

# MANAGING PHENOLS

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Phenolic compounds are present in wine in amounts ranging from 0.03 percent in white wines to about 0.5 percent in red wines. Even so, they are among the most important wine components because phenols are responsible for wine color, bitterness, astringency and part of flavor.

## PHENOLIC EXTRACTION

Phenolic compounds in wine come primarily from the grape seeds, skins and stems. Some phenols are more soluble than others, and these materials can be extracted from the solids quickly. Other phenolic materials are less soluble, and they require more time to be extracted. White and blush wines are made by separating the juice from the solids before fermentation is started. These wines have almost no skin contact time, and this is why white wines contain less phenolic material than red wines. Some phenolic materials are soluble in water, and other phenolic materials are more soluble in alcohol. The materials most soluble in water are extracted early in the fermentation process while the alcohol soluble materials are extracted later when more alcohol has accumulated. The pigments and many flavor compounds are soluble in water, so they are extracted earlier in the fermentation. Figure 1 shows how the color pigments and the tannin compounds accumulate as a function of skin contact time for red fermentations. These data show several interesting features. Note that about 94 percent of the total available color was extracted in the first four days of fermentation, and the color starts **decreasing** after eight days of skin contact time. After 20 days of skin contact the color dropped to about 75 percent of its maximum value. During the last 30 days, there was little change in color.

Tannin behaves differently than pigment. Tannin compounds are more soluble in alcohol. Small amounts of tannin are precipitated by the grape and yeast protein, so little tannin collects early in red fermentations. But when the protein is gone, the tannin begins to accumulate. More tannin is extracted late in the fermentation, and it continues to be extracted throughout the 50-day period. Much of the color has been extracted by the fourth or fifth day but only about half the tannin has been extracted.

Skin Contact (Days)	Color Intensity	Tannin (Grams/Liter)
1	0.46	0.75
2	0.89	1.77
3	1.24	1.96
4	1.42	2.42
6	1.49	2.63
8	1.62	3.18
10	1.41	3.39
14	1.36	3.55
20	1.21	3.65
30	1.20	3.74
40	1.22	4.26
50	1.23	4.30

**Figure 1. Color and tannin extract differently.**

## TANNIN MANAGEMENT

Fortunately, there are several techniques the winemaker can use to control the amount and kind of phenolic compounds in wine.

### Cold Soaking

Cold soaking is a winemaking technique often used to produce softer red wines. The process is simple. (1) Sound grapes are crushed and a small amount of SO<sub>2</sub> is added. (2) Refrigeration is used

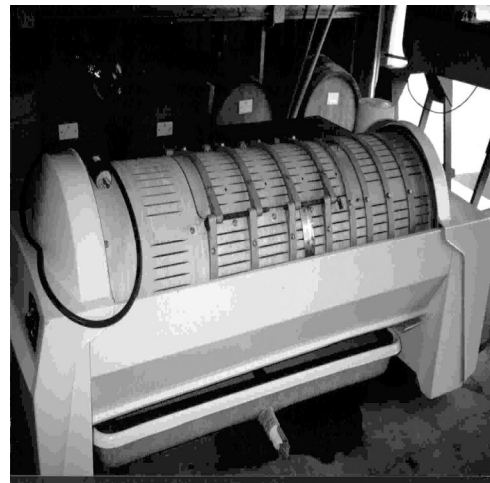
to cool the must to 45 or 50 degrees. (3) The crushed fruit is held at the cold temperature for a time ranging from one to several days. (4) The must is then allowed to warm up, and it is inoculated with yeast to start fermentation. The prolonged skin contact that occurs before any alcohol has formed results in considerable color and flavor extraction. However, relatively little tannin is extracted because no alcohol is present. Cold soaking is particularly effective when used on specific grape varieties such as Pinot Noir.

### Early Pressing

The term early pressing indicates that a wine was pressed before it reached dryness, so the skin contact time was relatively short. Since much of the color, bouquet and flavor producing materials are extracted early in a fermentation, three or four days of maceration is usually long enough to withdraw these materials from the solids. Consequently, early pressing often produces a soft, fruity wine suitable for early consumption.

### Pressing Technique

Winemakers control the phenolic levels in red wines by using different pressing techniques. High press pressures produce more harsh tannin materials, while low press pressures produce less of the harsh materials. Modern presses can be programmed to separate the liquids from the solids effectively by using low pressures and many press cycles. This kind of pressing schedule can produce dry pomace, but relatively small amounts of harsh tannin are extracted. In addition, winemakers often hold the press wine separately for a time, and then blend it back into the main lot if they feel that more astringency is needed.



### Cap Management

The way the juice and skins are manipulated during the early part of fermentation is another way of controlling phenolic extraction. Gentle punching down done several times a day extracts more color and less tannin than pumping over. Consequently, many winemakers prefer small, open fermenters for the production of quality red wines rather than large, closed tanks.

### Protein Fining

Fining provides a convenient means of reducing the phenolic content of wine late in the winemaking cycle. Here, carefully measured quantities of protein materials such as gelatin, casein or egg whites are added to the wine. The protein materials combine with the tannin and both precipitate out of the liquid. Huge amounts of tannin cannot be removed without stripping color and aroma from the wine, but fining gives winemakers a practical way of fine tuning the astringency of red wines.

### Summary

Winemakers manipulate several factors to control the amounts and kinds of phenolic compounds in wine. But unfortunately, winemakers seldom have complete control of these factors, and this is why making high quality red wine is often more art than science.