Experimental 
Pinot noir grapes from the same clones were grown in 15 different vineyards in California and Oregon (Figure 1). In ten cases, the vines were grafted onto the same rootstock. The grapes were harvested and transported to the UC Davis winery (Figure 2) where wines were made in quadruplicate from each vineyard using identical procedures. Included in the facility is a state of the-art winery with 132 highly automated research fermenters with precise temperature control, stirring, and fermentation monitoring. Each fermenter is equipped with an experimental chamber that was used to measure internal variables in as many variables as possible in the winery to mimic an industrial scale winery. It is of note that the chemical make-up of the wine would be due to the grape growing conditions — soil and microclimate. In future years, the vineyards that were used will continue for 5 years. In future years, recording weather stations will be placed in each vineyard located where the grapes are growing to provide accurate weather data. The project will utilize multiple techniques to analyze wines in order to develop a high-dimensional flavor, aroma, and sensory profile. This work describes analyses by HS-SPME GC/MS.

Results and Discussion

Significant aroma compounds identified in the Pinot noir wine are shown in Figure 7. These compounds could be classified only as terpenes and sesquiterpenes. HS-SPME GC/MS has proved to be very sensitive for the analysis of wine volatile. As shown in Figure 5, the HMSPC/MS GC/Q-TOF was able to detect 2,4,6-trichlorobenzene (responsible for a musty or “cork taint” aroma in wine) at ~2 ng/L.

Figure 7. Significant aroma compounds identified in the Pinot noir wine sample. These compounds were tentatively identified by spectral matching and comparison of retention index values.

Conclusions

Four batches of wine were made from four vineyards from Pinot noir grapes harvested from 15 different vineyards in California and Oregon (3 batches used for GC/Q-TOF analyses). Ten vineyards were grown at five different AVA’s north coast and California central coast. Volatile profiles differ between vineyards in Oregon. All samples could be separated in PCA based on volatile profiles of significant aroma compounds.