The Effect of Monoculture Cover Crops, Continuous Strawberry, or Continuous Cultivation on Plant Density and Yield of Strawberry, Pest Populations, and Soil Characteristics

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Introduction

Rotating with cover crops in strawberry production may alleviate pests in soil, such as weeds and nematodes. Cover crops also improve the soil health by the addition of organic matter compared with conventional tillage systems. The objective of this study was to compare strawberry plant density, yield of strawberry, weed and nematode abundance, and soil characteristics after the rotation with seven monocultures of cover crops, continuous strawberry production, or conventional tillage.

Materials and Methods

The experiment was established in 1996 at the Iowa State University Horticulture Station, Ames, IA in an area where strawberries had been grown since 1985. Seven monoculture cover crops, continuous *F.* ×*ananassa* Duch. Honeoye [strawberry], and cultivated-bare soil treatments were randomly distributed within three replicated blocks. Cover crop treatments included *Rudbeckia hirta* L. [blackeyed Susan], *Panicum virgatum* L. [switchgrass], *Sorghastrum nutans* (Michx.) Nash. [Indiangrass], *Andropogon gerardii* Vitm. [big bluestem], *Tagetes erecta* L. 'Crackerjack' [marigold], *L. perenne* [perennial ryegrass], and *Sorghum bicolor* [sorghum sudangrass]. In spring 2005, all treatments were tilled and *F.* ×*ananassa* Duch. Honeoye dormant crowns were planted to establish matted rows. In 2006 and 2007, berries were harvested in June and then the plants were renovated to reestablish the matted rows in early July. Weed growth was evaluated by estimating visual percentage, density, types, and dry weight of weeds in sample areas (0.25 m^2). Strawberry plant density was evaluated by the number of plants established per 0.25 m^2. Strawberry yield was collected from three, 1.52 m × .61 m areas within the row/plot. Soil characteristics were determined by measuring macroaggregate mass, bulk density, P, K, Ca, Mg, and pH. Nematodes will be enumerated from soil and strawberry plant roots.

Results and Discussion

Weed growth. Grass weed density was highest in plots of continuous strawberry, continuous cultivation, and plots rotated with *P. viragatum*, *L. perenne*, *A. gerardii*, *S. bicolor*, and *R. hirta* (Table 1). Dry grass weight was greatest in plots of continuous strawberry and plots rotated with *L. perenne*. Broadleaf weed density was highest in plots of continuous strawberry. Dry broadleaf weight was greatest in plots of continuous strawberry and plots rotated with *P. virgatum*, *S. nutans*, and *T. erecta*.

Strawberry plant density. Strawberry plant density was lowest in plots of continuous strawberry (Table 2). Density of strawberry was lower in 2007 compared with 2006.

Strawberry yield. Yield of strawberry was highest in plots rotated with *S. bicolor*, *S. nutans*, *T. erecta*, and *P. virgatum* (Table 2). The strawberry harvest season in 2007 was short due to increased June temperatures. Harvest was conducted for 10 days in 2007 compared with 30 days in 2006.

Soil characteristics. No differences were found between treatments in the variables P, K, Ca, Mg, pH, and bulk density in soil collected from

the 2006 growing season (data not presented). Aggregate mass was higher in plots of continuous strawberry and plots rotated with *R. hirta*, *S. nutans*, *A. gerardii*, and *T. erecta* than plots of continuous cultivation or plots rotated with *S. bicolor*, *L. perenne*, and *P. virgatum*.

Continued research. The research plots will be continued in 2008 to obtain strawberry harvest data for a third growing season. In addition, soil variables and nematode analyses will be completed for 2007.

Acknowledgements

We thank Nick Howell, Lynn Schroeder, Jim Kubik, and all other Horticulture Research Station staff for their assistance with spraying, renovation, mulching, and harvesting in the experiment.

Table 1. Weed incidence and prevalence in Honeoye strawberry matted rows grown in plots previously planted to cover crops or control treatments throughout the growing season of 2007.

Treatments	Percentage weed cover (%)[z]	Grass density (no.)[z]	Broadleaf density (no.)[z]	Grass dry wt. (g)[z]	Broadleaf dry wt. (g)[z]
R. hirta	23.8 cd[y]	9.8 abc	3.6 bc	5.19 bc	7.56 bc
P. virgatum	22.9 cd	19.3 a	7.3 b	4.59 bc	18.74 ab
S. nutans	32.5 bc	6.1 c	7.0 b	3.02 c	18.40 ab
A. gerardii	27.1 bcd	10.4 abc	4.1 bc	8.03 bc	13.35 bc
T. erecta	22.1 cd	8.2 bc	5.7 bc	3.31 c	17.97 ab
L. perenne	39.7 b	17.8 ab	4.9 bc	13.59 ab	13.80 bc
S. bicolor	29.1 bc	10.3 abc	4.2 bc	2.94 c	10.45 bc
Strawberry	58.8 a	15.2 abc	13.2 a	20.30 a	27.98 a
Cultivated	13.8 d	10.1 abc	0.8 c	7.52 bc	3.10 c
LSD P ≤ 0.05 [x]	14.5	9.8	4.9	9.20	14.16

[z]Data presented are averages of three sample areas (.25 m^2) per plot.
[y]Means of three replications averaged over the year (sampling dates include May, Aug., and Sept.).
[x]Means in the same row followed by the same letter are not different.

Table 2. Honeoye strawberry plant density and yield in Honeoye strawberry matted rows grown in plots previously planted to cover crops or control treatments in 2006 and 2007.

Treatments	Strawberry plant density (no.)[z]		Total yield (kg)[y]	
	2006	2007	2006	2007
R. hirta	22 a[x]	8 d	1.2 c	0.9 d
P. virgatum	26 a	10 bcd	2.3 a	1.4 abcd
S. nutans	21 a	13 abc	1.6 bc	1.5 ab
A. gerardii	22 a	10 bcd	2.0 ab	1.1 bdc
T. erecta	21 a	15 ab	2.0 ab	1.5 abc
L. perenne	10 b	9 cd	0.6 d	0.9 d
S. bicolor	22 a	17 a	2.0 ab	1.7 a
Strawberry	11 b	2 e	0.6 d	0.1 e
Cultivated	22 a	10 cd	2.0 ab	1.0 cd
LSD P ≤ 0.05 [w]	7	5	0.58	0.5

[z]Data presented are averages of three sample areas (.25 m^2) per plot.
[y]Data presented are averages of three sample areas (1.52 m × .61 m) per plot. (5 ft × 2 ft)
[x]Means of three replications.
[w]Means in the same row followed by the same letter are not different.