

2022 GRAIN & FIBER HEMP VARIETY TRIALS

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Intro and Methods

Researchers at Bay Mills Community College, Michigan State University and Lake Superior State University received funding from USDA-NIFA to conduct grain and fiber hemp variety trials in 2022. Fourteen varieties of grain hemp and ten varieties of fiber hemp were tested at Chatham, MI. Hemp varieties were sourced from seed companies in Europe, Canada and the Northern US under the assumption that conditions there would be similar to Northern Michigan, particularly in terms of day length and temperature.

The trials were managed conventionally using synthetic fertilizer and herbicide. The seedbed was prepared using rotary tillage and compacted prior to sowing. The experimental design was a RCBD with four replications. Plots were 4 ft. X 16 ft. with 7 inch row spacing. Plots were drilled May 10th at 25 plants/ft² for grain varieties and 50 plants/ft² for fiber, adjusting for germination and seed size. However, the fiber trial established poorly and was therefore replanted on June 3rd. One grain variety, T3H2006, was received late and therefore included in the fiber trial replant. As a result, data for this variety may not be representative and cannot be directly compared to the other grain varieties. 217 lbs/ac of 46-0-0 urea was top-dressed after planting. One pt/ac of Broclean and 10 oz/ac of Assure II was applied to the grain trial for weed control on June 8th and 20th respectively. Ten oz/ac of Assure II was applied to the fiber trial for weed control on July 1st. Herbicide injury was rated visually on a 0-5 (good-bad) scale. Stand counts were taken after herbicide application to capture herbicide effects on hemp stand.

Fiber plots were harvested August 19th and Sept 1st once varieties were actively flowering. Whole plots were cut with a Jari sickle bar mower and weighed green. Two grab samples were collected from each plot for 1) direct oven drying for moisture determination, and 2) field retting. Bundled samples were weighed, retted on turf for 7-9 weeks, oven dried and re-weighed. Fiber dry matter yields are reported here at 0% moisture. Six-inch flower samples were collected at harvest, oven dried at 120 degrees F, and submitted to LSSU for cannabinoid analysis.

Grain plots were harvested Aug. 31st – Oct 5th based on maturity. Whole plots were direct-cut with a Wintersteiger Nursery Master Elite plot combine. Grain was oven dried at 120 degrees F and passed through a Dickey-John 2500 GAC to determine moisture content. Remaining grain stems taller than 12 inches were harvested using a Carter forage harvester (flail type). Grab samples of grain stems were collected and oven dried for moisture determination. Grain yields reported here are adjusted to 9% moisture. Six-inch flower samples were collected at harvest, oven dried at 120 degrees F, and submitted to LSSU for cannabinoid analysis. Total THC was calculated as $D9THC + 0.877 * THCa$.

Results and Discussion

Temperature and precipitation were near normal at Chatham from planting through harvest. Both trials were exposed to moderate hail damage on July 1st. Early maturing varieties in the grain trial, the largest and most rigid plants, were damaged most extensively by the hail. Late maturing grain varieties experienced significant white mold infection and shattering loss due to wind and bird damage prior to harvest. Data were analyzed using ANOVA and Tukey's HSD test ($\alpha = 0.05$) in the Agricolae package for R. Varieties were compared based on a single year/location. Rep 4 fiber hemp data was removed from our analysis due to significant stunting, likely from a nutrient deficiency, isolated to that area. One thousand-kernel sample per variety was used to determine seed size.

Average fiber stand establishment was 46%, and did not differ significantly among varieties. Significant differences among varieties were observed in fiber hemp flower date, height and yield (Table 1). The average retted fiber dry matter yield was 4,555.2 lbs/ac with the lowest yielding variety, USO-31, producing 3,317 lbs/ac and the highest yielding variety, Carmenecta, producing 6,379 lbs/ac. Average hemp fiber yields in Canada are 2.5-3 T/ac. No herbicide injury was observed in the fiber trial, which was only treated with a grass herbicide, Assure II. All fiber varieties were THC compliant (<0.3% Total THC), and did not differ significantly in THC concentration. Varieties with no detectible THC in any sample are labeled as being below the lab's detection limit of 0.05% THC.

Significant differences among varieties were observed in grain hemp stand (T3H2006 excluded), flower date, height and yield (Table 2). The average grain yield was 532 lbs/ac with the lowest yielding

PURPOSE:

Compare performance of available grain and fiber hemp varieties, under Northern MI conditions.

TRIAL LOCATIONS:

MSU Upper Peninsula Research and Extension Center in Chatham, MI

EXPERIMENTAL DESIGN:

Randomized complete block design with four replications.

TRIAL MANAGEMENT:

- Planted May 10 (grain) & June 3 (fiber) at 25/50 plants/ft²
- Plots 4' X 16', 7 in. rows
- Borders and alleys planted to decrease edge effect
- 217 lbs/ac 46-0-0 urea
- 1 pt/ac of Broclean (grain only), 10 oz/ac of Assure II
- Fiber Harvest Aug 19th – Sept 1st
- Grain Harvest Aug 31st– Oct 5th based on maturity

TAKE AWAYS:

- Compacting the seedbed improved establishment somewhat, but stunted plants.
- Herbicide injury, hail, white mold and bird damage all reduced grain yields.
- Grain and fiber varieties were all THC compliant.



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variety, Bialobrzeskie, producing 268.9 lbs/ac and the highest yielding variety, CFX-2, producing 758.9 lbs/ac. Average hemp grain yields are 600-800 lbs/ac in Canada. Herbicide injury was significantly correlated with grain yield, but not stand, highlighting that Broclean (bromoxynil) severely stunted some varieties, but did not actually kill many plants. The average unretted grain stem yield was 920.8 DM lbs/a. All grain varieties were THC compliant (<0.3% Total THC), and did not differ significantly in THC concentration.

Many thanks to our funders, suppliers and partners including USDA-NIFA, Horizon Hemp Seeds, International Hemp LLC, MASA Ag LLC, Hemp Genetics International, Hempoint, New West Genetics, Dr. Shelby Ellison and Phil Alberti with UW-Madison, Dr. Esther S. Durairaj with Michael Fields Ag Institute, and Marguerite Bolt with Purdue University. This and other hemp performance data is available through the [Midwestern Hemp Database](#).

Table 1. Fiber Hemp Performance at Chatham, MI (* indicates varieties similar to the BEST)

Variety	Habit	Seeds/lb	Stand (1 ft ²)	Flower Date	Height (in)	Unretted DM Yield (lbs/a)	Retted DM Yield (lbs/a)	THC (%)
Bialobrzeskie	Mono	32,562.2	24.8*	25-Jul*	54.0	6,635.3*	3,766.7	0.123%*
Carmenecta	Dio	22,191.4	26.2	24-Aug	68.3	8,608.4*	6,379.0	0.067%*
Enectarol	Dio	23,237.3	20.5*	22-Aug	63.7*	7,677.7*	5,404.4*	<0.05%
Fibror 79	Mono	NA	23.7*	10-Aug	55.3	7,583.8*	3,737.4	0.013%*
Futura 75	Mono	25,340.3	21.5*	7-Aug	58.7	8,830.6*	4,851.9	<0.05%
Futura 83	Mono	24,386.7	24.8*	12-Aug	60.3	8,949.8	6,368.3*	0.027%*
Muka	Mono	30,648.1	19.2*	5-Aug	58.0	6,847.2*	4,094.3	<0.05%
Orion 33	Mono	25,340.3	25.3*	4-Aug	55.0	6,307.5	4,074.3	0.013%*
Santhica 70	Mono	28,173.4	23.0*	5-Aug	55.3	6,334.1	3,559.2	<0.05%
USO 31	Mono	26,999.5	21.0*	22-Jul	50.0	5,669.3	3,317.0	<0.05%
Average	NA	26,542.1	23.0	7-Aug	57.9	7,344.4	4,555.2	0.024%



Fig 1. Harvesting grain hemp



Fig 2. Hail damage to grain hemp



Fig 3. Harvesting fiber hemp

Table 2. Grain Hemp Performance at Chatham, MI (* indicates varieties similar to the BEST)

Variety	Habit	Seeds per Lb	Stand (1 ft ²)	Herbicide Injury (0-5)	Flower Date	Height (in)	Grain Yield (lbs/a)	Unretted Stem Yield (lbs/a)	THC (%)
Amaze Auto	Dio	35,715.9	4.1	3.3	28-Jun	21.8	434.6	NA	0.053%*
Anon A	Dio	36,056.6	11.6*	1.0*	26-Jul	31.5	285.3	1041.6*	<0.05%
Anon B	Dio	28,367.2	10.3*	1.8	23-Jul	34.5	547.1*	990.5*	0.028%*
Bialobrzeskie	Mono	32,562.2	9.1*	4.0	22-Jul	48.0*	268.9	1167.9*	<0.05%
CFX-2	Dio	28,173.4	9.1*	0.5*	29-Jun*	24.8	758.9	NA	0.070%*
Earlina 8FC	Mono	39,788.8	13.4	3.8	11-Jul	30.8	643.1*	NA	<0.05%
Grandi	Dio	28,965.0	13.0*	0.2	28-Jun*	21.3	539.9*	NA	0.113%*
Henola	Mono	31,875.8	10.6*	2.0	9-Jul	31.3	519.2*	764.1*	0.010%*
NWG 2463	Dio	28,155.9	12.9*	1.0*	21-Jul	31.3	718.6*	640.8*	0.038%*
NWG 4000	Dio	27,879.0	10.5*	2.3	21-Jul	34.0	707.2*	855.6*	<0.05%
Orion 33	Mono	25,340.3	9.0*	3.8	24-Jul	50.5	410.9	1125.6*	0.045%*
T3H2006	<i>Dio</i>	35,326.5	22.6	NA	<i>16-Aug</i>	<i>40.5*</i>	<i>290.0</i>	1349.0	<i>0.010%*</i>
USO 31	Mono	26,999.5	9.4*	1.3*	11-Jul	42.0*	659.3*	541.0	<0.05%
Vega	Mono	22,874.0	7.0*	0.8*	8-Jul	33.5	665.0*	731.5*	0.093%*
Average	NA	30,577.2	10.9	1.9	15-Jul	34.0	532.0	920.8	0.033%

