NORTHWEST CROPS & SOILS PROGRAM

2013 Flax Planting Date Trial

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UNIVERSITY OF VERMONT EXTENSION
CULTIVATING HEALTHY COMMUNITIES

2013 FLAX PLANTING DATE TRIAL

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INTRODUCTION

Early seeding of flax generally produces the best yields and quality. Moderate temperatures and sufficient soil moisture during flowering and seed development are important for high yield and quality, and these conditions are more likely to occur with early seeding. There is little risk of frost damage with flax. Newly emerged flax can withstand temperatures down to 27^{O}F, while plants past the two leaf stage can withstand temperatures as low as 18^{O}F. Early planted flax will also establish before the majority of summer weed species. This could potentially help reduce weed competition. This trial was initiated to determine optimum flax planting dates to maximize yields.

MATERIALS AND METHODS

Two varieties of flax were planted on four planting dates from mid-April to mid-May 2013. This trial was conducted at Borderview Research Farm in Alburgh, VT. The experimental design was a randomized complete block with split plots and four replications. Main plots were weekly planting dates from 19-Apr to 10-May. Subplots were two flax varieties including a brown (var 'Rahab 94') and a golden (var 'Omega') flax type. Plots were 5' x 20' in size. General plot management is listed in Table 1. The previous crop was spring wheat. The field was disked and spike tooth harrowed prior to planting. Plots were seeded at a seeding rate of 50 lbs acre^{-1}.

Populations were determined on 22-May by counting plants in two 1/3 meter sections. Weed cover was determined on 17-Jun as a percent of total plant cover using the web based IMAGING crop response analyzer. Digital images were taken with a compact digital camera, Canon PowerShot G12 (Melville, NY) (10.4 Megapixels). One picture covering approximately 1/2 m^2 was taken in each plot before weeding and one picture was taken after weeding. Digital images were analyzed with the automated imaging software, which was programmed in MATLAB (MathWorks, Inc., Natick, MA) and later converted into a free web-based software (www.imaging-crop.dk). The outcome of the analysis is a leaf cover index, which is the proportion of pixels in the images determined to be green. Total plant cover (1st picture) – flax cover (second picture)/ total plant cover = weed cover (%).

Flax plots were harvested with an Almaco SPC50 small plot combine on 5-Sep 2013. 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	Spring Wheat
Varieties	Rahab 94 & Omega
Planting dates	19-Apr, 26-Apr, 3-May, 10-May
Harvest date	5-Sep
Seeding rate	50 lbs acre^{-1}
Tillage methods	Mold board plow, disk, and spike tooth harrow

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 below, 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 2. From April to September, there was an accumulation of 4,511 Growing Degree Days (GDDs) in Alburgh which is 18 GDDs less than the 30-year average. Flax needs 1,603 GDDs to reach maturity.

Table 2. Seasonal weather data[1] collected in Alburgh, VT, 2013.

Alburgh, VT	April	May	June	July	August
Average temperature (°F)	43.6	59.1	64	71.7	67.7
Departure from normal	-1.2	2.7	-1.8	1.1	-1.1
Precipitation (inches)	2.12	4.79	9.23 ł	1.89	2.41
Departure from normal	-0.7	1.34	5.54	-2.26	-1.5
Growing Degree Days (base 32°F)	349	849	967	1235	1112
Departure from normal	-35.6	91.4	-47	36.8	-27.2

[1]Based on weather data from a Davis Instruments Vantage Pro2 with WeatherLink data logger.
Historical averages are for 30 years of NOAA data (1981-2010) from Burlington, VT.
ł June 2013 precipitation data based on National Weather Service data from cooperative stations in South Hero, VT (http://www.nrcc.cornell.edu/page_summaries.html)

Flax plot characteristics and harvest yields are presented by planting date in Table 3 and by variety in Table 4. Overall, yields were lower than expected due to heavy weed pressure. Weeds covered on average 25.2% of the plots. There was no reduction in weed pressure as a result of earlier planting dates. Additionally, of the two varieties chosen for the planting date trial, Omega's growth was poor (compared to the other 11 varieties in the Flax Variety Trial). The stands of Omega were thin and it is unclear if seed quality was the major factor impeding germination. However, even with the significant difference in yield and population between the two varieties (Table 4), there was no significant difference in yield by planting date. Generally, yields of the two flax varieties, Omega and Rahab 94, decreased with later planting dates (Figure 1). It is important to note that flax yields were far lower than expected. Significant losses were likely associated with direct combining flax with heavy weed pressure. To reduce flax losses the air speed on the combine is turned off, but this results in all the trash and wet weed seeds mixing with the flax seed. This mix is difficult to move through the combine and hence the combine can become easily plugged. The best means to deal with weeds in the flax is to swath the field and let dry so that weeds will separate better from the flax crop. Unfortunately, the weather was not conducive to swathing so direct combining was the only option.

Table 3. Plot characteristics and harvest yield of flax planted on four planting dates, averaged across two varieties.

Planting Date	**Flax Population** plants m^2	**Weed cover** %	**Yield** lbs. ac^{-1}
(1) 19-Apr	205	21.9	172
(2) 26-Apr	220	29.5	159
(3) 3-May	276	22.8	135
(4) 10-May	**487***	26.6	93
Trial Mean	297	25.2	140
LSD (p<0.10)	90.684	NS	NS

*Varieties with an asterisk are not significantly different than the top performer in **bold**.
NS – No significant difference amongst varieties.

Table 4. Plot characteristics and harvest yield of two flax varieties, averaged across four planting dates.

Variety	**Flax Population** plants m^2	**Weed cover** %	**Yield** lbs. ac^{-1}
Omega	223	26.9	93
Rahab 94	**371***	23.5	**187***
Trial Mean	297	25.2	140
LSD (p<0.10)	64.123	NS	51.434

*Varieties with an asterisk are not significantly different than the top performer in **bold**.
NS – No significant difference amongst varieties.

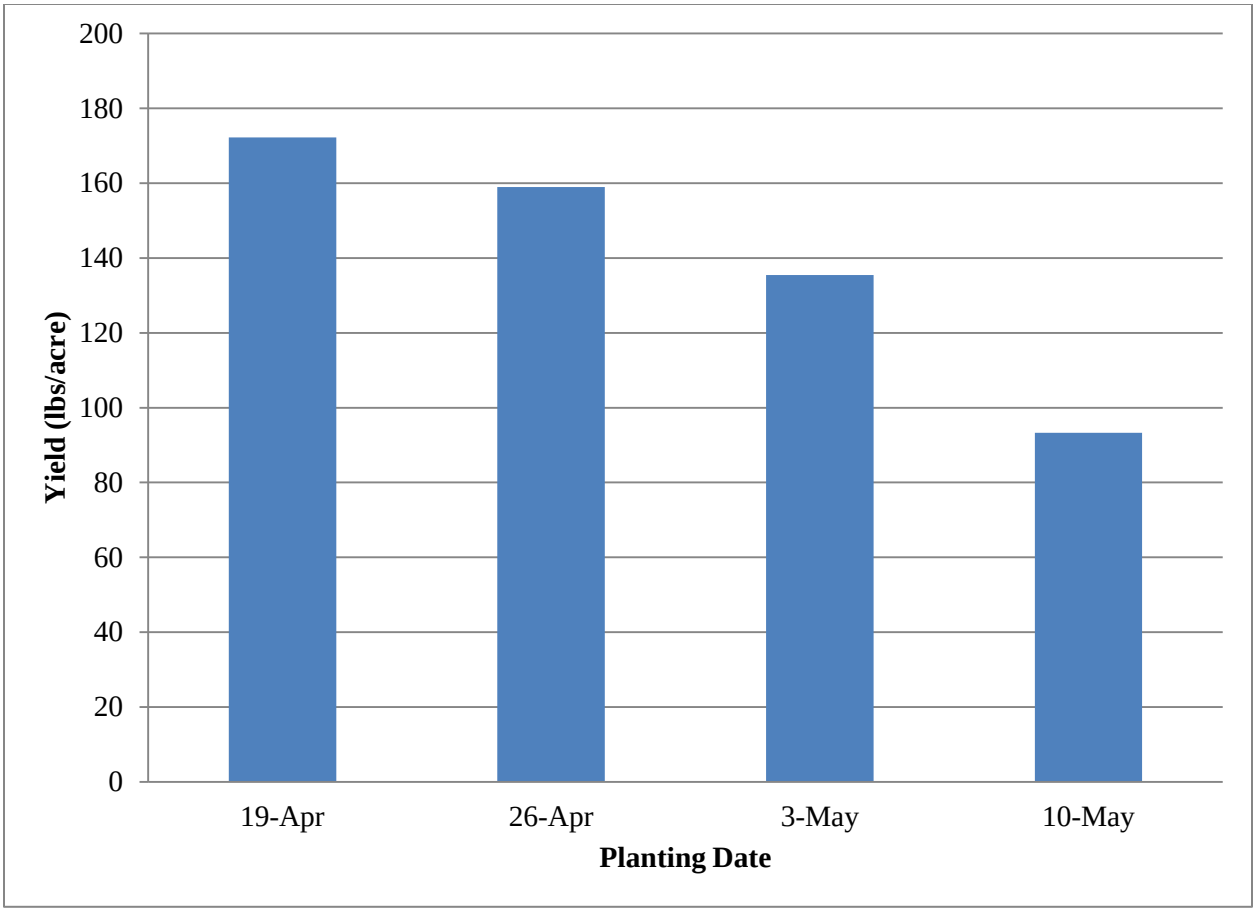

Figure 1. Average yields of two flax varieties planted at four different planting dates from mid-April to mid-May.

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