

# 2022 HEMP GRAIN & FIBER VARIETY TRIAL

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## Introduction & Methods

Research at Purdue University was conducted to evaluate grain and fiber cultivars in 2022 at one location in West-Central Indiana. A total of 16 unique cultivars were included in the trial, with several cultivars included in both the fiber and grain trial. Hemp cultivars were sourced from the United States, Canada, Europe, and China, with selection of several cultivars based on similar day length and temperature to West Central Indiana.

Hemp plots were managed conventionally at the Purdue Agronomy Center for Research and Education (ACRE) in West Lafayette, Indiana (40.470470, -86.994805). A pre-plant application of 13 gallons per acre of ammonium phosphate (10-34-0), 7 gallons per acre of ATS (12-0-0-26), 24 gallons per acre of UAN (28-0-0), and 40 pounds per acre of Aspire (0-0-58) were made. The plots were drilled on June 9th, at 25 plants/ft<sup>2</sup> for grain cultivars and 50 plants/ft<sup>2</sup> for fiber cultivars. Seeding rate was adjusted for each cultivar based on germination and seed size. The trial was established as a randomized complete block design with four replications. Plots were 5 feet wide by 19 feet long, with 7.5-inch row spacing. Seeds were planted into a tilled, firm seedbed using a no-till drill (Great Plains, Salina, KS). The trial was planted on Toronto-Millbrook complex soil type. One application of Fusilade was made on June 28th, however minimal weed control was observed with the high temperatures and lack of rain. Inner rows were manually hoed to reduce weed pressure before canopy closure. Weather conditions after planting were not conducive for growth. To improve establishment, ½ inch of irrigation was applied 14 days after planting using sprinklers. Drought conditions persisted in June and July with 2.94 in total precipitation. Observations of stand establishment, flowering date, height, stem diameter, and yield were made (Table 1-4). Aggregate flower samples (unreplicated) were collected at harvest, dried, and analyzed for tetrahydrocannabinol (THC) using HPLC at Purdue University.

Fiber plots were harvested on September 1<sup>st</sup> and September 8<sup>th</sup>. One meter by one meter sub plots were cut by hand and weighed green.

## Purpose

Compare performance of grain and fiber hemp at one location in West Central Indiana.

## Trial Location

Agronomy Center for Research and Education (ACRE)

## Experimental Design

Randomized complete block design with four replications

## Trial Management

Planted June 9<sup>th</sup>

Plots measure 5' x 19' with 7.5" rows

13 gpa ammonium phosphate, 7 gpa ATS, 24 gpa UAN, 40 lb/ac Aspire fertilizer applied

Manual weed management

Fiber Harvest September 1st & September 8th

Grain harvest September 8th and October 7th

## Outcomes

Conditions were hot and dry in June and July

All cultivars were THC compliant.

Weed pressure was excessive in some plots.

'Futura 83' has the highest retted stalk yield at 3,318 lb/ac.

'Henola' had the highest grain yield at 975 lb/ac.

Two grab samples were taken, one sample was dried to get moisture content and the second was left in the field for 6 weeks to determine moisture content of field retted hemp. Stem diameter and height were taken on 10 stems per plot. Fiber dry matter yields are reported at 0% moisture content.

The earlier maturing grain plots were harvested on September 8<sup>th</sup> while later maturing grain plots were harvested on October 7<sup>th</sup>. Sub plots were cut by hand and hand threshed; stalk yield was collected. Grain was cleaned using a grain aspirator (Carter Day, Minneapolis, MN). Grain yields are reported at 9% moisture content.

Temperatures were above normal in June and July and near normal in August, September, and October. Precipitation was below normal in June, July, September, and October and above normal in August. Weed pressure was excessive in some plots. One plot of 'AV1', 'Bialobrzieskie', 'Henola', 'NWG 2730', 'NWG 4000', 'NWG 4113', and 'USO 31' were not harvested due to weed competition. Data were analyzed using ANOVA and Tukey's HSD test ( $\alpha = 0.05$ ) in JMP 16 (SAS Institute Inc., Cary, NC, USA) Cultivars were compared based on a single year. Table values with different letters are significantly different from each other.

## **Results & Discussion**

Significant differences were observed in fiber hemp stand, flower date, height, and ret stalk yield (Tables 1 & 2). The average retted yield was 2,481 lb/ac, reported at 0% moisture. 'Rajan' had the lowest yield, producing 1,356 lb/ac. 'Futura 83' had the highest yield, producing 3,318 lb/ac. All cultivars were THC compliant.

Significant differences were observed in grain hemp time to flower, height and dry stalk yield (Tables 3 & 4). The average grain yield was 705 lbs/ac, reported at 9% moisture. 'NWG 4000' had the lowest yield, producing 518 lb/ac. 'Henola' had the highest yield, producing 975 lb/ac. Stalks were not retted in the grain trial, which would lower the reported yield. Dry matter stalk yield is reported at 0% moisture. The average dry stalk yield was 800 lb/ac. 'T3H2006' had the highest yield, producing 1,275 lb/ac. 'USO 31' had the lowest yield, producing 378 lb/ac. All cultivars were THC compliant.

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**Table 1. Fiber Trait Evaluation**

Cultivar	Habit	Seeds/lb	Plant Date	Stand (1 ft <sup>2</sup> )	Flower Date	Stem Diameter (mm)	Height (in)
AV1	Dio	30,586.11	6/9/2022	29ab	8/9/2022b	3.78a	48ab
Bialobrzeskie	Mono	32,562.20	6/9/2022	29ab	7/20/2022c	3.50a	38abc
Fibror 79	Mono	23,723.43	6/9/2022	28ab	8/4/2022b	3.85a	50ab
Futura 83	Mono	24,386.70	6/9/2022	27ab	8/4/2022b	3.29a	51ab
Muka	Mono	30,648.10	6/9/2022	29ab	7/25/2022c	2.96a	42ab
Rajan	Mono	28,909.62	6/9/2022	20b	7/25/2022c	3.17a	46c
Santhica 70	Mono	28,173.40	6/9/2022	25ab	7/25/2022c	3.45a	40ab
USO 31	Mono	26,999.50	6/9/2022	22b	7/11/2022d	3.13a	34bc
Yuma	Dio	19,098.61	6/9/2022	34a	8/16/2022a	4.19a	55a
<b>Average</b>		<b>27,231.96</b>	<b>6/9/2022</b>	<b>27</b>	<b>7/29/2022</b>	<b>3.48</b>	<b>45</b>

**Table 2. Fiber Yields**

Variety	Harvest Date	Dry Matter Yield (lb/ac)	Retted DM Yield (lb/ac)	THC (%)
AV1	9/8/2022	5749.7a	2994.7 ab	0.04
Bialobrzeskie	9/1/2022	5866.5a	2158.3 ab	0.06
Fibror 79	9/1/2022	6002.7a	2812.6 ab	0.02
Futura 83	9/1/2022	5520.7a	3318.4 a	0.00
Muka	9/8/2022	4403.2a	1760.4 ab	0.00
Rajan	9/8/2022	3970.2a	1355.7 b	0.35
Santhica 70	9/1/2022	4167.9a	1578.3 ab	0.00
USO 31	9/1/2022	4199.7a	3176.8 ab	0.00
Yuma	9/1/2022	5333.1a	3176.8 a	0.27
<b>Average</b>	<b>9/3/2022</b>	<b>5023.7</b>	<b>2481.3</b>	<b>0.08</b>



Fig 1. One of the fiber plots in July. Weed pressure was low in plots with good establishment and canopy closure.



Fig 2. Bundles of hemp stalks immediately after cutting. Stalks were then spread out to ret.

**Table 3. Grain Trait Evaluation**

Variety	Habit	Seeds/lb	Plant Date	Stand (1 ft <sup>2</sup> )	Flower Date	Height (in)
<b>Bialobrzieskie</b>	Mono	32,562.20	6/9/2022	17a	7/23/2022bcd	35bc
<b>USO 31</b>	Mono	26,999.50	6/9/2022	17a	7/18/2022bcd	34bc
<b>NWG 2463</b>	Dio	28,155.90	6/9/2022	15a	7/27/2022bc	44a
<b>NWG 2730</b>	Dio	34,079.04	6/9/2022	19a	8/4/2022ab	43a
<b>NWG 4000</b>	Dio	27,879.00	6/9/2022	17a	7/30/2022ab	39ab
<b>NWG 4113</b>	Dio	27,913.35	6/9/2022	13a	8/1/2022ab	41ab
<b>Henola</b>	Mono	31,875.80	6/9/2022	12a	7/14/2022cd	25c
<b>Vega</b>	Mono	22,874.00	6/9/2022	20a	7/14/2022d	31bc
<b>T3H2006</b>	Dio	35,326.50	6/9/2022	18a	8/9/2022a	46a
<b>Average</b>		<b>29,740.59</b>	<b>6/9/2022</b>	<b>16</b>	<b>7/25/2022</b>	<b>38</b>

**Table 4. Grain Yields**

Variety	Harvest Date	Grain Yield (lb/ac)	DM Stalk Yield (lb/ac)	THC (%)
<b>Bialobrzieskie</b>	9/8/2022	706.1a	586.8bc	0.02
<b>USO 31</b>	9/8/2022	844.1a	377.7c	0.00
<b>NWG 2463</b>	10/7/2022	638.0a	849.8abc	0.00
<b>NWG 2730</b>	10/7/2022	521.7a	1025.2ab	0.03
<b>NWG 4000</b>	10/7/2022	518.0a	701.5abc	0.02
<b>NWG 4113</b>	10/7/2022	579.6a	782.4abc	0.00
<b>Henola</b>	9/8/2022	974.7a	NA	0.00
<b>Vega</b>	9/8/2022	719.2a	NA	0.00
<b>T3H2006</b>	10/7/2022	842.4a	1274.8a	0.30
<b>Average</b>	<b>9/24/2022</b>	<b>704.9</b>	<b>799.7</b>	<b>0.04</b>



Fig 3. One of the grain plots in July. Male plants are shedding pollen and easily distinguishable from the female plants.



Fig 4. One of the late maturing grain cultivars. Male plants have died and female plants are all that remain.