

Choosing and managing cover crops to improve weed management in reduced tillage organic vegetable production

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Introduction

Is it possible to manage weeds in organic reduced tillage, lacking the tools of cultivation or herbicides?

Overwintered cover crops mechanically terminated into mulch can help with weed management. However, the impacts of cover crop termination method, termination timing, fertility, and variety are not well understood.

Improper termination times can lead to cover crop regrowth competing with the cash crop. Termination method—flailing or rolling—can influence weed germination. Finally, soil nitrate from legume cover crops may increase weeds.

Goal of this research:

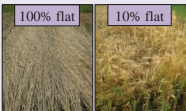
- Determine how cover crop characteristics influence weed germination in cover crop mulch.

Materials and methods

- We flail-mowed and roller-crimped seven over-wintered cover crop varieties at two different termination times in western Washington.



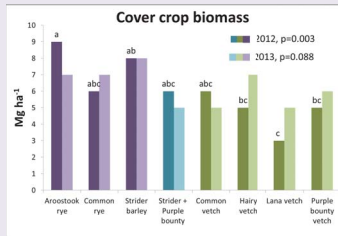
- Cover crops: 3 grains, 4 vetches, 1 mix.
- Termination times:
 - “Early” = grain late anthesis 60% vetch flowering
 - “Late” = grain early milk 100% vetch flowering
- We measured cover crop biomass, weed % cover, roller-crimping effectiveness, and soil nitrate.



Evaluating roller-crimping effectiveness

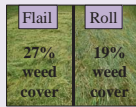
Results

Which cover crop produced the most?



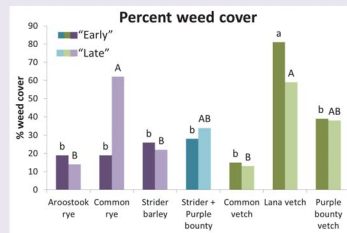
Dry weight biomass production of three grains, one mix, and four vetch cover crops in 2012 and 2013. Means for 2012 sharing the same letter were not significantly different by Tukey's test at $p < 0.05$; biomass was not significantly different in 2013.

Was it better to roll or flail?



Termination type influenced percent weed cover ($p = 0.007$). Rolling grain cover crops, rather than flailing, had less weed cover at 4 weeks.

Was there a difference in weed cover by variety?



Percent weed cover at 4 weeks by “early” and “late” termination in 2012/2013. Means within each termination time sharing the same letter were not significantly different by Tukey's test at $p < 0.05$.

Did soil nitrate influence weeds?

No; across all cover crop varieties there was only a very weak correlation between weed cover and nitrate levels ($p = 0.007$, Pearson's correlation coefficient = 0.23).

Was termination time influential?

Yes; termination time influenced rolling effectiveness (percent of mulch remaining flattened) in 2012 ($p < 0.0001$):

- “Early” = 71% of mulch remained flat
- “Late” = 90% of mulch remained flat

Termination time did not influence cover crop biomass production: there was no increase in yield from “early” to “late.”

Conclusions

Reduced tillage cover cropping presents trade-offs:

- Roller-crimp for weed management; flail for full-kill
- Grains have longer-lasting mulch; vetches input soil N
- Not a single “do-it-all” variety

Variety Recommendations

- Aroostook rye and common vetch, of grains and vetches respectively, produced the most biomass and had lower weed cover.



- Cover crop mulches with more than 50% weed cover by 4 weeks *cannot* be recommended for reduced tillage systems: Hairy vetch, Lana vetch, Purple bounty vetch.

Trend explanations

- Cover crops producing higher biomass had less weed cover.
- By the late termination time, cover crops were at a maturation stage for which roller-crimping was more effective.
- Perhaps soil nitrate did not influence weed cover because a certain high threshold of nitrate would be necessary to effect weeds; soil nitrate values in this study were medium to low (2.2 ppm – 13.7 ppm).

Grower applications

The goal of this work was to provide reduced-tillage organic growers with practical recommendations for cover cropping.

- Roller-crimp grains at early milk rather than late anthesis.
- Mow vetches for complete kill.
- Roller-crimp rather than flail for better weed management

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Further information

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