

Oat Cover Crop vs. Straw Mulch for Garlic Production

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In a Nutshell

- This project tested the effect on over-wintered garlic yield of planting date and two mulching strategies: companion-seeded oat cover crop vs. straw mulch.
- Farmer-cooperator Mark Quee planted garlic in September with a companion oat cover crop (oat residue following winterkill intended to serve as mulch). Garlic planted in October was mulched with straw.

Key Findings

- September-planted garlic had higher yield than October-planted, but pervasive rot in several areas of the field may have impacted results.

Project Timeline:

September 2015 – July 2016

Background

Fall-planting garlic allows farmers to maximize spring growing days without having to work in wet spring field conditions. Often, fall-planted garlic is mulched 6-8 inches deep with leaves or straw to provide insulation during the winter. Mark Quee, who uses cover crops extensively on his vegetable fields, wondered if he could plant a winter-killed cover crop with his garlic to serve as a mulch over the winter. To test this, Quee planted garlic in September and October. The September planting was companion-seeded with oats as a cover crop. The October planting received straw mulch. The objectives were to 1) determine if the winterkilled oat cover crop would provide enough residue to act as a suitable winter mulch, and 2) determine if an early, mid-September planting date (so that oats and garlic could be sown together with significant growth on the



Garlic plots covered with (still-green) oats and straw mulch on Dec. 11.

oats before winterkill) would impact over-wintered garlic yield compared to a more common mid-October planting date.

Methods

This trial was conducted by Mark Quee at Scattergood Farm near West Branch in Cedar County.

Project Design

Garlic was planted from saved seed heads. Planting dates were Sept. 10, 2015 and Oct. 20, 2015. The oat cover crop was drilled at a rate of 1.5 bu/ac with the garlic on Sept. 10. Six inches of straw mulch was applied on Dec. 11 to the October-planted garlic. Control plots with no mulch (oats or straw) were included for both planting dates. Garlic from all plots was harvested July 3, 2016. Plots were 40 ft long, with double-rows of garlic.

Initially, the trial was designed to include four replications each of September-plant-

ed garlic with oats, September-planted garlic with straw mulch, and October-planted garlic with straw mulch. Unfortunately, the treatments were implemented differently, which resulted in the no-mulch (control) plots and fewer replications of some treatments. These differences in design and implementation are shown in **Figure 1**.

Data Analysis

Garlic yield was measured by number of heads, and divided into two categories: seed and marketable. Seed garlic were large heads suitable for planting in Fall 2016; marketable heads were in good condition, but smaller. Data were analyzed using JMP Pro 12 (SAS Institute Inc., Cary, NC) and comparisons among measured variables employ least squares means for accuracy. Statistical significance is determined at $P \leq 0.10$ level and means separations are reported using Tukey's Least Significant Difference (LSD).

Results and Discussion

The fall of 2015 was wet, with most months receiving nearly twice their average precipitation. September had good weather for oat cover crop growth, and the oats continued growing into December, reaching knee- to thigh-high before winter killing. In Spring 2016, GDD was within normal ranges, precipitation was a bit low, as shown in **Table 1**. Quee stated that Iowa City (where data in **Table 1** is recorded) may have had precipitation that missed West Branch; Scattergood Farm was very dry in the spring.

Garlic Yield

In April 2016, Quee reported that the September-planted garlic with oats and the October-planted garlic with mulch both had 100% survival with little weed pressure. The plots without cover had variable survival and more weeds. By harvest time, however, there were more issues with the garlic crop. Said Quee, "The garlic this year was pretty much a disaster." Quee noted there were a lot of rotten heads, which he attributed to harvesting about a week too late and insufficient weeding. The rot seemed ubiquitous throughout the trial; not obviously more prevalent in one treatment or another.

As seen in **Figure 2**, yields were statistically different between September-planted and October-planted garlic, with September-planted providing more total garlic heads (seed and marketable). There was no statistical difference in yield between September-planted garlic with oats or without.



Garlic harvested from one of the plots on July 3.

Figure 1

INTENDED			
Sept. Oats	Sept. Straw	Sept. Oats	Sept. Straw
Oct. Straw	Oct. Straw	Oct. Straw	Oct. Straw
Sept. Straw	Sept. Oats	Sept. Straw	Sept. Oats

ACTUAL			
Sept. Oats	Sept. No	Sept. Oats	Sept. No
Oct. Straw	Oct. No	Oct. Straw	Oct. No
Sept. No	Sept. Oats	Sept. No	Sept. Oats

Figure 1. Intended plot layout and actual plot layout

Table 1

Total Monthly Precipitation and Growing Degree Days (GDD) (Base 50°F) for 2015-16 and Long-term Averages¹

Month	Precipitation (in.)		GDD	
	2015-16	Avg.	2015-16	Avg.
Sept. 2015	4.4	3.6	582	489
Oct. 2015	4.1	2.6	243	270
Nov. 2015	4.7	2.0	--	--
Dec. 2015	4.0	1.5	--	--
Jan. 2016	0.4	1.2	--	--
Feb. 2016	0.5	1.2	--	--
Mar. 2016	2.0	2.3	114	69
Apr. 2016	1.5	3.4	192	210
May 2016	3.9	4.2	390	418
June 2016	4.3	4.7	681	616

¹Precipitation and growing degree day data accessed from the weather station nearest West Branch (IOWA-CITY) (Iowa Environmental Mesonet, 2016).

Figure 2

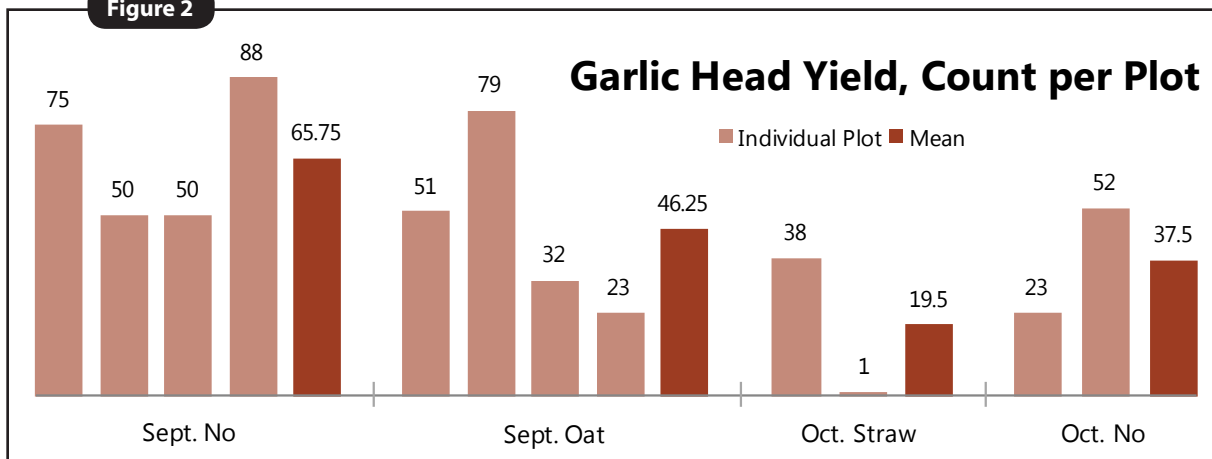


Figure 2. Garlic Head Yield, by Count. Total count was different between September-planted garlic (Sept. No and Sept. Oat) and October-planted garlic (Oct. Straw and Oct. No). Light red bars show individual plot values; dark red represent the mean value for the treatment.

Conclusions and Next Steps

Sowing oats as a winterkill, companion cover crop to overwintering garlic is a compelling idea, and though the results did not show that the cover crop improved yields, planting in September produced a good oat cover mulch and a better garlic crop than planting in October. "Clearly this project needs more work," said Quee. "But in general, I'm not discouraged by the sowed oat treatment."

Quee was glad he had September-planted garlic for the trial; "I'm operating under the assumption that the dry spring set back the garlic, which might explain why the Sept.-planting did better: deeper, well-established roots," he said. Quee is trying another year with the cover-cropped system, but with a couple changes. Instead of double rows, he will plant in a single row to better accommodate his narrow drill (for the oats), and counted number of cloves planted per plot to better gauge survival over the winter.



Oats growing over September-planted plots in October.

References

Iowa Environmental Mesonet. 2016. Climodat Reports. Iowa State University, Ames, IA. <http://mesonet.agron.iastate.edu/climodat/> (accessed Nov. 3, 2016).

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