Evaluation of Grape Weed Management using Organic Techniques–On-Farm Trial, Madrid, IA, 2009

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Introduction

In 1899, Iowa ranked 11th in the United States in grape production and sixth in 1919. When the focus was shifted to corn and soybean production in the 1930s and 1940s, grape production decreased and with the introduction of the corn herbicide 2,4-D, damage sustained from herbicide drift in the remaining Iowa vineyards was significant enough to cause a great decline in Iowa grape production. In 2009, Iowa had 398 vineyards, and the industry continues to grow (Domoto, 2010).

Materials and Methods

The 'Le Crescent' grape vines for this experiment were planted in Spring 2001 in Madrid, Iowa. Nine rows of 9 grape vines each were studied. The following treatments were compared: conventional herbicide management; and two organic weed management systems: GreenMatch™ (Marrone Bio Innovations, Inc., Davis, CA) with mulch; and AllDown™ (Summerset Products, Bloomington, MN) with mulch. Five rows were treated with conventional herbicides, following recommended Iowa State University rates. In the four rows of organic weed management, four vines in each row were treated with AllDown™ and mulch, and four were treated with GreenMatch™ and mulch. Mulch was applied in a 1–m^2–diameter circular pattern around the base of each vine at a 4-inch depth on May 6. The ninth vine in each row was mulched, but not treated with conventional or organic herbicide to allow for a demonstration of mulch alone. The aisles between vines were mowed regularly, and the area between mulched vines was cut with a string trimmer periodically.

Organic herbicide treatments were applied on May 19 and 29; June 4, 12, 18 and 25; July 1, 13, 20 and 28; and August 10 and 17. The organic herbicides were applied to the woodchips and to saturate the leaves of all weeds emerging through the mulch. The conventional sprays were applied by the vineyard staff to maintain a weed-free environment.

Data collected on grape vines included the length and number of buds on May 19 and 29. The number of grape clusters per vine was counted on June 18. Brix readings were taken with a refractometer on August 18. Weeds (grasses and broadleaves) were counted in the mulched area surrounding each vine before herbicide treatment.

Results and Discussion

The vine lengths of the three treatments on May 19 were not significantly different, averaging 75 inches per vine (Table 1). The number of buds per vine averaged 58, with vines treated with GreenMatch™ having significantly less buds than those treated with AllDown™. However, it is not clear that herbicides affected bud number since buds were set the previous year. The vines treated with AllDown™ had a significantly greater number of grape clusters (98/vine) compared to the GreenMatch™ and

conventional herbicide treatments (averaging 72/vine) (Table 1). The Brix levels (16 °) measured on August 17 did not differ significantly between the three treatments.

In comparing the seasonal average weed populations, the conventional herbicide treatment had significantly higher numbers of grass weeds (15/vine) than the organic treatments (averaging <2/vine), but the seasonal number of broadleaf weeds was not significantly different between the conventional (8/vine) and the organic treatments, also averaging 8 weeds per vine (Table 1).

During the weekly sampling periods, the average number of broadleaf weeds was significantly higher in the conventional herbicide treatment than the organic treatments on 5 of 11 dates (Table 2). Overall, there were few differences in broadleaf weed management between the two organic herbicides; there was one sampling period where broadleaf weeds were greater in the AllDown™ treatment and one period where the GreenMatch™ treatment had greater weeds out of 12 sampling periods.

The average number of grass weeds during the weekly sampling periods was significantly higher in the conventional herbicide treatment compared to the organic treatments on 9 of 11 dates (Table 2). The organic treatments had similar low levels of grass weeds except on two sampling periods: on August 10, the AllDown™ was equivalent to the conventional treatment, and on the first sampling date, the Green Match treatment had a higher number of grass weeds than the AllDown™ treatment (Table 2).

In summary, the organic treatments of mulch plus organic herbicide treatments successfully managed weed growth compared to the conventional herbicide treatment. Herbicides and mulch had little effect on vine growth and Brix levels, but due to loss of the crop from birds, we were unable to determine the effect of these treatments on grape yields.

References

Domoto, P. 2010. ISU Viticulture webpage. http://viticulture.hort.iastate.edu/info/iowagrapeexpectionsmap09.jpg

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Table 1. Vine measurements and seasonal weed populations in organic weed management trial, Snus Hill Vineyard, 2009.

Treatment	Vine length (1 side) (inches)	Number of buds (1 side)	Number of clusters	Brix (°)	Seasonal average weed population (weeds/vine)	
	May 19[1] and May 29[2]	May 19[1] and May 29[2]	June 18	August 17	Grass	Broadleaves
Conventional herbicide (no mulch)	38.38[1]	28.18ab[1]	37.84b	16.58	14.46a	8.07
Mulch + GreenMatch™	35.62[2]	24.68b[2]	34.12b	16.30	1.02b	7.70
Mulch +AllDown™	38.18[2]	33.19a[2]	49.38a	15.25	1.77b	8.98
$LSD_{0.05}$	NS	2.86	4.92	NS	8.136	NS

Table 2. Broadleaf weed populations in organic weed management trial, Snus Hill Vineyard, 2009.

Treatment	May 19	May 29	June 04	June 12	June 18	June 25	July 01	July 13	July 20	July 28	Aug. 10	Aug. 17
Conventional herbicide (no mulch)	-	5.60b	3.11b	8.67b	19.87a	13.71a	9.87a	11.29a	10.47a	1.96b	2.31	1.91b
Mulch + GreenMatch™	13.81	7.19b	15.69a	15.06a	11.37b	5.62b	3.94b	4.88b	2.62b	5.50a	3.31	3.50a
Mulch +AllDown™	16.88	10.38a	15.88a	15.81a	17.31ab	8.50b	5.75b	4.94b	3.00b	4.19a	3.94	1.12b
$LSD_{0.05}$	NS	2.64	9.11	3.06	1.62	4.00	2.63	3.03	6.51	2.58	NS	2.04

Table 3. Grass weed populations in organic weed management trial, Snus Hill Vineyard, 2009.

Treatment	May 19	May 29	June 04	June 12	June 18	June 25	July 01	July 13	July 20	July 28	Aug. 10	Aug. 17
Conventional herbicide (no mulch)	-	1.56	1.07	4.11a	28.02a	16.50a	16.60a	26.49a	47.29a	6.16a	6.56a	4.76a
Mulch + GreenMatch™	1.94a	0.44	0.88	0.12b	1.43b	0.88b	1.31b	0.56b	0.56b	0.62b	2.62b	0.88b
Mulch +AllDown™	0.12b	0.50	0.75	0.81b	3.50b	1.81b	2.12b	1.62b	1.00b	3.00b	4.44ab	1.56b
$LSD_{0.05}$	0.63	NS	NS	1.91	15.25	8.51	9.32	20.11	43.07	2.95	3.30	3.62