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Abstract

Through a grant from the Leopold Center for Sustainable Agriculture, a grape cultivar by management system trial was established in 2002 at the ISU Horticulture Research Station, Ames, and at the ISU Armstrong Research and Demonstration Farm, Lewis. The trial was designed to evaluate 15 cultivars under three management systems. In 2002, 10 wine cultivars [Maréchal Foch (Foch), Frontenac, Cynthiana (Norton), St.Croix, Chambourcin, Seyval Blanc (Seyval), La Crosse, Vignole, Traminette, Edelweiss], and four seedless table cultivars (Marquis, Vanessa, Reliance, Mars) were planted at the two locations, with the seedless cultivar Jupiter added in 2003.

Keywords

Horticulture

Disciplines

Agricultural Science | Agriculture | Horticulture

2002 Leopold Grape Cultivar by Management System Trial

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Introduction

Through a grant from the Leopold Center for Sustainable Agriculture, a grape cultivar by management system trial was established in 2002 at the ISU Horticulture Research Station, Ames, and at the ISU Armstrong Research and Demonstration Farm, Lewis. The trial was designed to evaluate 15 cultivars under three management systems. In 2002, 10 wine cultivars [Maréchal Foch (Foch), Frontenac, Cynthiana (Norton), St.Croix, Chambourcin, Seyval Blanc (Seyval), La Crosse, Vignole, Traminette, Edelweiss], and four seedless table cultivars (Marquis, Vanessa, Reliance, Mars) were planted at the two locations, with the seedless cultivar Jupiter added in 2003. The three management systems being evaluated are a conventional system that relies on herbicides for weed control and the application of insecticides and fungicides on a regular basis, an IPM/best management system that uses herbicides as needed and relies on monitoring to determine the need for insecticides and fungicides, and an organic-approved system, that relies on alternative methods of weed control and the use of organic-approved insect and disease control strategies. The vines were planted at a spacing of 8 × 10 ft apart (545 vines/acre) with three vines/replication. Treatments were replicated five times at the Ames farm and three times at the Armstrong farm.

Materials and Methods

The vines are being trained to the bi-lateral cordon system on a 2-wire trellis with wires at 3.5 and 6.0 feet and posts spaced 24 feet apart. Vines with a procumbent (trailing) growth habit will be trained to the top wire, whereas those with a semi-upright to upright growth habit

(Chambourcin, La Crosse, Seyval, Traminette, Vignole) will be trained to the mid-level wire with catch wires added above. This report summarizes the practices and results for the 2003-growing season.

In 2003, the conventional and IPM/best management treatments were fertilized at a rate of 45 lb actual N/acre using urea. For the organic-approved treatment, an equivalent rate of corn gluten meal was applied. Weed control in the conventional and IPM/best management treatments was accomplished with a pre-emergence application of oryzalin herbicide followed up with a wick application of glyphosate. Hoeing and a layer of straw mulch in flakes were used to control weeds in the organic-approved treatment. No insecticides or fungicides were applied in 2003 at the Horticulture Station planting. Carbaryl was applied at the Armstrong Farm in an attempt to control grasshoppers.

The vines were pruned in the spring and pruning weights were recorded (Table 1). However, because of considerable cane dieback at each site, pruning weights were not a good indicator of vine growth in 2002. Following bud break, the height of terminal buds emerging above the ground was recorded. At the Horticulture Station, 'Frontenac' vines experienced the least cane die-back, whereas at the Armstrong Farm the least die-back occurred on 'Mars' vines. At both sites, 'Traminette,' 'Marquis,' 'Seyval Blanc,' and 'Cynthiana' vines exhibited the greatest cane dieback. Differences between sites for height of terminal bud emergence were evident for 'Maréchal Foch,' 'Frontenac,' St. Croix,' and 'La Crosse' vines.

During the growing season, both sites were exposed to 2,4-D herbicide drift. Injury symptoms were evident at the Armstrong Farm in June and August and at the Horticulture

Station in August. When rated for severity of injury in September, 'Vanessa' and 'Cynthiana' vines exhibited the greatest injury at both sites (Table 2). 'Frontenac,' 'St. Croix,' 'Chambourcin,' 'Seyval blanc,' 'La Crosse,' and 'Vignole' vines exhibited little or no injury. Vines at both sites exhibited a "crinkly" leaf pattern that is characteristic of potato leafhopper feeding (Table 3). At the Horticulture Station, the greatest injury occurred on 'Cynthiana' vines followed by 'Traminette,' 'La Crosse,' and 'Jupiter' vines, whereas at the Armstrong Farm, the greatest injury occurred on 'La Crosse' vines. By management system, organic-approved vines at the Horticulture Station exhibited less leafhopper damage. It was noted that the foliage of these vines exhibited a lighter green color that was assumed to have been caused by the straw mulch tying up nitrogen. This probably affected the feeding activity of the leafhoppers.

Grape phylloxera galls were evident on the leaves at the Horticulture Station but were not evident at the Armstrong Farm. When rated for severity of infestation, 'Seyval Blanc' and 'Frontenac' vines were associated with the highest levels of galls (Table 3). Grasshoppers were again a problem at the Armstrong Farm, and when rated for injury, it was evident that they preferred to feed on 'Vanessa' vines.

Both sites were exposed to early fall freezes in late September and/or early October. At the

Horticulture Station freezing temperatures were recorded on successive mornings of September 29 (32°F), 30 (32°F), October 1 (31°F), and 2 (26°F), whereas at the Armstrong Farm 31°F was recorded on October 2. When rated for the severity of injury, 'St. Croix' vines exhibited the least injury at the Horticulture Station (Table 3). At the Armstrong Farm 'Vanessa' and 'Marquis' exhibited the greatest injury, whereas several cultivars exhibited little or no injury. At both sites, vines in the organic-approved treatment exhibited greater frost injury than vines in the other management systems. This was attributed to the trapping of energy by the mulch under radiation freeze conditions. At the Armstrong Farm the vines were not exposed to other frosts or freezes following October 2, and a rating was taken on leaf senescence and drop on October 25 (Table 3). For cultivars that experienced slight frost injury on October 2, these results would seem to indicate the ability of the cultivars to go dormant and acclimate for the winter.

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Table 1. Pruning weight and height of bud emergence of 14 cultivars in the ISU 2002 grape cultivar by management system trial for 2003.^z

Cultivar	Pruning weight (oz)		Height of bud emergence (in)	
	Horticulture	Armstrong	Horticulture	Armstrong
Maréchal Foch	6.7 bc	1.9 ef	36.9 b	9.7 de
Frontenac	5.2 cd	1.6 f	46.9 a	7.8 def
Cynthiana	4.0 de	3.2 cd	9.6 ef	6.0 ef
St. Croix	3.0 e	2.5 def	29.8 bc	9.0 def
Chambourcin	7.6 ab	3.8 b	9.5 ef	13.0 cd
Seyval Blanc	8.5 a	4.1 abc	8.6 ef	7.9 defg
La Crosse	7.4 ab	4.5 ab	20.9 cd	2.6 fg
Vignole	4.7 d	2.9 cde	14.9 de	15.9 bc
Traminette	3.8 de	3.7 bc	2.9 f	6.5 efg
Edelweiss	5.0 d	5.3 a	32.5 b	19.7 ab
Marquis	4.9 d	4.9 ab	8.9 ef	2.3 g
Vanessa	3.8 de	3.3 cd	28.0 bc	19.3 ab
Reliance	4.2 de	3.4 bcd	33.3 b	17.7 bc
Mars	5.4 cd	4.6 ab	29.2 bc	24.5 a

^z Mean separation by Tukey's HSD ($P=0.05$).**Table 2. 2,4-D herbicide injury and leaf crinkle rating of 15 cultivars in the ISU 2002 grape cultivar by management system trial for 2003.**^z

Treatment	2, 4-D injury rating ^y		Leaf crinkle rating ^x	
	Horticulture	Armstrong	Horticulture	Armstrong
Management system:				
Conventional	2.0 a	2.4 a	2.3 a	1.3 a
IPM/best mgmt	2.0 a	2.4 a	2.4 a	1.3 a
Organic approved	2.1 a	2.5 a	2.1 b	1.3 a
Cultivar:				
Maréchal Foch	2.9 bcd	2.7 c	1.5 gh	1.3 b
Frontenac	1.0 g	1.1 d	1.1 gh	1.6 b
Cynthiana	3.5 ab	4.4 a	4.1 a	1.4 b
St. Croix	1.1 g	1.0 d	1.2 gh	1.0 b
Chambourcin	1.0 g	1.0 d	1.6 fgh	1.2 b
Seyval Blanc	1.0 g	1.0 d	1.1 h	1.2 b
La Crosse	1.0 g	1.0 d	3.3 bc	3.8 a
Vignole	1.0 g	1.0 d	1.4 gh	1.1 b
Traminette	3.0 bc	3.5 bc	3.5 ab	1.1 b
Edelweiss	2.0 ef	3.2 bc	2.6 de	1.0 b
Marquis	2.3 de	2.7 c	2.6 de	1.0 b
Vanessa	3.9 a	4.4 a	1.8 fg	1.0 b
Reliance	2.1 e	3.1 bc	2.2 ef	1.0 b
Mars	2.7 c	3.8 ab	2.6 cde	1.0 b
Jupiter	1.4 fg	2.8 c	3.0 bcd	1.0 b

^z Mean separation within each group by Tukey's HSD ($P=0.05$).^y Herbicide injury scale 1–5: 1 = no apparent injury; 2 = slight symptoms of abnormal venation; 3 = moderate; 4 = severe; 5 = very severe.^x Leaf crinkle rating scale 1–5: 1 = no apparent injury; 2 = slight symptoms of abnormal crinkling; 3 = moderate; 4 = severe; 5 = very severe.

Table 3. Grape phylloxera, grasshopper, frost and leaf senescence ratings of 15 cultivars in the ISU 2002 grape cultivar by management system trial for 2003. ^z

Treatment	Phylloxera ^y	Grasshopper ^x	Frost ^w		Senescence ^v
	(Horticulture)	(Armstrong)	Horticulture	Armstrong	(Armstrong)
Management system:					
Conventional	1.5 a	1.5 a	4.1 b	1.9 ab	4.0 b
IPM/best mgmt	1.6 a	1.5 a	4.1 b	1.8 b	3.7 c
Organic approved	1.5 a	1.6 a	4.5 a	2.0 a	4.4 a
Cultivar:					
Maréchal Foch	1.0 d	1.1 cd	4.5 bcd	3.1 b	5.5 ab
Frontenac	2.8 a	1.7 b	5.0 a	2.8 b	4.4 cd
Cynthiana	1.0 d	1.6 bc	4.1 de	1.0 e	3.8 de
St. Croix	2.1 b	1.4 bcd	2.9 g	1.1 de	4.4 cd
Chambourcin	1.6 c	1.4 bcd	4.4 cd	1.2 de	2.3 g
Seyval Blanc	3.0 a	1.3 bcd	3.8 ef	1.0 e	2.3 g
La Crosse	2.2 b	1.5 bcd	4.5 bc	1.7 c	3.2 efg
Vignole	2.3 b	1.4 bcd	5.0 a	1.7 c	3.2 efg
Traminette	1.0 d	1.7 b	3.8 ef	1.0 e	2.3 g
Edelweiss	1.0 d	1.4 bcd	3.5 f	1.3 cd	5.6 ab
Marquis	1.1 d	1.3 bcd	5.0 a	4.0 a	4.7 bc
Vanessa	1.0 d	3.7 a	4.9 ab	4.1 a	6.0 a
Reliance	1.3 cd	1.6 bc	4.0 e	2.8 b	5.5 ab
Mars	1.0 d	1.1 cd	3.7 ef	1.1 de	4.6 c
Jupiter	1.0 d	1.0 d	4.9 ab	1.4 cd	2.7 fg

^z Mean separation within each group by Tukey's HSD ($P=0.05$).

^y Phylloxera leaf injury scale 1–5: 1 = no apparent galls; 2 = few galls; 3 = moderate; 4 = severe; 5 = very severe, galls causing severe leaf malformation.

^x Grasshopper leaf feeding scale 1–5: 1 = no apparent feeding activity; 2 = slight feeding; 3 = moderate; 4 = severe; 5 = very severe.

^w Frost injury scale 1–5: 1 = no apparent injury; 2 = slight, injury confined to youngest leaves; 3 = moderate, some older leaves exhibiting injury; 4 = severe, over 50% of the leaves injured; 5 = very severe, over 90% of the leaves injured. Rated at the Horticulture Station on October 2 following three successive frosts and before the leaves had thawed following exposure to 26°F; and at the Armstrong Farm on October 5 following 31°F recorded on October 2.

^v Leaf senescence recorded on October 25. Rating scale 1–6: 1 = completely green; 2 = beginning to show a color change but mostly green; 3 = half or more of the leaves have turned color; 4 = leaves turned color and beginning to drop; 5 = over half of the leaves have dropped; 6 = all the leaves have dropped.