Oregon Wine Advisory Board
Research Progress Report

1994 - 1995

Inflorescence Necrosis and Ammonium in Grape

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Introduction and Objectives

Poor set and low yields in 1988 and 1990 were, in part, attributed to Inflorescence Necrosis (IN), a disorder that results in death of flowers and rachis tissue near bloom-time. In isolated areas, IN has caused significant loss of crop in each year since then. Past research at OSU has indicated that high vigor and vine shade worsen IN, and that vines more severely affected by IN have higher concentrations of ammonium ion (NH,"), which seems to be the cause of IN symptoms in cluster tissue. However, there is still much that we do not understand about IN. Currently, our research is focusing on determining how viticultural factors affect NH," concentrations in flower tissues and investigating one possible reason why NH,~ may build up to toxic levels.

Results and Discussion

In 1994, flower clusters from the trellis trial at the Lewis Brown Farm in Corvallis, the Pinot noir clonal trial at Woodhall Vineyard, and three replicated rootstock trials (one in Southern Oregon and two in the Willamette Valley, each containing Pinot noir on own-roots, or grafted to rootstocks, 44-53, 5C, 101-14, 3309, 420A, or Harmony) were sampled at bloom. Petioles were also sampled from the rootstock trials.

In the rootstock trials surveyed, it was evident that location of the vineyard had a greater impact on flower cluster NH4* than did rootstock (Fig. 1). Only in the vineyard with the highest overall NH,* levels (Site 3) were there statistically significant differences in NFV between rootstocks, with 420A being the lowest (3.08mg NFL*/gdw) and 101-14 the highest (3.78mg/gdw). It is possible that in a year of potentially bad IN rootstocks may make a difference in its severity. A test sample from the Woodhall Vineyard rootstock planting showed that *Riparia gloire* (which is reported to favor fruit set) flower clusters had considerably lower NH,+ than in other rootstocks.

Full nutrient analysis of petioles is still forthcoming, but NH,,+ concentration was measured. Levels in petioles were about one-third that found in clusters. 3309 had the highest NH,+ at all sites, and Harmony and 420A were among the lowest. Petiole NH,+ followed the same trend as that for clusters, suggesting that site has an effect on NH,+ levels in different plant organs. There was no significant correlation between NH,+ content in petioles and flowers on the same shoot, however, showing that NK+ levels are regulated differently in these two tissue types.

Flower clusters collected from the Pinot noir clonal trial showed significant differences in NH,+ concentration (Fig. 2) and visual IN severity. The Dijon clones (with the exception of Dijon 60) tended to have lower cluster NH,,+, and were not in the high IN severity group. In general, however, there

wasn't a clear relationship between characteristics of a clone (e.g. cluster looseness or vine vigor) and IN severity.

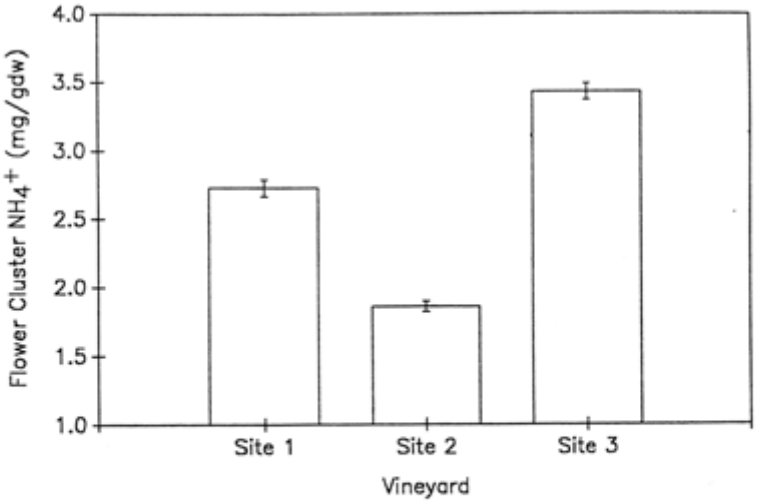

Fig. 1. Average flower cluster NH_4^+ concentration at three different, replicated rootstock trials in Oregon. Sites 1 and 2 are located in the Willamette Valley, and Site 3 is in the Rogue River Valley. Bars indicate standard error; clusters were collected at bloom.

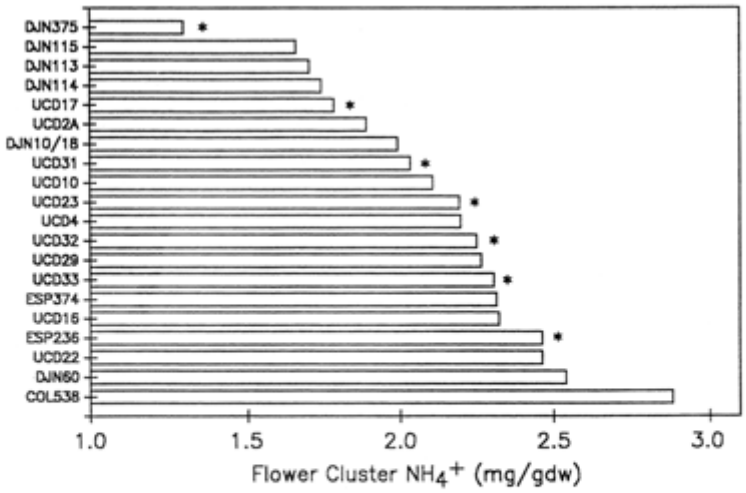

Fig. 2. Flower cluster NH_4^+ concentration from clones at the Woodhall clonal trial, Alpine, Oregon. Bars marked with an asterix indicate significantly higher IN (visual scoring). Clusters were collected at bloom; test for difference between means significant at $p<0.001$.

Since both the rootstock and clonal plots are just coming into production and are not fully established in the soil or on the trellises, these surveys will be repeated in the 1995 growing season.

Trellis was also found to affect flower NIL+ content (Fig. 3). Cordon pruned Riesling trained to a single upright canopy had the lowest NK+, while cane-pruned Riesling trained to GDC had the highest concentration. There were no statistical differences between trellises in Pinot noir this year, however. In

general, average NH,+ levels were lower in 1994 than in 1993 (1.66 vs. 2.79mg NFL+/gdw).

Canopy alterations affected NH,+ levels in field-gown vines. Removal of the lower nine leaves of a shoot one week before bloom increased cluster NK+ (from 1.79 to 2.34mg/gdw) and IN severity (visual scoring). Whole-vine shading, and single shoot shading (imposed one week before bloom) increased cluster NFL+ significantly (by about 50% over that of the control), also. The latter result suggests that the environment of a single shoot can play a large part in NH,+ levels in that shoot's flower clusters, while the rest of the vine can have relatively little impact.

Previous researchers at OSU suggested that the rachis tissue of flower clusters may be more susceptible to NK+ toxicity because it lacks the enzymes (or the enzymes are in an inactive state) that normally assimilate NFI~+, which allows it to build up to toxic levels. By using a probe for one of the enzymes of NIL* assimilation, we found evidence that tendril, petiole, leaf, rachis, and flower tissue all have this enzyme present. The question of whether or not the enzymes that are there are active and able to assimilate NH,+ will be completed this year.

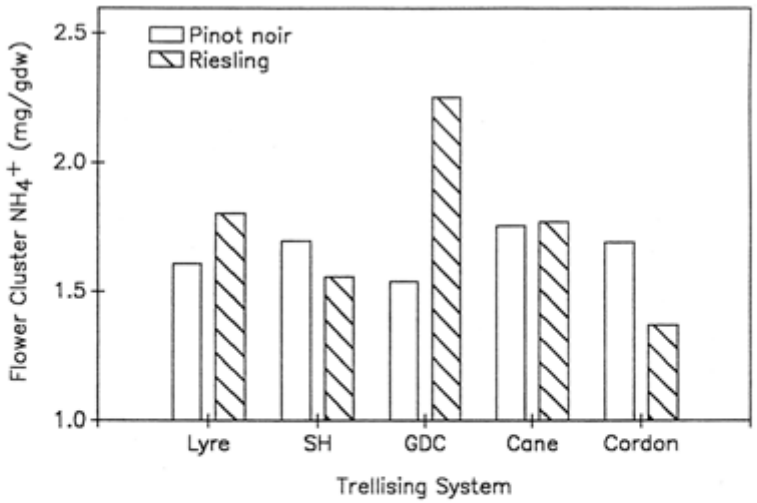

Fig. 3. Flower cluster NH_4^+ concentration in Pinot noir and Riesling from the Lewis Brown Farm, Corvallis, Oregon. Cane- and cordon-pruned vines were trained to a single upright canopy. Clusters were collected at bloom. Test for difference between means for Riesling significant at $p < 0.001$; means for Pinot noir were not significantly different.