NORTHWEST CROPS & SOILS PROGRAM

2014 Flax Weed Control Trial

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2014 FLAX WEED CONTROL TRIAL

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Flax (*Linum usitatissimum* L.) is a multi-purpose crop grown for its fiber, oil (linseed oil), and meal. The majority of production occurs in the Dakotas, Minnesota, and Montana. Recently there has been interest in growing flax in the northeast, both for human consumption and for animal feed, for its high levels of heart-healthy omega-3 fatty acids. Flax is a spring annual that is usually planted as early as the ground can be worked. However, one of the main challenges to successfully growing flax is weed control. Flax plants compete poorly with fast growing weeds due to its relatively short height (between 12 and 36 inches when mature) and tiny leaves. This trial was initiated to see if management, including different row spacing and cultivation, would affect weed densities in flax and improve yields.

MATERIALS AND METHODS

This trial was planted at Borderview Research Farm in Alburgh, VT on 9-May 2014. General plot management is listed in Table 1. The previous crop was corn with rye cover crop. The field was disked and spike tooth harrowed prior to planting. Plots were seeded with variety ‘Rahab 94’ at a seeding rate of 50 lbs acre^{-1}. The experimental design was a randomized complete block with four replications. Four weed control techniques were compared against a <u>control</u> of standard 6” row spacing and no cultivation (Table 2). The <u>narrow row</u> treatment was planted with a Kverneland grain drill at 4.5” row spacing. The <u>wide row</u> treatment was also planted with a Kverneland grain drill (by plugging every other hole in the hopper for 9” row spacing) and cultivated with a Schmotzer hoe on 9-Jun. The <u>tine-weed</u> treatment was planted with a Great Plains grain drill at 6” row spacing and tine-weeded on 2-Jun. The <u>inter-seed</u> treatment was planted with a Great Plains grain drill at standard 6” row spacing with the addition of Ladino white clover at 6 lbs. acre^{-1} and Laura Meadow Fescue at 12 lbs. acre^{-1} on 15-May.

Annual and perennial broadleaf and grass weeds were counted before and after cultivation on 2-Jun for tine-weeding and 9-Jun for Schmotzer hoeing. Flax plots were cut and swathed on 22-Aug and picked up with an Almaco SPC50 small plot combine on 26-Aug 2014. The harvest area was 5’ x 20’. Seed was cleaned with a small Clipper M2B cleaner (A.T. Ferrell, Bluffton, IN). Results were analyzed with an analysis of variance in SAS (Cary, NC). The Least Significant Difference (LSD) procedure was used to separate cultivar means when the F-test was significant ($p < 0.10$).

Table 1. General plot management.

Trial Information	Borderview Research Farm Alburgh, VT
Soil Type	Benson rocky silt loam
Previous crop	Corn with Rye cover crop
Planting date	9-May
Swathed	22-Aug
Harvested	26-Aug
Seeding rate	50 lbs acre^{-1}
Tillage methods	Mold board plow, disk, and spike tooth harrow

Table 2. Weed control techniques.

Treatment	Row spacing inches	Planter	Cultivation
Narrow row	4.5	Kverneland grain drill	none
Wide row with cultivation	9	Kverneland grain drill	Schmotzer hoe
Tine-weed	6	Great Plains grain drill	Tine-weeder
Inter-seed	6	Great Plains grain drill	none
Control	6	Great Plains grain drill	none

Variations in yield and quality can occur because of variations in genetics, soil, weather and other growing conditions. Statistical analysis makes it possible to determine whether a difference among varieties is real, or whether it might have occurred due to other variations in the field. At the bottom of each table, a LSD value is presented for each variable (i.e. yield). Least Significant differences (LSD's) at the 10% level of probability are shown. Where the difference between two treatments within a column is equal to or greater than the LSD value at the bottom of the column, you can be sure in 9 out of 10 chances that there is a real difference between the two varieties. Treatments that were not significantly lower in performance than the highest value in a particular column are indicated with an asterisk. In the example to the right, A is significantly different from C but not from B. The difference between A and B is equal to 1.5, which is less than the LSD value of 2.0. This means that these varieties did not differ in yield. The difference between A and C is equal to 3.0, which is greater than the LSD value of 2.0. This means that the yields of these varieties were significantly different from one another. The asterisk indicates that B was not significantly lower than the top yielding variety.

Variety	Yield
A	6.0
B	7.5*
C	9.0*
LSD	**2.0**

RESULTS AND DISCUSSION

Seasonal precipitation and temperature recorded at a weather station in Alburgh, VT are shown in Table 3. From May to August, there was an accumulation of 4,109 Growing Degree Days (GDDs) in Alburgh which is 2 GDDs more than the 30-year average. Flax needs 1,603 GDDs to reach maturity.

Table 3. Seasonal weather data[1] collected in Alburgh, VT, 2014.

Alburgh, VT	May	June	July	August
Average temperature (°F)	57.4	66.9	69.7	67.6
Departure from normal	1.0	1.1	-0.9	-1.2
Precipitation (inches)	4.90	6.09	5.15	3.98
Departure from normal	1.45	2.40	1.00	0.07
Growing Degree Days (base 32°F)	789	1041	1171	1108
Departure from normal	33	27	-27	-31

Flax yields averaged 1,158 lbs. acre^{-1} in 2014 (Table 4 and Figure 1). There was no significant difference in yields or test weight amongst any of the weed control techniques. However, the average yield was more than double the 2013 average. The reasons for this increase in yield likely include lower weed pressure and better harvest technique. Overall, the weed pressure in 2014 was much less than 2013. The average weed populations were 169 weeds meter^{-2} compared to 423 weeds meter^{-2} in 2013. Likely the low weed pressure experienced by flax in 2014 resulted in adequate yields regardless of weed control technique. To harvest, plots were cut and swathed, and picked up with a combine four days later. This technique allowed the flax and weed biomass to dry down. Additional adjustments to the combine, such as turning the air off, prevented flax seed from being lost in the combine.

Table 4. Harvest yield and test weight of flax grown with different weed control techniques, Alburgh, VT, 2014.

	Yield lbs/acre	**TW** lbs/bushel
Wide row w/ Schmotzer hoe	1073	53.1
Inter-seed	1129	53.0
Tine-weed	1194	55.0
Narrow row	1195	54.9
Control	1198	53.6
Trial Mean	1158	53.9
LSD (p<0.10)	NS	NS

NS – No significant difference amongst weed control techniques.

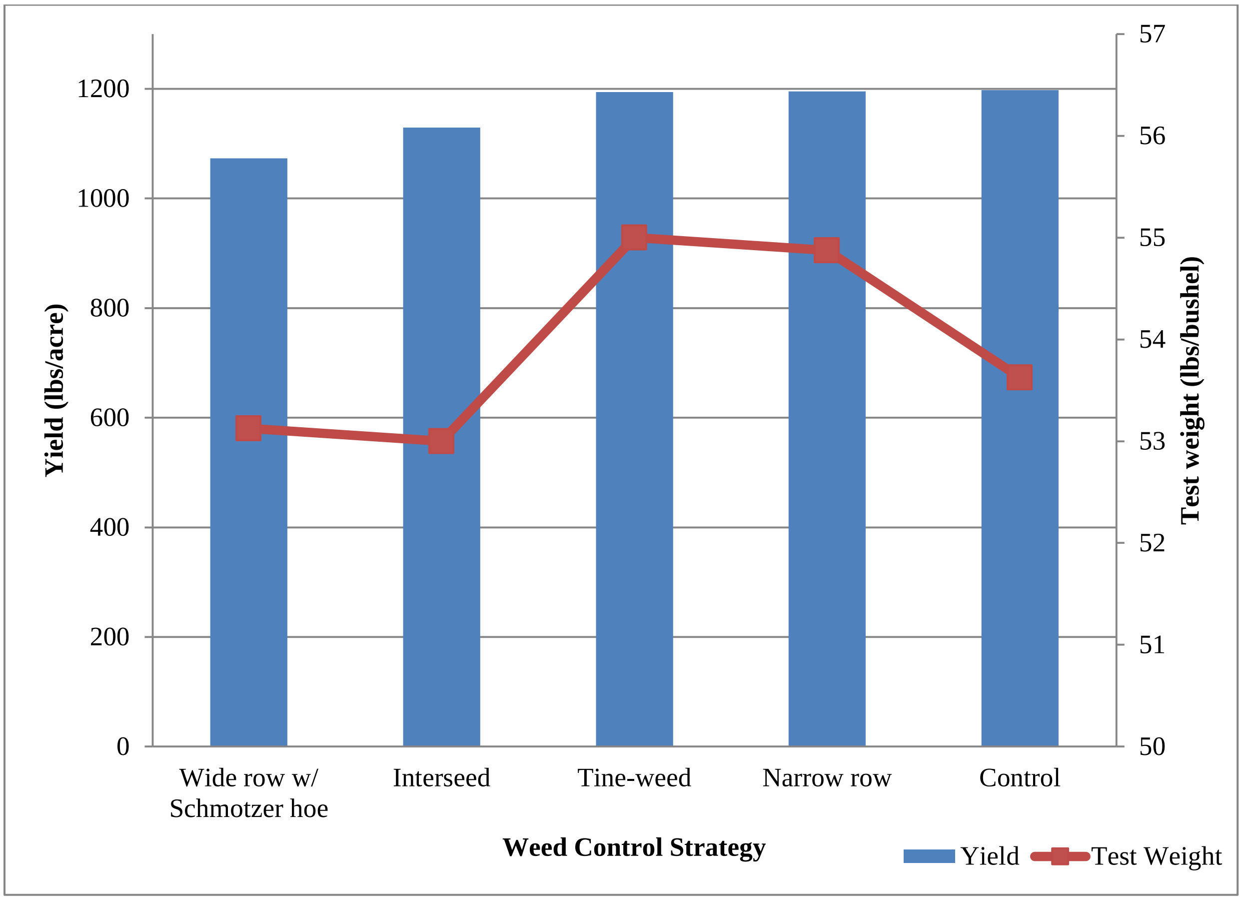

Figure 1. Yield and test weight of flax grown with different weed control techniques, Alburgh, VT.

Overall, cultivation approximately one month after planting reduced weed pressure in the flax plots by about 90% (Table 5). Cultivating with a Schmotzer hoe removed 91% of all weeds, while tine-weeding removed 88%. There was no significant difference in the amount of weeds removed from either cultivation technique. Cultivation appears to be an adequate technique to control weeds in flax especially under moderate weed pressure. Timing of the cultivation is important for successful removal of weed species. The cultivation occurred when the weeds were in the cotyledon to first leaf stages making them easier to remove with mechanical equipment.

Table 5. Weeds removed by each cultivation technique, 2014.

	Grass Removed %	Broadleaf Weeds Removed %
Tine-weed	83.8	92.1
Schmotzer Hoe	90.5	91.4
Trial Mean	87.2	91.7
LSD (p<0.10)	NS	NS

NS – No significant difference amongst weed control techniques.

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