



2022 Industrial Hemp Fiber Variety Trial

2

Dr. Heather Darby, UVM Extension Agronomist
Laura Sullivan and John Br...
UVM Extension Crops and Soils...
(802) 524-6501

2021 INDUSTRIAL HEMP FIBER VARIETY TRIAL
Dr. Heather Darby, University of Vermont Extension
heather.darby[at]uvm.edu

Hemp is a non-psychoactive variety of *cannabis sativa L.* The crop is one of historical importance in the U.S. and reemerging in worldwide importance as manufacturers seek hemp as a renewable and sustainable resource for a wide variety of consumer and industrial products. The fiber has high tensile strength and can be used to create a variety of goods. Hemp fiber consists of two types: bast and hurd. The bast fiber are the long fibers found in the bark of hemp stalks and are best suited for plastic bio-composites for vehicles, textiles, rope, insulation, and paper. The hurd fiber are short fibers found in the core of the stem and are suited for building materials, such as hempcrete and particle boards, bedding materials, and absorbents.

For decades, U.S. entrepreneurs have been importing hemp from China, Eastern Europe and Canada. and suitable for rotation with other small grains and grasses.

Table 2. Hemp varieties evaluated in the industrial hemp fiber trial 2022, Alburgh, VT.

Variety	Days to seed maturity	Seed supplier
Bialobrzeskie	130	International Hemp
Carmenecta	120	International Hemp
CFX-1	105+	Hemp Genetics International
CFX-2	103+	Hemp Genetics International
Enectarol	115	International Hemp

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 ($p < 0.10$).

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 an 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). June was cool and wet seeing below average temperatures and above average precipitation. From seeding and establishment in May until harvest in August, there were 2157 Growing Degree Days (GDDs) accumulated, which was 2 GDDs below normal.

Table 3. Seasonal weather data collected in Alburgh, VT, 2022.

Alburgh, VT	May	June	July	August
Average temperature (°F)	60.5	65.3	71.9	70.5
Departure from normal	2.09	-2.81	-0.54	-0.20

profitable byproduct of textile production. Varieties that performed statistically similar to Santhica 27 in terms of harvest population include Orion 33, Futura 83, Fibror 79, Felina 32, Fedora 17, and Enectarol.

The variety with the highest ratio of bast fiber to hurd fiber was Fibror 79; a French variety bred specifically for fiber and recognizable by its distinct yellow stem. The stalks of Fibror 79 contained 41.1% bast fiber and averaged a thickness of 4.5 mm. While the bast fiber ratio of this variety exceeded typical expectations, the slight size of the plants did not maximize overall

Figure 1. Dry matter biomass yields and bast fiber yields for hemp fiber variety trial Alburgh, VT, 2022.

responsible for breaking down the lignin, pectin, and hemicellulose binding the fibers. Warm and moist conditions, like those typical of the late Vermont summer, will encourage increased microbial activity and thus speed the retting process, which can take anywhere from 7-45 days. If the climate is too dry at this time, the stalks will dry out and field retting will not occur naturally. The stalks must also be turned periodically to ensure an even retting process. With these factors in mind, some specific equipment, as well as a modest yet acute visual literacy of the retting process is required in order to effectively harvest and process quality hemp fiber. That being said, yields from this trial indicate that hemp fiber can be grown and harvested in the Northeast with favorable outcomes.

The average dry matter yield across all seventeen varieties in the 2022 fiber trials was 7486 lbs ac⁻¹, with some varieties surpassing that value by over a ton (Table 4). According to the National Hemp Report issued by the USDA in early 2022, the average yield for 2021 hemp grown for fiber was estimated at 2620 lbs ac⁻¹. Across all varieties, 34.9% of yields were comprised of bast fiber. Depending on variety and planting density, bast fiber typically represents 20-30% of the total fiber content. Population counts varied greatly and were generally lower than desired as a result of poor germination. On average, plants were 132 cm tall, which could be as little as half of the desired height of fiber plantings in ideal growing conditions, depending on the desired quality of fiber for end-use. Plant heights may also have been impacted by the cooler than average temperatures seen by most of the growing season and especially in June. Early season weed pressure and bird predation may have also influenced populations and are other considerations for growing hemp.

ACKNOWLEDGEMENTS

The UVM Extension Northwest Crops and Soils Program would like to give a special thanks to Roger Rainville and the staff at Borderview Research Farm for their generous help with the trials. This research was supported with funds from the USDA SARE grant program and our ongoing work can be identified as project number ONE22-410. We would also like to acknowledge Anna Brown, Catherine Davidson, Hillary Emick, Ivy Krezinski, Lindsey Ruhl, Sophia Wilcox Warren, and Sara Ziegler, for their assistance with data collection and data entry. This information is presented with the understanding that no product discrimination is intended and neither endorsement of any product mentioned, nor criticism of unnamed products, is implied.

UVM Extension helps individuals and communities put research-based knowledge to work.