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## **Yeast Assimilable Nitrogen (YAN): Why Measure YAN Each Vintage Year?**

In order for proper fermentation to occur, it is important that yeast have adequate nutrients available. Yeast assimilable nitrogen (also known as yeast available nitrogen or YAN) is conducted on juice at harvest to indicate the level of nitrogen available at the start of fermentation. Nitrogen is an essential nutrient required for yeast health during the fermentation process. The YAN value for a given lot of grape must or juice directs winemakers to determine what nutrient additions need to be made during fermentation to minimize the potential of hydrogen sulfide production.

Although there are differences in what nutrient suppliers consider a “high,” “medium,” and “low” YAN reading, the general principle is the same: use the initial YAN content and Brix of the juice/must in order to determine proper nutrient supplementation. Additionally, some consideration may need to be given to yeast strain selection, as some yeasts have higher nitrogen requirements than others. Penn State Extension Enology recommends following supplier guidelines for specific nutrient additions.

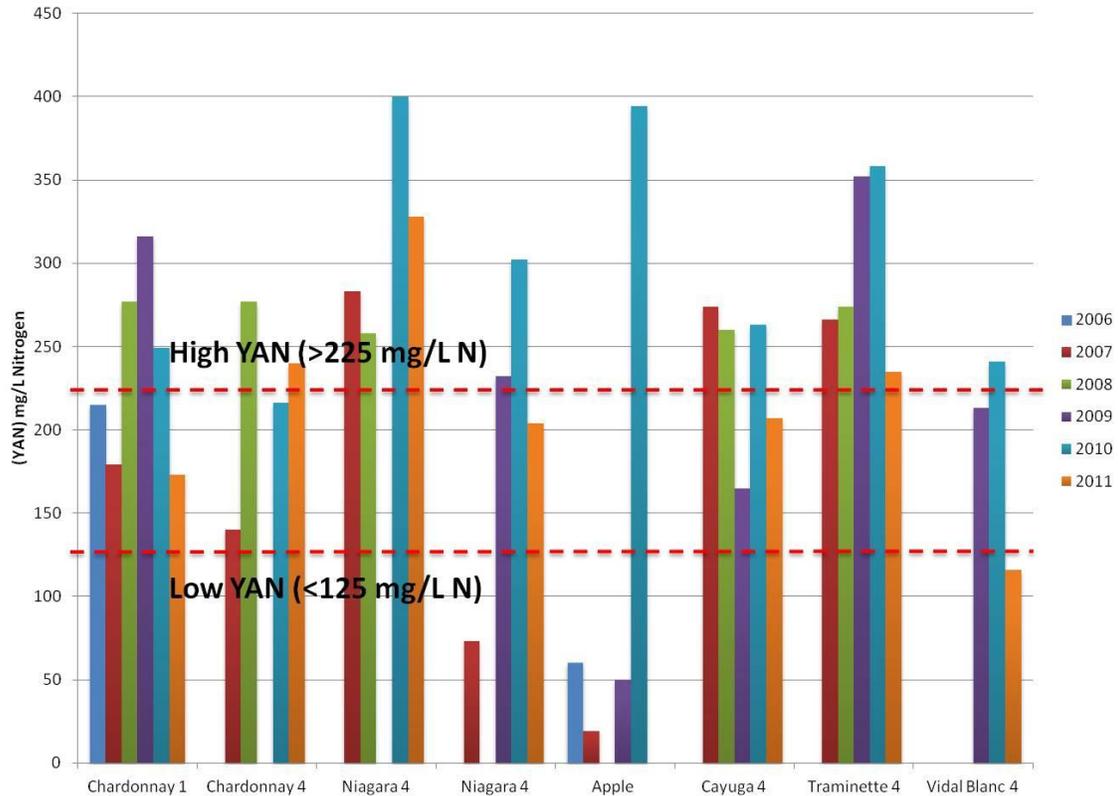
***The purpose of this report is to show the variation in YAN values for a wine grape variety within a single vineyard (located in Pennsylvania or New York) and across several vintage years.*** Data was collected by a single winemaker in Pennsylvania and not analyzed for statistical purposes. It should be noted that YAN values were evaluated using Formol Titration until 2011, at which point some of the varieties were tested enzymatically. *(The result differentiation between these two methods was not found to be significantly different. Statistical evaluation of these analytical methods was completed by the industry member.)*

At the conclusion of this report, a listing of additional information on YAN, YAN analysis, and hydrogen sulfide formation are included.

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The following is an explanation regarding how the charts in this paper should be read:

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The YAN content (mg Nitrogen/L, Nitrogen may be abbreviated as “N”) is indicated on the “Y” axis. The “X” axis contains a wine grape or fruit variety (of a particular vineyard plot) in which YAN has been measured. A numeral (1-4) follows the variety name to emphasize the region where grape must/juice was obtained:

- 1 Southeastern Pennsylvania
- 2 Long Island, New York
- 3 Finger Lakes, New York
- 4 Lake Erie Region, Pennsylvania

For each variety, there are a group of bars, each representing a different harvest year. A total of 6 years of YAN evaluation has been recorded. Some varieties do not contain all 6 years of data. This is represented by an absence of the bar on the chart. In the example above, we can see that for “*Chardonnay 4*” data was not collected in 2006 and 2009.

Two red dashed lines indicate the general “minimum” and “maximum” values to indicate the difference between “Low” and “High” YANs. For the purpose of this report, anything below 125 mg N/L is considered a low YAN content. Any number above 225 mg N/L is considered a high YAN content.

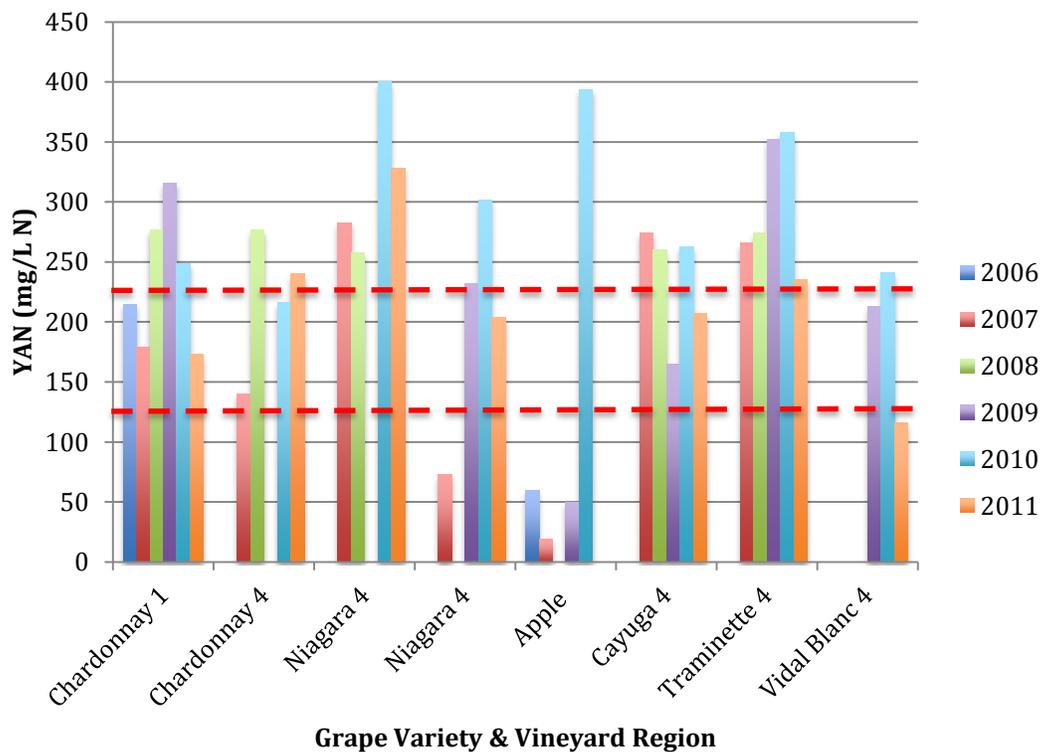
These levels generally require different nutrient supplementation protocols during fermentation to maintain yeast health, and dependent on Brix concentration.

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The following graphs contain several years of YAN values for a specific wine grape variety. Each variety identified is grown and produced from one particular grower and fruit is taken from the same vineyard each year for analysis.

The objectives of these graphs are to show the variation in YAN values for a specific variety over the course of several years, and provide justification for measuring YAN each vintage.



As one can see from the above graph, for many of these varieties the YAN content varies among the three YAN ranges (high, medium, and low) from year-to-year. Some examples include the second “Niagara 4” or “Vidal Blanc 4,” which had YAN quantities that ranged in the “high,” “medium,” and “low” magnitude over various harvest years. The chart shows that other varieties varied between “high” and “medium” YAN numbers. The “apple” variety demonstrates great variation in its YAN in 2010 compared to previous vintage years. This annual variation in YAN provides the winemaker with information for making specific nutrient additions that will benefit the fermentation best at the time of harvest.

The variation in YAN values for a given variety illustrates a need to:

1. Measure YAN on an annual basis for each variety that comes into the winery.
2. Stop the use of mid-range nutrient additions and/or excessive use of diammonium phosphate (DAP). With such variation in YAN values, it is best

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to determine where the must/juice lies in terms of being a “high,” “medium,” or “low” YAN fermentation. Nutrient additions should adhere to supplier recommendations based on individual fermentation conditions to decrease the risk for stuck or sluggish fermentations, minimize hydrogen sulfide formation, and enhance the quality of the wine by the end of fermentation.

3. Keep accurate record books to evaluate YAN trends for a specific variety.

The table below lists several different supplies of nitrogen-based products that contribute nitrogen during primary fermentation. This is to emphasize the variation in nutrient products and how supplier recommendations differ. Each of the brands offered by a given supplier represents a line of products to be used for different YAN conditions. Fermaid, for example, has several options: Fermaid K, Fermaid O, and Fermaid A. (This list is just an example for winemakers and should not replace product information provided by the supplier.)

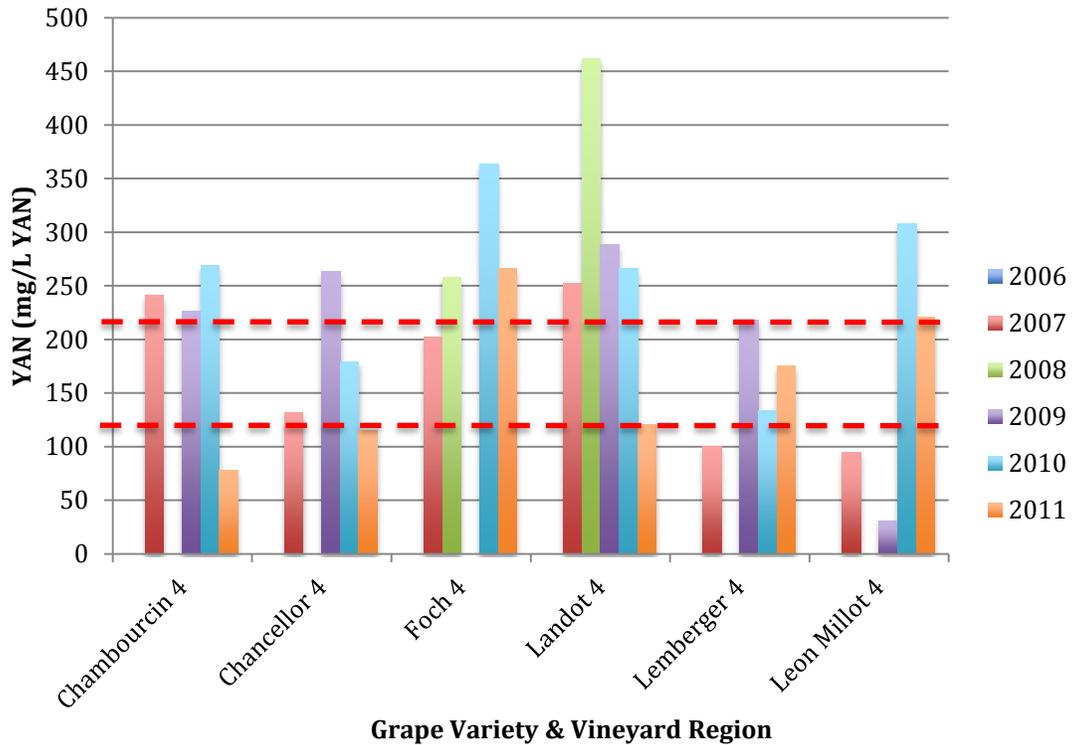
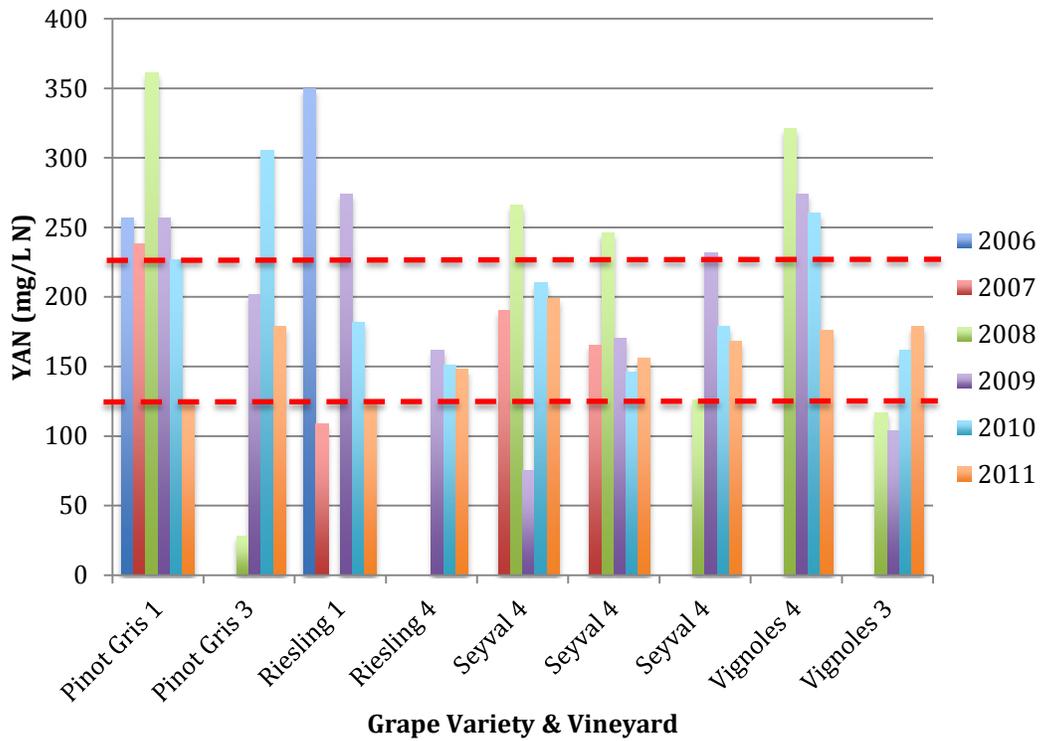
**Table 1:** Nitrogen Product Lines that Contribute to YAN during Fermentation and Optimal YAN Rates per Supplier Recommendations

COMPANY	NITROGEN PRODUCT LINES	HIGH/MEDIUM/LOW YAN RATES
<b>Beverage Supply Group (BSG)/ The Wine Lab/ Lesaffre</b>	Superfood™	Recommended YAN Levels to Reach by End of Fermentation: ≤21°Brix: 200-250 mg/L N 23°Brix: 250-300 mg/L N 25°Brix: 300-350 mg/L N
	Superferm™	
	Vinferm®	
	Startup™	
<b>Enartis Vinquiry</b>	Startup-Org™	25°Brix: 300-350 mg/L N
	Nutriferment	High: >225 mg/L N Medium: 125-225 mg/L N Low: <125 mg/L N
<b>Gusmer Enterprises</b>	MicroEssentials™	Addition rates and timing based on specific fermentation conditions
<b>Laffort</b>	Dynastart®	High: >180 mg/L N
	Thiazote®	Medium: 140-180 mg/L N
	Nutriscart®	Low: 40-140 mg/L N
	Bioactiv®	
<b>Lallemand/ Scott Labs</b>	GoFerm®	High: >200 mg/L N
	Fermaid™	Medium: 125-200 mg/L N Low: <125 mg/L N

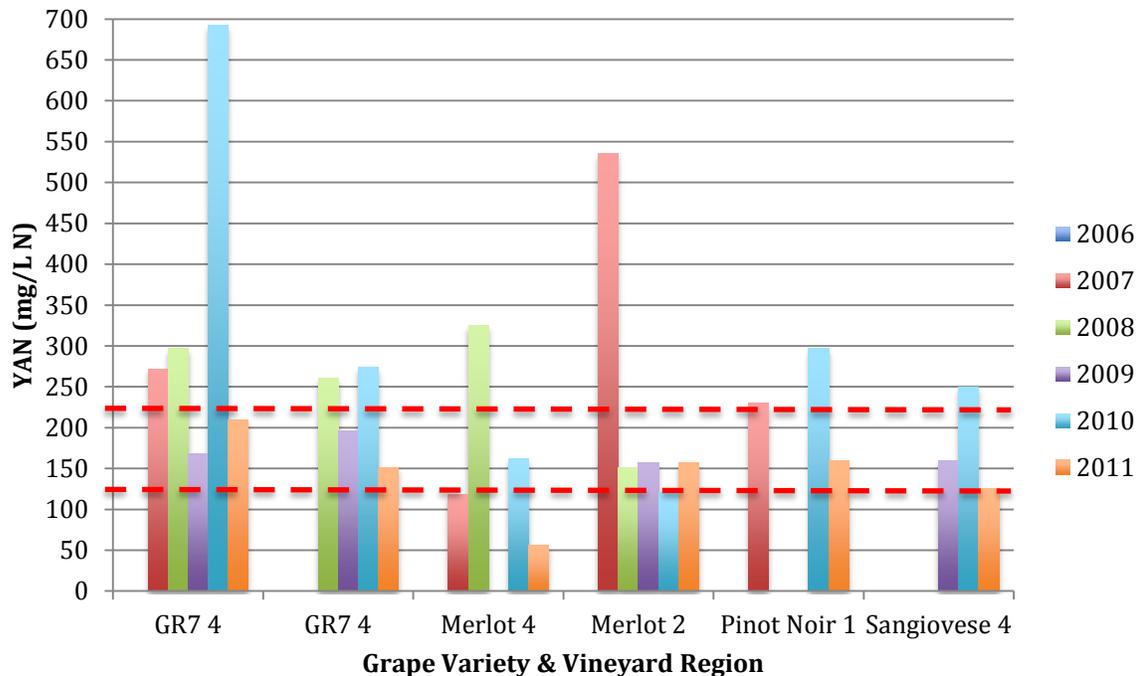
*For a complete listing of all products, please see individual supplier's catalogs or websites. This list was made as complete as possible at the time of its publication.*

The following graphs show more YAN data on several more varieties throughout Pennsylvania and New York. This data is included to show the variation in YAN with many wine grape varieties grown in the Mid-Atlantic region.

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With a better understanding of YAN and YAN management during fermentation, winemakers can take a proactive approach at controlling the fermentation and final wine quality. Improving YAN management practices offers several advantages to the winemaker:

1. Minimize hydrogen sulfide occurrences in the finished wine.
2. More successful, dry fermentations.
3. Improve the number of clean wines by the completion of fermentation.
4. Reduce the number of stuck or sluggish fermentations, which may contribute to other problems or flaws in the finished wine.
5. Develop a better understanding of YAN values and nitrogen needs for wine varieties made at the winery.
6. Reduce unnecessary costs for fermentation nutrients by only using those nutrients required for a healthy fermentation.

While there is a lot more to cover with regards to YAN and fermentation management, it is beyond the scope of this paper. For more information on YAN or hydrogen sulfide problems in winemaking, or stuck fermentations, please visit the following sources:

FAQ's About YAN from Cornell University:

<http://www.fruit.cornell.edu/shared/pdfs/FAQYAN.pdf>

Virginia Tech's Enology Grape Chemistry Group "Online Publications" which posts several articles on YAN and sulfur-like off-odors: <http://www.vtwines.info/>

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Improving Management Options for YAN in the Vineyard and Winery from Cornell University: <http://www.fruit.cornell.edu/shared/pdfs/ImproveYAN.pdf>

Stuck and Sluggish Wine Treatment Summary by Vinotec Napa:

<http://www.bsgwine.com/PDF/StuckReinoc09%5B1%5D.pdf>

Measuring YAN Enzymatically in Cornell's Jan. 2012 Cellar Dweller:

<http://grapesandwine.cals.cornell.edu/cals/grapesandwine/outreach/enology/loader.cfm?csModule=security/getfile&PageID=1037840>