

## AVF Annual Report

### I. Project Title:

Skin and Seed Tannin Extraction During Red Wine Fermentations.

### II. Principal Investigator: James A. Kennedy

### III. Summary:

The major goal of this research for the past year was to complete the development of an analytical method for directly determining skin and seed tannin extraction into red wine. This has been accomplished and the method has undergone peer review and has now been published in the *Journal of Agricultural and Food Chemistry* (1). In addition to publishing the method, an update on the method was presented at the 2003 ASEV national and northwest regional meetings.

Additional experimental work was carried out this year to improve our understanding of tannin extraction during fermentation. The method has been used to monitor the extraction of tannins in several experiments including:

- A comparison of 4 day versus 10 day prefermentation cold soak in cv. Pinot noir
- Comparison of fermentations undergoing intentional seed removal during maceration in cv. Pinot noir
- A comparison of varietal extraction in cvs. Syrah, Pinot noir and Merlot
- Measurement of tannin extraction as a function of grape maturity
- Punchdown versus pumpover extraction of tannins in cv. Pinot noir
- Investigation of the effect of grape maturity on the extraction of tannin during fermentation

### IV. Overall objectives and Experiments Conducted to meet Objectives:

The objectives of this proposal are as follows:

1. Develop an analytical method to separately measure skin and seed tannin extraction during red wine production.
2. Determine extracted amount and relative contribution of skin and seed tannins in red wine made from grapes harvested at different maturity levels.
3. With the cooperation of various wineries, understand how winery related treatments affect the amount and relative contribution of skin and seed tannin in red wine.
4. Conduct sensory studies on prepared wines to determine the relationships between the tannin present in red wine and the textural quality of red wine.

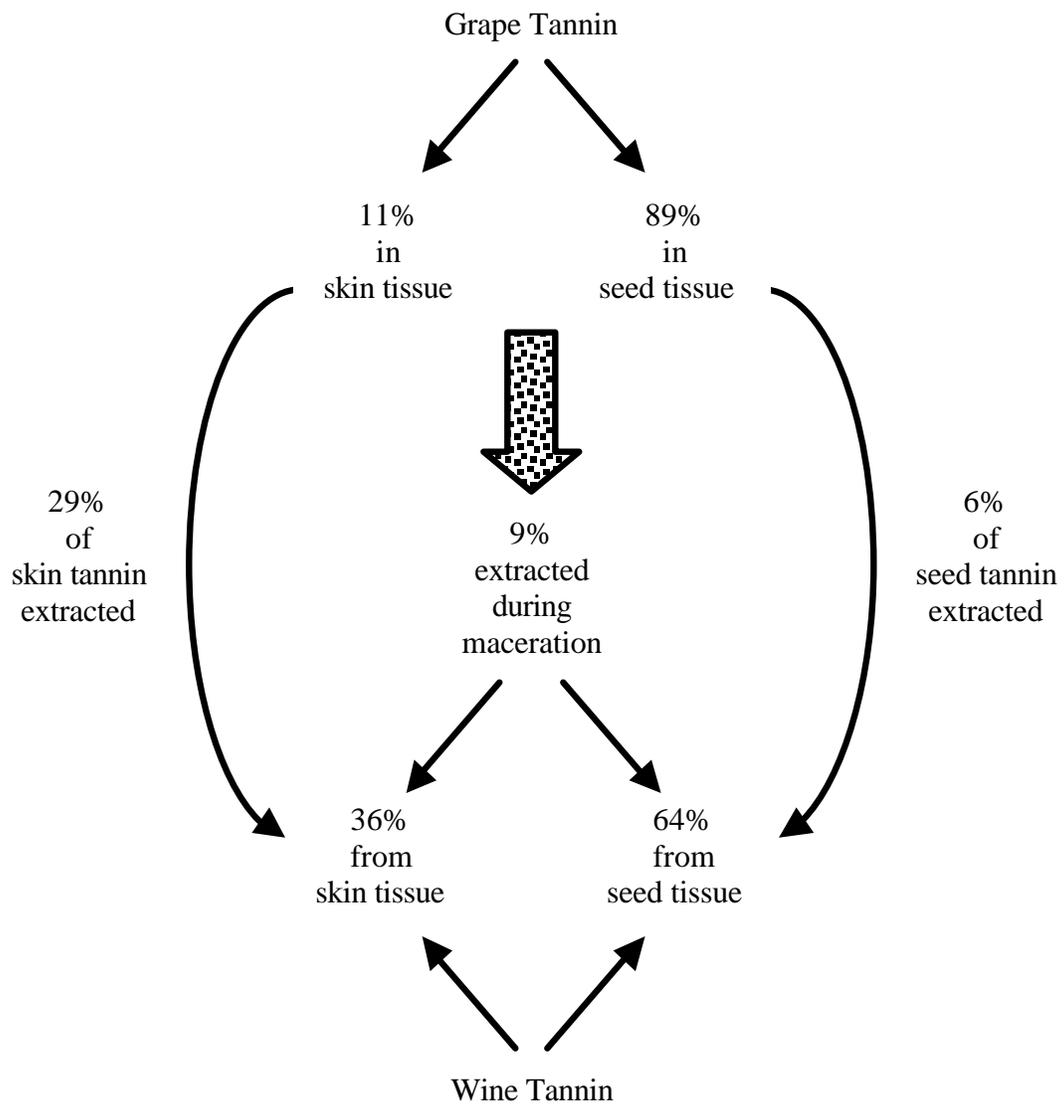


Figure 1. Distribution of tannins in cv. Pinot noir in grape berries and in wine indicating the proportion of tannins resulting from seed and skin tissue, and demonstrating the quantitative information on tannin extraction now available.

Objectives 1-4 have either been met or have been partially met at this point. An analytical method has been developed and published. In addition, the method has been used to analyze wines made from grapes harvested at different stages of maturity.

V. Summary of Major Research Accomplishments and Results (by Objective):

1. Develop an analytical method to separately measure skin and seed tannin extraction during red wine production.

The method has been completed, a manuscript has been written, undergone peer review and published:

- Peyrot des Gachons, C.; Kennedy, J.A. (2003) Direct method for determining seed and skin proanthocyanidin extraction into red wine. *Journal of Agricultural and Food Chemistry* 51:5877-5881.

2. Determine extracted amount and relative contribution of skin and seed tannins in red wine made from grapes harvested at different maturity levels.

Two years have been completed and are summarized below. The study has taken place in cv. Pinot noir grown in the Willamette valley during the 2002 and 2003 vintages.

Table 1. Change in the amount and proportion of tannin extracted from cv. Pinot noir grapes harvested at various ripening stages for the 2002 and 2003 vintage.

		Sugar, °Brix	Tannins in wine, mg/L	% Skin tannin
2002	Early	20.1	702	37
	Mid	23.4	664	37
	Late	25.5	559	34
2003	Early	22.9	684	39
	Mid	24.6	674	35
	Late	28.0	799	25

Surprisingly, results from both years indicate that the proportion of extracted seed tannin increases with grape maturity in Pinot noir, this result is not consistent with previous expectations.

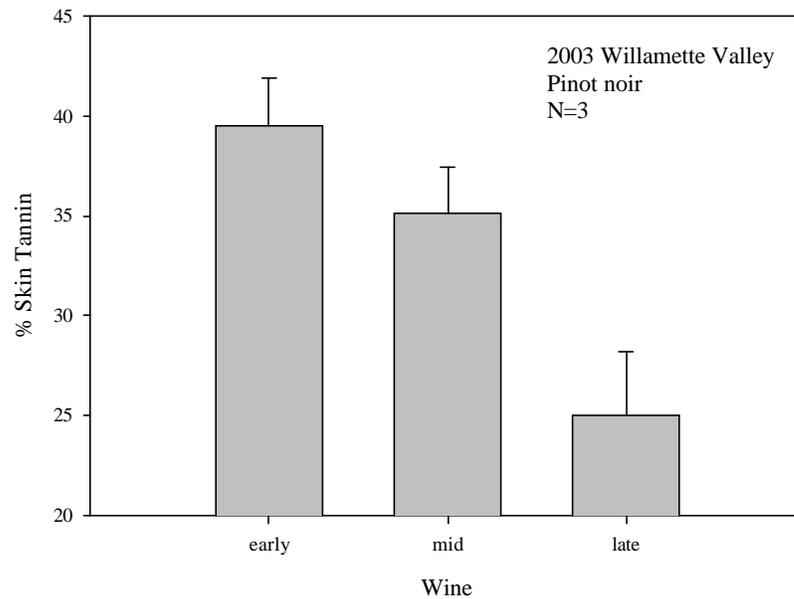
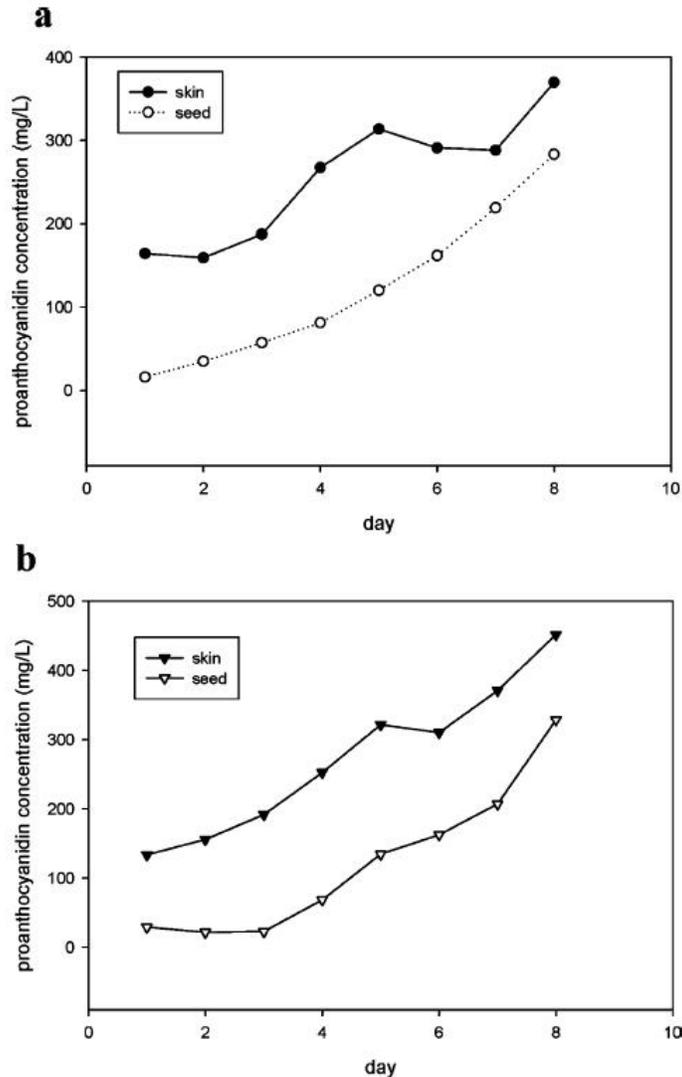


Figure 2. Percent skin tannin in wine made from cv. Pinot noir fruit harvested from 21.5 °Brix (early) to 25.5 (late) °Brix.

3. With the cooperation of various wineries, understand how winery related treatments affect the amount and relative contribution of skin and seed tannin in red wine.
  - i. Cold soak duration (as published by Peyrot des Gachons and Kennedy, 2003)



**Figure 4.** Increase in skin and seed proanthocyanidin concentration during alcoholic fermentation during a fermentation with 4 (a) and 10 day (b) low temperature prefermentation skin contact prior to fermentation.

#### Other projects in progress

- Comparison of fermentations undergoing intentional seed removal during maceration in cv. Pinot noir: in progress
  - A comparison of varietal extraction in cvs. Syrah, Pinot noir and Merlot: preliminary work complete
  - Punchdown versus pumpover extraction of tannins in cv. Pinot noir: in progress
  - Extraction dynamics (spatial variation): in progress
4. Conduct sensory studies on prepared wines to determine the relationships between the tannin present in red wine and the textural quality of red wine.

- i. Preliminary tasting complete, planning underway. This area is proving to be quite complicated. While the new analytical method is proving to be helpful in measuring proportional extraction, understanding the sensory consequence of this is difficult. Several approaches to this are being undertaken including the isolation of tannins during maceration, as well as conducting PCA analysis on wines produced in various ways. Planning is ongoing for this portion of the project.

#### VI. Outside Presentations of Research

- a. Presented at the 2003 National ASEV meeting.
- b. Presented at the 2003 Northwest regional ASEV meeting.
- c. Presented at the 2003 Oregon Research Grape Day.
- d. Method published in the *Journal of Agricultural and Food Chemistry*

#### VII. Research Success Statements

This research has provided winemakers with the ability to measure the relative proportion and amount of skin and seed tannin extracted into red wine during fermentation. An initial and surprising outcome of this investigation has been that the proportion of extracted seed tannin increases as grapes become more mature. This suggests that one of the reasons for improving wine texture by letting grapes “hang” on the vine (to more fully ripen seeds and hence reduce seed tannin extraction), is not due to tannins. This is interesting because it suggests that texture improvement with hang time is associated with other ripening phenomenon (i.e.: increased sugar, soluble polysaccharides etc.).

#### VIII. Funds Status

Applying for a third year of funding