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Horticulture
Research

Quick Turnaround Cover Crops for Horticulture

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In a Nutshell

- **Cover crops can play an important role in fruit and vegetable systems** and bring a number of benefits such as reducing weed populations, adding organic matter, enhancing nitrogen cycling in the soil and reducing erosion.
- Four different species – three non-leguminous including **buckwheat**, **Japanese millet** and **sorghum-sudangrass** and one legume, **cow peas** were tested for this project.
- This project shows that a variety of cover crops have potential to effectively suppress weeds in the window between spring and fall cash crop plantings.

Project timeline:
May 2012 - September 2012

Buckwheat, cowpeas, millet, and sorghum-sudangrass at Grinnell Heritage Farm.

About the Cooperators

Andy and Melissa Dunham own and operate Grinnell Heritage Farm near Grinnell, Iowa. They grow USDA-certified organic vegetables, flowers and herbs on their 80 acre farm which has been in the family for over 150 years. They also tend a small herd of beef cows raised on pasture. They market their produce through a CSA (Community Supported Agriculture), Iowa City Farmers Market, and through select grocery stores.

Background

Crop rotations in fruit and vegetable systems are complex. Farmers strive to rotate crop families to curtail disease as well as crops with high and low nutrient needs to maintain healthy soil fertility. Cover crops can play an important role in fruit and vegetable systems and bring a number of benefits such as reducing weed populations, adding organic matter, enhancing nitrogen cycling in the soil and reducing erosion (Creamer, 1999). The window between spring and fall plantings would benefit from all these cover crop attributes. However, with a busy and intensive schedule for vegetable producers during the limited growing season, incorporating cover crops while maximizing the amount of vegetable production can be a challenge (Sundermeier, 2009). Therefore, choosing the most appropriate cover crop species according to the climate and the desired purpose is crucial. The goal of this project was to examine potential cover crop species and evaluate their abilities to grow adequately between spring and fall crops to add a rotation, build soil, and suppress weeds in a short timeframe in Iowa's climate.

Methods

Four different species – three non-leguminous including buckwheat, Japanese millet and sorghum- sudangrass and one legume, cow peas were tested for this project.

Cover crops were planted with a hand broadcast seeder on 7/23/2012, after the removal of spring cash crops - onions and garlic. Cooperators planted three replicated strips of each cover crop species. Seeding rates for each species were as follows: buckwheat at 80 lbs/A, cowpeas at 60 lbs/A, Japanese millet at 35 lbs/A, and sorghum-sudangrass at 80 lbs/A.

On 8/09/2012, the number of weeds was counted in four randomly selected 1-ft^2 quadrates within each treatment. Germination of the cover crops was measured on 8/14/2012 using the same quadrate technique; the germination rate was calculated by dividing the number of seedlings in one square foot by the number of seeds planted, estimated from the seeding rate.

Cover crops were killed with a 14 ft. disc on 9/05/2012. Winter rye and hairy vetch mix was planted following the summer cover crop treatments. Cover crop biomass and % of ground cover were measured before termination. Aboveground biomass samples were taken from 1-ft^2 quadrates in each strip to obtain the dry matter lbs/A amount. For ground cover, pictures were taken in 1-ft^2 quadrates in each strip and % of ground cover was estimated by the visual observation of these photos.

Data were analyzed with the MIXED procedure of SAS (SAS Institute, Cary NC) and least-squares means are reported. The PDIFF statement was used to determine difference between means, and differences are reported as significant at the $\alpha = 0.05$ level.

Results

Table 1 shows the germination percentage of each cover crop species and the number of weeds observed during cover crop growth. Germination % and weed counts in the cover crop were not different amongst the three treatments. Buckwheat had the greatest germination rate, followed by Japanese millet and sorghum-sudangrass (which didn't differ from each other), and cowpea did not germinate at all. Cooperator Andy Dunham noted that there was insufficient moisture to get the cowpeas to grow, and that other plots were less productive than he normally observes. Consequently, cowpea plots had the most weeds, followed by Japanese millet, and then sorghum-sudangrass and buckwheat.

Table 1

Germination and weed count in four different cover crops

Cover Crop	Germination (%)	Weed Count (per sq ft)
Sorghum-Sudan	82.9 b	10.4 c
Cowpea	0 c	41.7 a
Buckwheat	89.6 a	11.3 c
Japanese Millet	85.8 b	17.5 b
Standard Error	1.20	2.55
P-value	< 0.0001	< 0.0001

*means with different letters are statistically different

One bulked aboveground biomass sample from each treatment was harvested and is reported in **Table 2**. Additionally the percentage groundcover of all three rows of a cover crop species in a plot was measured. Percent germination and weed counts present in the following cash crop of hairy vetch and winter rye are reported as well. Buckwheat yielded the highest biomass, though Andy says it was lower than he is used to, due to the drought. Despite the differences in biomass, there was not much variation in ground cover between the buckwheat, Japanese millet, and sorghum-sudangrass. The subsequent cash crop of hairy vetch and winter rye did not germinate differently amongst the cover crop species that it followed. However, more weeds were present two weeks after crop planting in the area following the cowpeas than in the other species.

Conclusions and Next Steps

Results from the current trial demonstrate some of the differences between cover crop species. Of the tested varieties, buckwheat had the highest germination rate and one of the lowest weed counts while it was growing. It also produced the most biomass, one of the highest ground cover rates, and appeared to suppress weed growth for the subsequent cash crop, though statistical significance could not be determined. Japanese millet and sorghum-sudangrass had similar germination rates, but sorghum-sudangrass prevented more weeds during its growth, and despite lower biomass, had the lowest weed counts in the following cash crop. Cowpeas did not germinate due to drought conditions; as might be expected, where it had been planted there were more weeds during the period of cover crop growth and after planting the cash crop. However, the lack of cowpea growth did not harm germination of the cash crop. This project shows that a variety of cover crops have potential to effectively suppress weeds in the window between spring and fall cash crop plantings; however it seems beneficial to use a hardy, drought-tolerant variety in dry years.

PFI Cooperators' Program

PFI's Cooperators' Program gives farmers practical answers to questions they have about on-farm challenges through research, record-keeping, and demonstration projects. The Cooperators' Program began in 1987 with farmers looking to save money through more judicious use of inputs.

Table 2

Ending biomass and ground cover of four cover crops, and germination and weed count in subsequent cash crops

Cover Crop	Biomass (lb/A)	Ground Cover (%)	Cash Crop Germination (%)	Two-Week Weed Count (per sq ft)
Sorghum-Sudan	5000	85	95	5
Cowpea	0	0	95	32
Buckwheat	1000	85	95	9
Japanese Millet	2750	90	95	6

References

Creamer, N. G. 1999. Summer Cover Crops. North Carolina Cooperative Extension Service. http://www.ces.ncsu.edu/hil/hil-37.html

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