

On-farm testing of organic weed control strategies in Indiana

The purpose of this project was to substantiate and measure the effectiveness of various organic strategies for creating a weed free 'stale seedbed'.

At Rhoads farm we grow specialty lettuces, salad greens, other leafy greens, herbs and tomatoes. Weeding of salad green beds has been our most time consuming and least desirable farm task. Typically we deal with four weeds, having over the years virtually eliminated commonly seen weeds such as lambsquarters, pigweed, and smartweed. Our problem weeds are **chickweed, hairy galinsoga, purslane** and **various grasses**. While we have not identified the specific grass that we have the most of, it is a very short season grass being able to produce seed from seedling to maturity in two months.

Objectives

The primary objective of our project was to compare in replicated field trials the effectiveness and cost of a number of organic weeding strategies—several different organic herbicides and flaming. The herbicides used were Matran 5, vinegar solution at two different dilution rates, flaming with an LP hand-held flamer, and the herbicide Burnout II. (We later discovered that Burnout II is not certifiable for organic production due to a mineral carrier—the data for this material are nevertheless included in this report for comparison.)

A stale seedbed for planting salad greens was prepared three times in the year. The seed beds were tilled, leveled, watered and allowed to sit for one to two weeks to germinate weed seeds. Each bed was 3' feet wide and 90' long. Each of these beds had 18 equal 3'x 5' sized sections that

received the different treatments to be tested, with three replications of each treatment, assigned randomly to each section. Treatments were made on May 18th, June 15th and August 28th. Weed counts to determine effectiveness were made about one week after treatment. Several days after weed kill the areas were hand weeded to determine the extent of weed kill—some weeds like grass and purslane can be defoliated but not killed by some of these treatments and will re-grow about 5 days after application.

Methods

The different treatments were:

1. No treatment.
2. **The organic herbicide Matran 5** applied at a 3% dilution.
3. **A vinegar solution** applied as an organic herbicide at a **10% dilution**.
4. **A vinegar solution at a 13% dilution rate**.
5. **A hand held 'flaming unit'** that burns germinated weeds to the ground.
6. **The organic herbicide Burnout II** at a 33% dilution.



The above photo shows planting and treatment areas at time of harvest. Note (center of photo) weeds on untreated paths that someone was hoeing as pictures were taken.

At the time of the the first application (May 18), the plots were very weedy, having had uncomposted manure put on the year before. The area was covered with a sheet of clear plastic for two weeks before application of materials to germinate weeds. Plastic was removed 10 days before application and a light frost had damaged some of the leafy annuals. There were 700 weeds counted in one of the untreated plots. Materials were applied at stated treatment rates, at ½ gallon per 3'x5' area. Flaming took approximately 45 seconds per plot and used 15 ounces of LP gas for each of the flaming plots.

During the second application (June 15), plots differed from the springtime trials in terms of different kinds of weeds.

There was not nearly as much hairy galinsoga, more grass, considerable purslane and small amounts of pigweed, lamb-squarters and ragweed. Weeds were allowed to get a little bigger in this set of trials to demonstrate killing power with

Project Notes

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larger weeds. Here weeds were 4"-8" tall. As the purslane and grass is much harder to kill, all sprayed applications had 1 gallon of mix applied per 3'x 5' area (as opposed to ½ gallon used in trials #1 and #3) and 2 lbs of LP gas was used in flaming the plots. Dilution rate of all spray materials was the same as in trial #1.

For the third trial on August 28, there were fewer weeds than in any of the other two trials, particularly Trial #1. The majority of the weeds were hairy galinsoga, with fewer numbers of purslane and some grass. These beds had been tilled, prepared for planting and let sit for two weeks to germinate weeds. There were 250-400 weeds per plot in the untreated plots.

Because of the lower weed populations before application and less of the hard-to-kill purslane in these trials, ½ gallon of each liquid spray material was used to cover each of the three replications. One pound three ounces of LP gas was used to the flaming plots in this trial.

Key Results & Discussion

Results averaged over the three trials are shown in Table 1. From using these products and methods in these trials and in the field outside of these trials, **we think in order of efficiency LP Flaming does the most complete job, Burnout II was next, Matran, Vinegar 13% and then Vinegar 10%.** All of the methods dramatically reduced weeding time. In the trials Vinegar at 13% appeared to perform better than Vinegar at 10%. While we did not notice much difference between Vinegar 10% and 13%, at times it appeared to us that the 13% killed a few more weeds and common sense would support that. In future trials we are going to try Vinegar at 15% instead of 13%.

All of the test materials and methods reduce weeding time by at least 32% when used to create a stale seedbed. In many situations these methods and materials will reduce weeding time by 75% or more (in the August trials weeding time was reduced by 200%).

Flaming is the only organically approved option that dealt with young

grasses. (Note: Matran EC in a higher dilution rate than used in these trials is thought to kill young grasses.)

The LP flaming is the most convenient to use, but the least favorite due to it being a non-renewable resource. We have had some problems with the herbicides eating sprayer seals and gaskets. Care must be used to add all the water before adding the herbicides and a good washing afterwards. Vinegar was the second easiest to use and seemed less hard on the gaskets. Also on our backpack sprayers we started off using a diaphragm sprayer only to experience multiple diaphragm failure. After switching to a piston sprayer we did not experience sprayer failure.

At Rhoads Farm we will use all these materials and methods in our stale seedbed arsenal. Basically our current strategy looks something like this:

1. **Areas with grasses or purslane we use the LP flaming.**
2. **Moderate weed pressures we use Matran 5.**
3. **Moderate to slight weed pressures we use 10% or 13% vinegar.**

The timing of application of these products can be played with and adjusted for different crops to increase their effectiveness. Variables that can be played with include length of time of letting seedbed set

before application, and doing planting before application of herbicides and timing treatment to 1-2 days before crop germination.

In figuring costs from these trials several factors need to be considered. These include weed density, type of weeds, and weed size. Higher weed concentrations and larger weeds require more material, as do difficult weeds such as purslane and grasses. [Estimated cost data is provided in the full report.]

It cannot be stated enough that these herbicides in our opinion work best in setting up a stale seedbed for closely grown crops that will not outcompete weeds by themselves. This is for crops like salad greens, carrots, beets, cilantro, etc. The weeds should be under 4" in height to get good kill. And the herbicide used and the concentration it is used in must be matched up to the type, density and size of weed to be killed.

After initially being leery of the benefits to be gained from these products we have seen that not only is there the easy-to-see benefit of labor saved, but also this labor savings allows crops to be grown profitably in harder to grow seasons or makes less profitable crops profitable due to a reduction in weeding time. 🌱

Table 1. Weed management results averaged over the three trials.

Product used, in order farmer thinks is most effective	Average weeding time in minutes for Trial #1	Adjusted average weeding time in minutes for Trial #2	Average weeding time in minutes for Trial #3	Average weeding time in minutes for all trials
L.P. Flaming	19 - ^	1	.4	6.8
Burnout II - #	10	4	0	4.6
Matran 5 - *	22	11	.8	11.2
Vinegar 13%	23	17	1	13.6
Vinegar 10%	27	11	1	13
Untreated - \$	40	40	22	34

^ - In Trial #1 flaming was applied at too short of an interval for best weed control.

- Burnout II is not approved for USDA certified organic use due to a mineral carrier.

* - Matran 5 was used at 3% dilution rate and now newly formulated Matran EC is recommended by manufacturer to be used at 5-8%, which would greatly increase its effectiveness.

\$ - Untreated areas weeding time was stopped at 40 minutes.