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Canopy Management Practices and Light Interception of Northern Grape Cultivars

Dylan P. Rolfes

Iowa State University, dprolfes@iastate.edu

Gail R. Nonnecke

Iowa State University, nonnecke@iastate.edu

Paul A. Domoto

Iowa State University, domoto@iastate.edu

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Canopy Management Practices and Light Interception of Northern Grape Cultivars

Abstract

The recent development of Vitis riparia hybrids has allowed the expansion of the wine industry into Iowa and the Upper Midwest. These cultivars are more cold hardy and vigorous than traditional *V. vinifera* hybrids. During maturation the fruit tend to retain high levels of acids, exhibit a rapid rise in pH, accumulate high potassium levels, and possess a different profile of malic to tartaric acid than other hybrids. Wines from these grapes often have a “grassy” or “herbaceous” flavor. These same characteristics have been associated with fruit grown in shaded canopies. This study was undertaken as part of the USDA Northern Grapes Specialty Crops Research Initiative (SCRI) project to assess the effectiveness and cost benefit of various combinations of canopy management practices on improving the fruit quality characteristics of Frontenac, La Crescent, and Marquette wine grapes. This report summarizes part of the first year results.

Keywords

RFR A1210, Horticulture

Disciplines

Agricultural Science | Agriculture | Fruit Science | Horticulture

Canopy Management Practices and Light Interception of Northern Grape Cultivars

RFR-A1210

Dylan Rolfes, graduate assistant
Gail Nonnecke, university professor
Paul Domoto, professor
Department of Horticulture

Introduction

The recent development of *Vitis riparia* hybrids has allowed the expansion of the wine industry into Iowa and the Upper Midwest. These cultivars are more cold hardy and vigorous than traditional *V. vinifera* hybrids. During maturation the fruit tend to retain high levels of acids, exhibit a rapid rise in pH, accumulate high potassium levels, and possess a different profile of malic to tartaric acid than other hybrids. Wines from these grapes often have a “grassy” or “herbaceous” flavor. These same characteristics have been associated with fruit grown in shaded canopies. This study was undertaken as part of the USDA Northern Grapes Specialty Crops Research Initiative (SCRI) project to assess the effectiveness and cost benefit of various combinations of canopy management practices on improving the fruit quality characteristics of Frontenac, La Crescent, and Marquette wine grapes. This report summarizes part of the first year results.

Materials and Methods

Mature La Crescent vines at Snus Hill Winery, Madrid, Iowa, and Frontenac vines at Penoch Winery, Adel, Iowa were used in this study. Both vineyards had 6–8 ft spacing between vines and 8–10 ft spacing between rows. Both vineyards were trained to a high-wire bilateral cordon system. The La Crescent rows were oriented east-west while the Frontenac rows were oriented north-south. Marquette vines were to be included in the

study, but a spring frost in 2012 killed most of the emerging shoots.

Treatments included all combinations of shoot thinning (ST), which consists of thinning to a single shoot per node and removal of non-count adventitious (basal) shoots emerging along the cordon early in the season; shoot positioning (SP), where shoots are repositioned (combed) downward; and lateral shoot removal (LM), where adventitious shoots emerging from the leaf axils in the fruiting zone of the shoots were removed later in the season. A control treatment of no canopy management outside of terminal shoot hedging also was included. Each treatment/experimental unit included three adjacent vines and was replicated four times in randomized complete block design. The amount of time to conduct each practice was recorded in minutes.

Throughout the season, measurements were taken on physiological development of the vines, such as the number of shoots and the associated number of grape clusters. Light interception onto the grape clusters was measured at harvest using a LI-COR line quantum sensor. The sensor was placed within the canopy, running the length of the cordon on the vine’s south side for La Crescent and on the west side for Frontenac. Three readings were taken for each vine within one hour of solar noon. A point quadrat analysis was taken once per foot within the fruiting zone. These measurements will be used to evaluate light penetration through the canopy. At harvest, clusters per vine, harvest weight, and time required to harvest were recorded. Sample fruits are being evaluated for glucose, fructose, and potassium, and citric, tartaric, malic, succinic, lactic, and acetic acids.

Results and Discussion

Trends in labor requirements (Figure 1) and light interception (Table 1) can be seen from the 2012 results. The labor required for a treatment increased as the subsequent light penetration increased. The preliminary data analysis indicates that lateral shoot management is the most effective management strategy for increasing light penetration into the canopy. Harvest data indicates that no consistent pattern can be associated between the treatments and yield (Table 1). However, there seems to be a

relationship between canopy management and decreased berry weights (Table 1).

Acknowledgements

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Table 1. Light interception (as a percentage of that found in full sunlight), total yield, cluster weight, and berry weight of La Crescent and Frontenac grapevines grown under different canopy management treatments.

Treatment	Light Interception (% of full sun)		Total Yield (lb/vine)		Average cluster weight (lb)		Average berry weight (g)	
	Cultivar		Cultivar		Cultivar		Cultivar	
	Frontenac	La Crescent	Frontenac	La Crescent	Frontenac	La Crescent	Frontenac	La Crescent
Control	12.8	5.6	7.7	6.4	0.12	0.15	0.99	1.02
Shoot positioning (SP)	14.3	10.9	9.9	5.7	0.15	0.13	0.93	1.08
Shoot thinning (ST)	12.2	20.1	6.9	4.4	0.13	0.12	0.95	0.99
Lateral management (LM)	19.2	37.0	7.9	4.3	0.13	0.12	0.95	1.01
SP + ST	18.5	14.8	7.5	6.4	0.13	0.14	0.91	1.03
SP + LM	22.9	28.7	7.1	5.8	0.12	0.12	0.92	0.98
ST + LM	21.4	30.6	9.1	4.8	0.13	0.13	0.93	0.99
SP + ST + LM	24.7	27.7	7.5	3.6	0.15	0.11	0.95	1.01

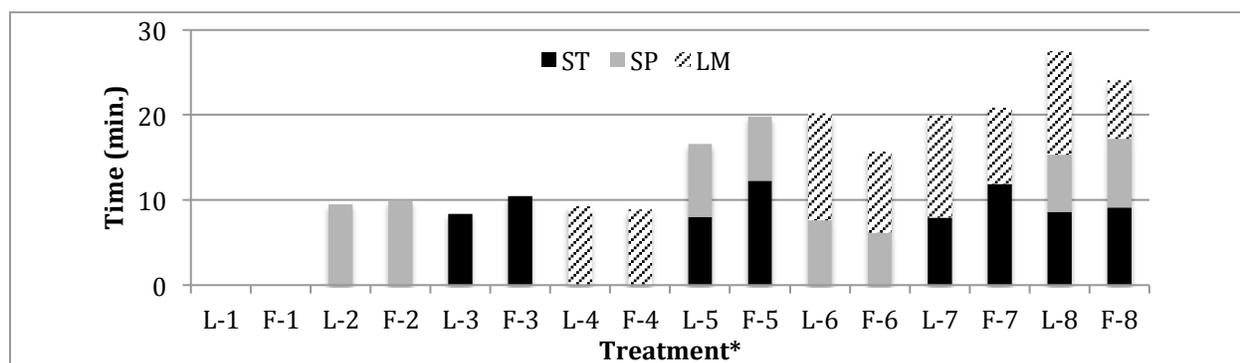


Figure 1. Time required to perform lateral management (LM), shoot positioning (SP), shoot thinning (ST) and combinations of canopy management practices (in minutes) on La Crescent and Frontenac grapevines.

*Treatments designated as cultivar-treatment (i.e. F-1 for Frontenac cultivar and Treatment 1).

Treatment: (1) Control, (2) Shoot Positioning: SP, (3) Shoot Thinning: ST, (4) Lateral Management: LM, (5) SP+ST, (6) SP+LM, (7) ST+LM, (8) SP+ST+LM.