2012

Effects of Leaf Removal on Fruit Quality of Wine Grapes Grown in Iowa

Dennis N. Portz
Iowa State University

Leah B. Riesselman
Iowa State University, lriessel@iastate.edu

Crystal Seeley
Iowa State University

Paul Beamer
Iowa State University

Gail R. Nonnecke
Iowa State University, nonnecke@iastate.edu

Effects of Leaf Removal on Fruit Quality of Wine Grapes Grown in Iowa

Abstract
Leaf removal practices are common in many viticulture regions, leading to improved fruit quality. However, little research has been done on the benefits and challenges of leaf removal on cold-climate grape cultivars grown in the Upper Midwest that have high acidity. Potential benefits of leaf removal include increased canopy air circulation and sunlight exposure, decreased cluster disease, and improved flavor, pH, and titratable acidity (TA). Potential leaf removal challenges include fruit sunburn, fewer photosynthesizing leaves around clusters, production of fruit offflavors, and increased production cost due to labor-intensive leaf removal. The objective of this study was to determine if leaf removal around grape clusters is beneficial to improve fruit quality (soluble solids, pH, and TA) of grape cultivars grown in Iowa.

Keywords
RFR A1046, Horticulture

Disciplines
Agricultural Science | Agriculture | Fruit Science | Horticulture

Effects of Leaf Removal on Fruit Quality of Wine Grapes Grown in Iowa

RFR-A1046

Dennis Portz, agriculture specialist
Leah Riesselman, agriculture specialist
Research Farms
Crystal Seeley, undergraduate student
Paul Beamer, undergraduate student
Gail Nonnecke, university professor
Department of Horticulture

Introduction

Leaf removal practices are common in many viticulture regions, leading to improved fruit quality. However, little research has been done on the benefits and challenges of leaf removal on cold-climate grape cultivars grown in the Upper Midwest that have high acidity. Potential benefits of leaf removal include increased canopy air circulation and sunlight exposure, decreased cluster disease, and improved flavor, pH, and titratable acidity (TA). Potential leaf removal challenges include fruit sunburn, fewer photosynthesizing leaves around clusters, production of fruit off-flavors, and increased production cost due to labor-intensive leaf removal. The objective of this study was to determine if leaf removal around grape clusters is beneficial to improve fruit quality (soluble solids, pH, and TA) of grape cultivars grown in Iowa.

Materials and Methods

Three separate experiments were conducted simultaneously in 2010 to observe the effect of leaf removal on several cultivars of wine grapes in central and southwestern Iowa.

Experiment 1. Leaf removal practices were applied to Brianna, Frontenac Gris, La Crescent, Marquette, and Prairie Star in a vineyard (est. 2003) at the Horticulture Research Station, Ames, IA. Each treatment was replicated three times within the cultivar and included 12 vines. Vines were balanced pruned in the spring. Leaves and laterals were removed on the east and west side of the canopy per treatments in early July. The four treatments were: 1) no leaf or lateral shoot removal or cluster thinning (control); 2) leaf and lateral shoot removal on both sides of the canopy and no cluster thinning; 3) cluster thinning to one cluster per shoot and no leaf or lateral shoot removal; and 4) leaf and lateral shoot removal on both sides of the canopy as well as thinning one cluster per shoot.

Experiment 2: Leaf removal practices were applied to Maréchal Foch (est. 1985) at the Horticulture Research Station, Ames, IA. Each treatment was replicated four times within the cultivar and included 16 vines. Vines were balanced pruned in the spring. There was no cluster thinning completed because of the cultivar's small cluster size. Leaves and laterals were removed on both sides per treatments in June, two weeks after full bloom. The two treatments were: 1) no leaves or laterals removed (control); and 2) leaves and laterals removed from across each cluster, one node above, and one node below each cluster.

Experiment 3: Leaf removal practices were applied to La Crescent and Marquette (est. 2003) at the Armstrong Research Farm, Lewis, IA. Each treatment was replicated four times within the cultivar and included 12 vines. Vines were balanced pruned in the spring. Cluster thinning was completed on the two cultivars in June. Leaves and lateral shoots were removed per treatments in July after fruit set. The three treatments were: 1) leaves and lateral shoots removed surrounding each cluster on both the east and

west side of the canopy; 2) leaves and lateral shoots removed surrounding each cluster from just the east side of the canopy; and 3) no leaves or lateral shoots removed (control).

Clusters were harvested from all three experiments based on maturity indices and declining condition (fruit rot). Thirty berry samples from each replication were blended and strained. The juice was analyzed for sugar content: soluble solids concentration (SSC), titratable acidity, and pH. Soluble solids were determined using a refractometer, pH was determined using a pH meter, TA was determined by titrating 0.1 N NaOH with 5ml of juice and 95mL of water to a pH end point of 8.20.

Results and Discussion

Experiment 1: Samples were collected during maturity (Aug 19, Aug 25, and Sept 2) and a final collection at harvest (Sept 8 for Brianna and Prairie Star and Sept 17 for Marquette, La Crescent, and Frontenac Gris). Data variables collected showed no difference among treatments in the cultivars Marquette, Frontenac Gris, and Prairie Star for average berry size, SSC, initial pH, or TA. Soluble solids concentration in Brianna and La Crescent was greater at harvest when leaf and lateral shoots were removed with no cluster thinning than when no leaves were removed and cluster thinning to one cluster per shoot occurred. No other differences were found in fruit quality variables for Brianna or La Crescent. (Harvest parameters for Marquette average berry size 1.38 g, SSC 23.5 percent, initial pH 3.58, and TA 0.74 percent. Harvest parameters for La Crescent average berry size 1.32 g, SSC 22.6 percent, initial pH 3.47, and TA 1.10 percent. Harvest parameters for Brianna average berry size 3.00 g, SSC 17.6 percent, initial pH 3.62, and TA 0.58 percent. Harvest parameters for Frontenac Gris average berry size 1.13 g, SSC 24.5 percent, initial pH 3.40, and TA 0.90 percent. Harvest parameters for Prairie Star average berry size 2.23 g, SSC 19.1 percent, initial pH 3.75, and TA 0.69 percent).

Experiment 2: Samples were collected at harvest (Sept 10). Data variables collected show no difference among leaf and lateral removal treatments for fruit quality of Maréchal Foch for average berry size, SSC, initial pH, or TA. (Harvest parameters for Maréchal Foch: average berry size 1.15 g, SSC 20.6 percent, initial pH 3.62, and TA 0.60 percent).

Experiment 3: Samples were collected during maturity (Aug 10 and 18) and a final collection at harvest (Aug 30). There was no difference among leaf and lateral removal treatments in the cultivars Marquette and La Crescent for average berry size, SSC, initial pH, or TA. (Harvest parameters for Marquette avg. berry size 1.60 g, SSC 23.0 percent, initial pH 3.68, and TA 0.69 percent; harvest parameters for La Crescent average berry size 1.56 g, SSC 22.0 percent, initial pH 3.60, and TA 1.00 percent).

Benefits from removing leaves and lateral shoots to improve berry SSC, initial pH, and TA were not found, which suggests that leaf and lateral shoot removal may not be cost effective due to additional costs of labor without benefits to fruit quality. However, the available vines to work with limited this study and if treatments were performed on a larger scale, results may show differences between treatments of fruit quality as measured by SSC, pH, TA, or compounds important in wine. Future work should be continued to emphasize the viticulture techniques on fruit quality for wine production in Iowa.

Acknowledgements

We thank the staff at the Armstrong Research Farm and the Horticulture Research Station for their assistance.