2006

Influence of Cover Crop Rotation and Conventional Practices on Grapevine Plant Growth and Weed Growth

Dennis N. Portz
Iowa State University

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

Influence of Cover Crop Rotation and Conventional Practices on Grapevine Plant Growth and Weed Growth

Abstract
Cover crops are used in rotation with cropping systems to improve soil quality and to suppress pests. Use of cover crops prior to replanting on sites with grape may provide a sustainable alternative to chemical pesticides and may maintain or improve soil quality. The objectives of this study were to investigate how cover crops affect weed and nematode populations and soil physical and chemical properties when used on replant sites with *Vitis* spp. (grape).

Keywords
Horticulture

Disciplines
Agricultural Science | Agriculture | Horticulture

Influence of Cover Crop Rotation and Conventional Practices on Grapevine Plant Growth and Weed Growth

Dennis Portz, graduate student
Gail Nonnecke, professor
Department of Horticulture

Introduction

Cover crops are used in rotation with cropping systems to improve soil quality and to suppress pests. Use of cover crops prior to replanting on sites with grape may provide a sustainable alternative to chemical pesticides and may maintain or improve soil quality. The objectives of this study were to investigate how cover crops affect weed and nematode populations and soil physical and chemical properties when used on replant sites with *Vitis* spp. (grape).

Materials and Methods

The experiment was established in 2000 at the Iowa State University Horticulture Station, Ames, Iowa, in plots where Seyval Blanc grapevines were growing from 1986 to 1996. The plots were fallow for four years before establishing the treatments. Four main-plot treatments were cover crops of *Rudbeckia hirta* L. [black-eyed Susan], *Panicum virgatum* L. [switchgrass], hand cultivation, or conventional herbicide application. In 2005, prior to planting one-year-old, dormant, rooted Seyval Blanc grapevines, a mixture of Surflan® and Roundup® was applied to all treatment plots to kill cover crops or weeds. Two types of propagation plants (with their own roots or grafted) were randomized in a split-plot design within the main treatment plots. Subplots were Seyval Blanc grapevines with their own roots or Seyval Blanc grapevines grafted onto C-3309 rootstock. Weed growth was evaluated by visual percentage, number of weeds, and weed shoot biomass (dry weight). Grapevine plant biomass was evaluated by current season shoot vigor (height). Nematodes were enumerated from soil by sugar extraction. Soil quality will be determined by measuring macroaggregate mass (wet aggregate stability), bulk density, water infiltration, percentage of organic carbon, total nitrogen, and pH. Pruning weights will be obtained in spring 2006.

Results and Discussion

Weed growth results. Weed growth in plots that had previously grown *R. hirta* had a lower number of grasses in July and August compared with the herbicide-treated plots (Table 1).

Shoot growth results. The average shoot growth of grafted vines was higher in the *R. hirta* treatment compared with the *P. virgatum* and hand-cultivated treatments (Table 2). There were no significant differences in growth found between weed management treatments in the "own rooted" plots.

Water infiltration results. Soil in *R. hirta* plots had significantly higher water infiltration rates than the hand-cultivated or herbicide-treated plots in the spring of 2005. *R. hirta* plots also had significantly higher water infiltration than *P. virgatum* and herbicide treatments in the fall of 2005 (Table 3). All water infiltration values presented in Table 3 are considered very rapid rates according to the USDA Soil Quality Test Kit Manual.

The study will be continued in the 2006 growing season to determine grapevine plant and weed growth of the treatment plots. In addition, soil and nematode analyses will be completed.

Table 1. Incidence of weed growth in Seyval Blanc grapevine rows, July and August 2005.[x z y]

	2005									
	Weed cover (percent)		Grasses (No.)		Broadleaves (No.)		Grass dry wt. (g)		Broadleaf dry wt. (g)	
Treatments	July	Aug.	July	Aug.	July	Aug.	July	Aug.	July	Aug.
R. hirta	4.2 b	18.1 b	8 b	5 b	1	7 a	0.5 b	2.2 b	0.1	1.1 b
P. virgatum	12.1 ab	40.8 a	20 ab	9 a	4	7 a	2.0 ab	7.4 a	0.7	1.7 ab
Hand Cult.	13.3 ab	33.8 ab	10 b	6 ab	6	7 a	0.6 b	4.0 ab	1.5	6.0 a
Herbicide	24.6 a	24.2 b	31 a	9 a	6	6 ab	8.4 a	3.7 ab	1.2	0.7 b
LSD P≤0.05	16.3	16.3	22	4	NS	6	6.8	4.9	NS	4.6

[z] Means of four replications.
[y] Data presented are averages of three samples (.5 meter^2/plot).
[x] Grown on sites with previous cover crop using conventional or control treatments.

Table 2. Seyval Blanc grapevine plant growth in the year of establishment using conventional or control treatments.[x z y]

	2005	
Treatments	"Own roots" avg. growth (cm)	"Grafted" avg. growth (cm)
R. hirta	100.38	380.13 a
P. virgatum	127.63	274.63 b
Hand Cult.	85.13	271.88 b
Herbicide	115.25	301.75 ab
LSD P≤0.05	NS	95.33

[z]Means of four replications.
[y]Data presented are total growth 1st year plants.
[x]Planted on sites with previous cover crop.

Table 3. Effect of cover crop, conventional or control treatment, on water infiltration into the soil.[z y]

	2005	
Treatments	Spring (in./hour)	Fall (in./hour)
R. hirta	123.8 a	108.7 a
P. virgatum	105.2 ab	58.3 b
Hand Cult.	42.3 bc	69.7 ab
Herbicide	29.8 c	40.7 b
LSD P≤0.05	67.7	44.0

[z]Means of four replications.
[y]Data presented are averages of three samples/plot.