Alternative Weed Control

Situation

Interior Alaska's short growing season and temperature extremes raise challenges for sustainable, profitable agriculture. Long summer daylight hours change growing characteristics of many crops and weeds, and little research has been conducted on organic weed management techniques under these distinctive conditions.

USDA and University of Alaska weed team at work on Rosie Creek's weed problem, below.

On Rosie Creek Farm, certified organic and herbicide free since it began in 1998, the abundance of annual weeds is the biggest current problem. The major weed problems are Chickweed (Stelleria media [L] Vill.) and shepherd's purse (Capsella bursa-pastoris L.)

The farm uses traditional methods of weed management – hand weeding, flaming and tractor cultivation:

- Hand weeding is effective but time-consuming
- Flaming is effective early in the season, but the huge seed bank results in a second flush after crops emerge
- Tractor cultivation also works well, but disturbing the soil can bring on a new weed flush later on

Cover crops out-compete weeds, but they don't deplete the seedbank. A method is needed that reduces the likelihood of weeds germinating in the first place.

Objectives

- Determine the impact of tillage on soil nutrients in a bare-fallow treatment
- Determine the efficacy of bare-fallow in reducing the weed seedbank
- Assess the impacts of managing weeds with landscape fabric (plasticulture) in crop aisles

Actions

Bare-Fallow Experiment

A 1/3-acre plot was divided into three treatments, 1) bare-fallow full season, 2) bare-fallow followed by field peas and 3) bare-fallow followed by barley, each managed as follows:

1. Till every 10-14 days throughout the growing season when a flush of weed seedlings emerges, pre-flowering
2. Till to peak of growing

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Farmer/Rancher Grant

Title: Weed Management and Soil Fertility on a Sub-Arctic Farm

Project Number: FW08-017

Project Coordinator:
Michael Emers
Rosie Creek Farm
PO Box 181
Ester, AK 99725
907.479.3642
mike@rosiecreekfarm.com

Technical Advisors:
Mingchu Zhang
Associate Professor
College of Natural Resources and Agriculture Sciences
University of Alaska
Fairbanks, AK 99775
907.474.7004
Mingchu.zhang@uaf.edu

Steven Seefeldt
Research Agronomist
USDA Agricultural Research Service
360 O'Neill Bldg., 905 Koyukuk
University of Alaska
P.O. Box 757200
Fairbanks, AK 99775-7200
907.474.1898
sseefeldt@pw.ars.usda.gov

Michele Hebért
Land Resources Agent
Cooperative Extension
University of Alaska, Fairbanks 99775-8155
(907) 474-2423
mahebert@alaska.edu

SARE Grant: $14,803

Western SARE
Sustainable Agriculture Research & Education

Western SARE

Phil Rasmussen, Coordinator
Utah State University
Agricultural Science Building
Room 305
4865 Old Main Hill
Logan, Utah 84322-4865
phone: (435) 797-2257
fax: (435) 797-3344

Professional Development Program

Michele Hébert
Alaska PDP Coordinator
Tanana District Agriculture and Horticulture Agent
Cooperative Extension Service
University of Alaska
P.O. Box 75-8155
Fairbanks, AK 99775-8155
907.747412423
mahebert@alaska.edu

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season; then plant field pea cover crop (mixture of three varieties: Trapper, CDC Sage and SW Midas)

3. Till to peak of growing season; then plant barley cover crop (variety: Albright)

For nutrient analysis, soils were sampled three times – pre-plant, mid season and end of season – to a depth of 30 cm, separated 0-15 cm and 15-30 cm.

Weed species were counted and percent cover was estimated within three subplots per plot.

To assess seedbank weeds in mechanical versus biological methods, soils were sampled at 0-6 inches before and after treatments, and then frozen until grow-out in the greenhouse. A second freeze-thaw simulated a second growing season.

Plasticulture Experiment

Black opaque landscape fabric was applied with ground staples in half of the aisles, and rows of annual ryegrass (Lolium multiflorum Lam.) were sowed following planting in the other half.

Photographic and anecdotal observations were made of the effects.

Results

Bare-Fallow Experiment

Seedbank measures in 2008 and 2009 showed that tillage and cover cropping decreased total seedbank weeds. Chickweed and shepherd's purse were most dominant. In 2008, a second flush of germinating weeds was observed, suggesting a weed strategy of germinating season long, not just at one time.

Total C, N, P and S in soil samples did not change between early and late in the first season, showing that total nutrient concentration was unaffected by mechanical tillage for weed control.

For the cover crop treatments, barley was superior for both its rapid growth and its ability to inhibit further weed growth during the season.

Plasticulture Experiment

Landscape fabric was totally effective in suppressing weeds, but only if complete coverage was obtained in the aisles.

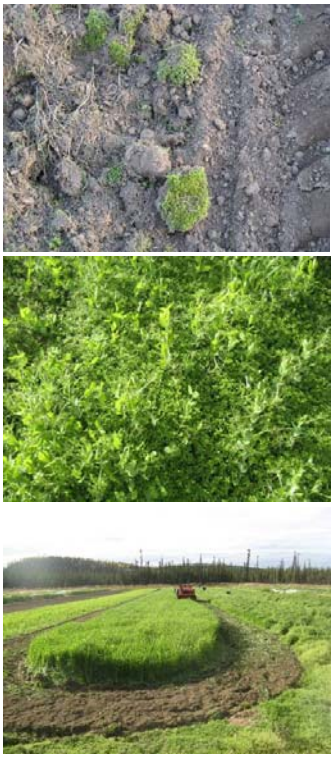
Annual ryegrass could be equally effective if seeded early enough. And it has the added benefit of adding organic matter back into the soil.

Impacts or Benefits on Agriculture

While it's too early to draw conclusions on the impact of bare-fallow on soil fertility, the impact on the weed seedbank is important: Both the counts from weeds emerging in the field and the seed bank decreased over the course of the summer. Whether the reduction is significant relative to its effect on farming will require another study.

Bare-fallow appears to have some promise because:

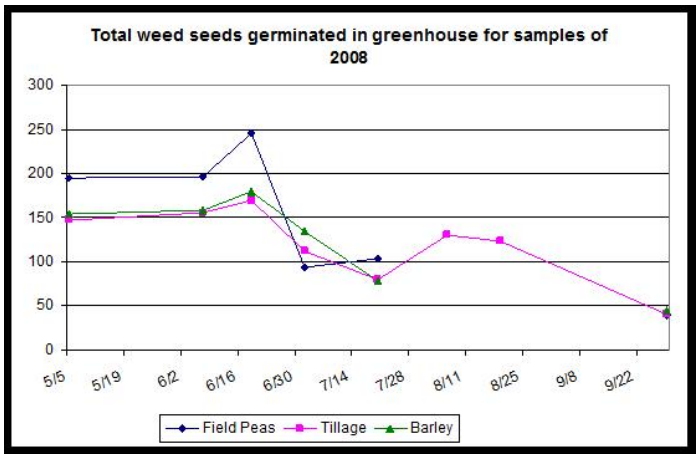
- It is a quick method to kill weeds over a large area
- It can reduce the weed seed bank by more than 70% if employed season long
- It could provide a long-term strategy for reducing weeds to accommodate seeded and slow-to-germinate crops like carrots and beets



Top to bottom, chickweed mat after tillage, peas and barley.

Special Acknowledgement

This study would not have been possible without the hard work of Erin Carr, a University of Alaska graduate student who did field and greenhouse work and collected data.



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