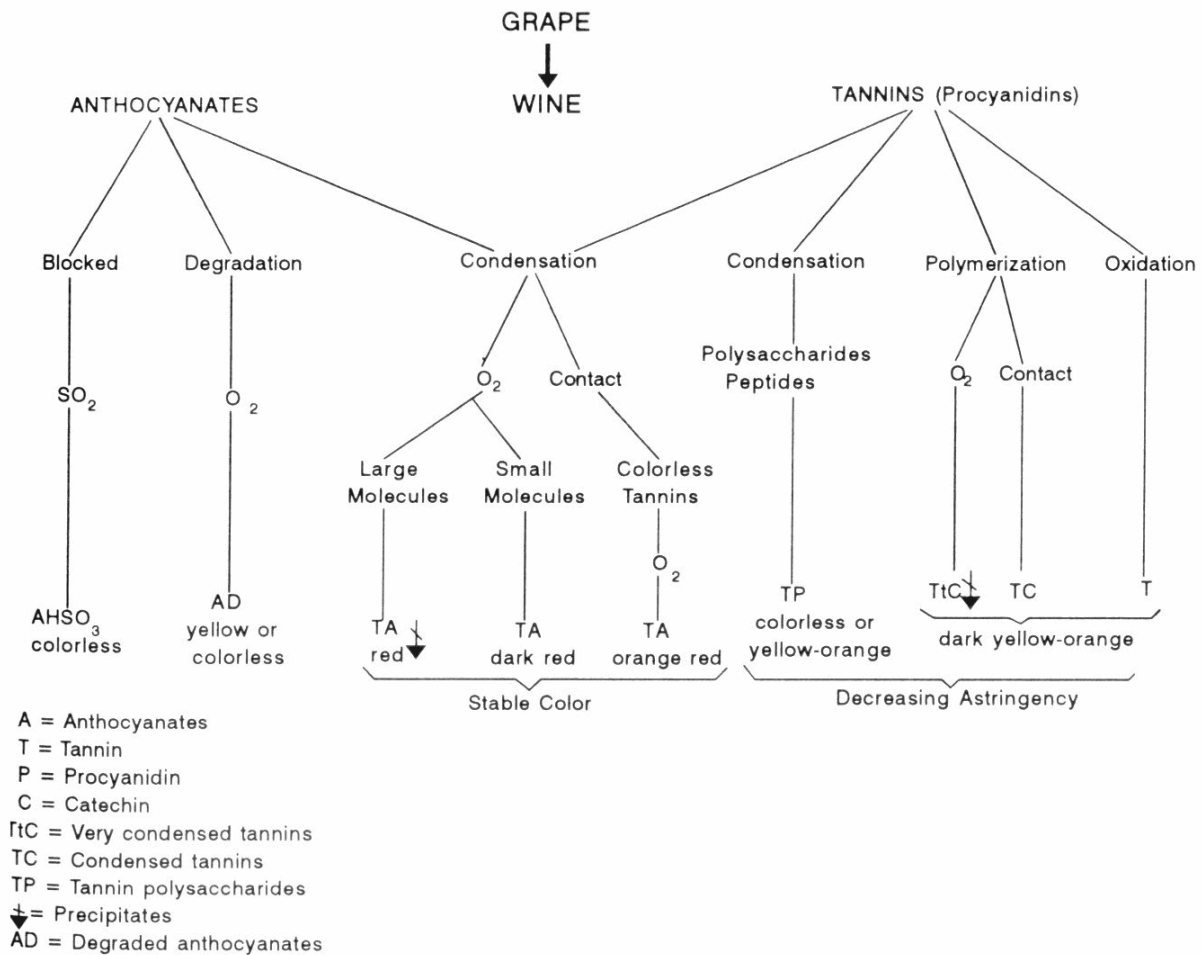


Fig. 7-8. Phenolic reactions occurring in red wines. Adapted from Rabreau-Gayon and Glories (1987) by Recht (1993).