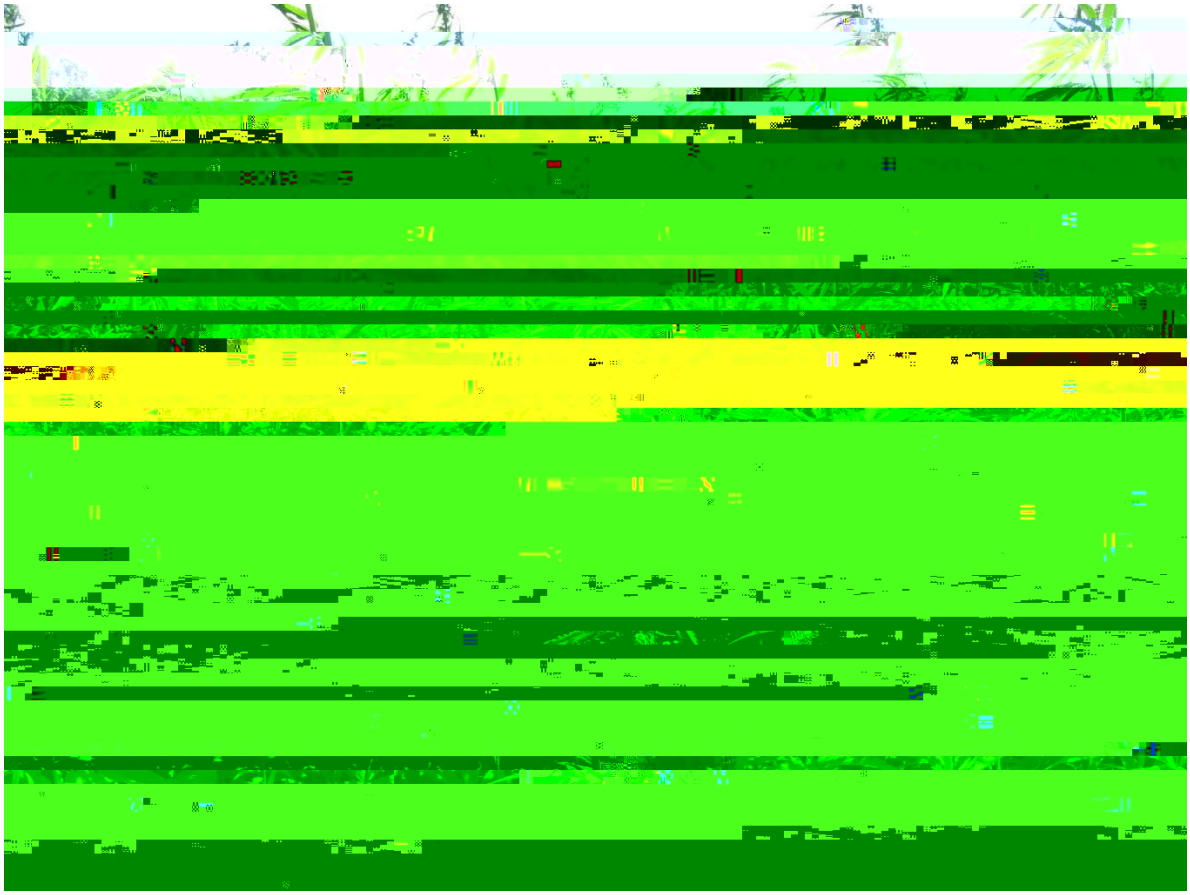
2017 Industrial Hemp Fiber Variety Trial



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2017 INDUSTRIAL HEMP FIBER VARIETY TRIAL

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Table 2. Hemp varieties evaluated in the industrial hemp fiber trial 2017, Alburgh, VT.

Variety	Days to maturity
Beniko	120
Carmagnola	160-170
Carmagnola selezionata	160-170
Carmaleonte	140
Eletta campana	160-170
Felina 32	120
Fibranova	160-170
Futura 75	140

There were a total of eight hemp varieties evaluated (Table 2) that came from Schiavi Seeds (Lexington, KY). On 6-Jul, the trial was fertilized with 100 lbs ac^{-1} of nitrogen, 60 lbs ac^{-1} of phosphorus, and 60 lbs ac^{-1} of potassium. Fertility amendments were based on soil test results. All fertility amendments were approved for use in USDA certified organic systems.

Two to three weeks after planting, vigor was measured by doing a visual assessment of each plot and using a 1=high through 5=low scale. A month after planting, plant populations were recorded by counting the number of plants in a foot-long section of a row, three times per plot. A few days before harvest, data was collected on plant heights by measuring three randomly selected plants per plot. Infection rates from the disease, *Sclerotinia sclerotiorum*, were recorded 1.5 months after planting, at female flower development stage on 12-Jul, and just before harvest on 17-Aug by counting the number of infected plants per plot. Pest pressure from arthropods was recorded at those times as well, by counting the number and variety of each arthropod present on two leaves from five plants per plot. On 23-Aug, wet weight harvest yields were calculated by sampling the hemp biomass within a $0.25m^2$ quadrat. Harvest moisture was calculated by taking a subsample of hemp yield and drying it at 105 F till it reached a stable weight. On 24-Aug, the fiber plants were mowed using a 5-foot sickle bar mower and allowed to ret in the field for approximately three weeks.

Image 1. Custom built decorticator, Alburgh, VT, 2017.

After retting, the stalks were decorticated to separate the bast and hurd fibers, using a custom built decorticator (Image 1). As the stalks passed between the two moving gears, hurd fiber broke away and dropped to the floor or a bucket, placed underneath. The variety trial data were analyzed using mixed model analysis using the mixed procedure of SAS (SAS Institute, 1999). Replications within trials were treated as random effects, and variety treatments were treated as fixed. Mean comparisons were made using the Least Significant Difference (LSD) procedure when the F-test was considered significant ($p<0.10$). Across planting dates, data was analyzed using the PROC MIXED procedure in SAS.

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 treatments 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 (LSDs) at the 0.10 level of significance are shown, except where analyzed by pairwise comparison (t-test). 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 that for 9 out of 10 times, there is a real difference between the two treatments. Treatments that were not significantly lower in performance than the top-performing treatment in a particular column are indicated with an asterisk. In this example, hybrid C is significantly different from hybrid A but not from hybrid B. The difference between C and B is equal to 1.5, which is less than the LSD value of 2.0. This means that these hybrids did not differ in yield. The difference between C and A is equal to 3.0, which is greater than the LSD value of 2.0. This means that the yields of these hybrids were significantly different from one another. The asterisk indicates that hybrid B was not significantly lower than the top yielding hybrid C, indicated in bold.

RESULTS

Seasonal precipitation and temperature were recorded with a Davis Instrument Vantage Pro2 weather station, equipped with a WeatherLink data logger at Borderview Research Farm in Alburgh, VT.

Table 3. Seasonal weather data collected in Alburgh, VT, 2017.

Alburgh, VT	May	June	July	August
Average temperature (°F)	55.7	65.4	68.7	67.7
Departure from normal	-0.75	-0.39	-1.90	-1.07
Precipitation (inches)	4.10	5.60	4.90	5.50
Departure from normal	0.68	1.95	0.73	1.63
Growing Degree Days (base 50°F)	245	468	580	553
Departure from normal	47	-7	-60	-28

Throughout the growing season, temperature and precipitation fluctuated away from the 30-year historical averages. May-August was wetter than normal, receiving 4.99 more inches of precipitation as compared to historical averages (Table 3). Temperatures in May-August were cooler than normal by an average of 1° F per month. Overall, there were an accumulated 2293 Growing Degree Days (GDDs) from May to August, approximately 48 less than the historical average.

Table 4. The impact of variety on plant characteristics and harvest yield of industrial hemp fiber, Alburgh, VT, 2017.

Variety	Early season vigor†	Height @ harvest	Stem diameter	Harvest population	Dry matter yield	Moisture @ harvest	Bast fiber
	1 to 5 rating	cm	mm	plants ac^{-1}	lbs ac^{-1}	%	%
Beniko	3.00*	146	4.67	246*	20,442	64.9	25.8
Carmagnola	2.25	**214**	6.20*	175	25,343	68.1	23.2
Carmaleonte	**3.75**	134	5.68*	215	24,428	68.1	23.8
Carmaleonte selezionata	3.00*	204*	**7.13**	125	21,482	67.2	23.2
Eletta campana	2.25	162	4.11	**311**	12,661	68.0	18.4
Felina 32	3.50*	137	4.93	150	19,554	65.0	16.8
Fibranova	3.50*	155	5.47	181	15,428	64.7	18.8
Futura	2.75	147	4.97	198	18,449	66.2	19.6
LSD (0.10)	0.945	38.0	1.62	92.1	NS		

Table 5. The impact of variety on disease and arthropod presence in industrial hemp fiber at female flower development (12-Jul), Alburgh, VT, 2017.

Variety	Aphids	Leafhopper	Japanese beetles	Tarnished plant bug	Physical damage

Table 6. The impact of variety on disease and arthropod presence in industrial hemp fiber before mowing (17-Aug), Alburgh, VT, 2017.

Variety	Sclerotinia infection	Aphids	Leafhopper	Spiders	Tarnished plant bug	Physical damage
	% of plants	# plant^{-1}	# plant^{-1}	# plant^{-1}	# plant^{-1}	# leaves plant^{-1}
Beniko	0.000	2.55	0.050	0.100	0.050	0.200
Carmagnola	0.000	4.80	0.000	0.000	0.000	0.400
Carmaleonte	0.063	1.50	0.000	0.050	0.000	0.450
Carmaleonte selezionata	0.000	4.20	0.000	0.000	0.000	0.350
Eletta campana	0.000	1.40	0.050	0.000	0.000	0.350
Felina 32	0.018	4.50	0.000			

establishment, the hemp fiber stands looked relatively good and this was likely due to their high seeding rate compared to grain hemp.

The average height across varieties was 1.62 m, while a desirable height is 2 m or greater. However, the taller varieties may leave more possibility for lodging. The lack of heat during the early and mid-part of the season may have contributed to shorter plants.

Pest Pressure in Hemp: Disease, insects, weeds

Hemp has the potential to host a number of diseases and insects. For the most part, hemp growing regions have not indicated that disease and arthropod pests are of economic significance. During the growing season, a survey of pest incidence was conducted to gain a better understanding of any pressures that exist on hemp in the region.

Aphids infested the hemp more heavily during later stages of plant development and but did not seem to affect plant yields, since most vegetative growth had already been completed. Similarly, *Sclerotinia sclerotiorum* infection increased later in the season, but did not seem to affect yields.

Early season weeds can pose a threat to hemp populations, however, due to the higher seeding rate it seemed the weeds were less competitive with the fiber hemp as compared to grain hemp, which has a lower seeding rate. The primary weeds observed the hemp trials were lamb's quarter, ragweed, and foxtail. Currently, there are no pesticides (herbicides, insecticides, fungicides, nematicides, etc.) registered for hemp in the U.S, so growers must follow best practices to reduce the impact of pests, especially weeds.

It is important to remember that these data represent only one year of research, and in only one location. More data should be considered before making agronomic management decisions. Additional reseae leates s 0 0ely one li C

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