Industrial Hemp Variety Performance in North Dakota – 2018
NDSU Langdon Research Extension Center

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An industrial hemp variety trial (*Cannabis sativa* L.*,* THC level of 0.3% or less) was conducted at the NDSU Langdon Research Extension Center (REC) in 2018. The objective of the study was to screen varieties (Table 1) from various sources, monitor and record plant growth and development, determine grain and dry stalk yield, note pest incidence, and record agronomic traits. Variety trials were previously conducted in 2015, 2016 and 2017 at the REC. The 2015 trials were the first industrial hemp evaluations in North Dakota in over 70 years, and provided grain and fiber yield for Canadian and French varieties. The 2016 trial was lost due to herbicide drift, replanted and lost again to saturated soil conditions.

Table 1. Industrial hemp varieties and characteristics for the Langdon REC 2018 trial.

Variety	Country	Company†	Type	Purpose
CRS-1	Canada	HGI	Dioecious	Grain
CFX-1	Canada	HGI	Dioecious	Dual
CFX-2	Canada	HGI	Dioecious	Grain
Grandi	Canada	HGI	Dioecious	Grain
Katani	Canada	HGI	Dioecious	Grain
Picolo	Canada	HGI	Dioecious	Grain
Canda	Canada	PIHG	Monoecious	Dual
Delores	Canada	PIHG	Monoecious	Dual
Joey	Canada	PIHG	Monoecious	Dual
X-59	Canada	Terramax	Dioecious	Grain

†HGI (Hemp Genetics International)
PIHG (Parkland Industrial Hemp Growers)

- Dual purpose varieties are bred to be used for both grain and fiber production.
- Dioecious varieties have separate male and female plants.
- Monoecious varieties have separate male and female flowers on the same plant.
- Plant height is an important consideration in determining end use of the crop. Shorter varieties tend to have less fiber and are more suited to grain production.
- Dual purpose varieties are generally taller.

Materials and Methods

Seeding date was June 6 with plants emerging six to seven days later. The seeding rate was 12 pure live seeds/ft^2 and was adjusted for germination and 1000 kernel weight (kwt) with an additional 25 percent added to allow for seedling mortality. Planting depth was one-half inch. Plot size was 21 feet long x 4 feet wide and consisted of four 12 inch spaced rows. The experimental design was a randomized complete block with four replications. The previous crop was soybeans. The fiber dry stalk yield harvest date was August 8. Fiber harvest consisted of one linear 10 foot row cut from each plot. The plant samples were air-dried and leaves were removed prior to weighing to determine dry stalk yield. Grain harvest occurred on September 6. A small plot combine was used to harvest the plots. Samples were dried, then processed to determine yield, test weight and 1000 kwt. Plant samples of all varieties, which included leaves and flowering heads, were sent for laboratory analysis of THC. All samples tested less than the 0.3% THC limit for industrial hemp classification.

Results and Discussion

Pure live seed emergence (PLSE) among the varieties averaged 86% (Table 2) while 2017 PLSE averaged 73%. Both 2017 and 2018 PLSE values were approximately two to three times (or more) greater than the previous industrial hemp studies at the Langdon REC, in 2015 and 2016, where PLSE ranged from 3 to 61%. Rainfall, after planting which can result in soil crusting and reduced emergence, was much greater in 2015 and 2016. There were significant differences among industrial hemp varieties for seedling mortality that ranged from 5 to 26% in 2018. Seed/seedling mortality for traditional crops such as wheat, corn, and soybean commonly ranges from 10 to 15% under good/average conditions. The variety CFX-1 (26%) had the highest seedling mortality but final plant stands for all varieties were near or above the 12 plants/ft^2 target plant population. Fiber dry stalk yield was greatest for the dual-purpose varieties Canda, Delores, and Joey which also had the greatest plant height. Canda had significantly higher 1000 kwt compared to the other varieties. Average test weight of the varieties were low this year, averaging 36.6 lbs/bu, compared to the 2017 average of 41.5 lbs/bu. The standard test weight for hemp is 44 lbs/bu. Yields of industrial hemp varieties averaged 1031 lbs/a with a range of 802 to 1236 lbs/a. This was below the 1907 lbs/a average yield in 2017. CFX-1 had the highest 2 and 3-year average yield. Stored subsoil moisture was below average in April and May coming into the spring planting season. Rainfall for June and July was near normal but 1.32 inches below normal in August. There was no rainfall from July 24 to August 25. The lower than optimum test weight and yield can be associated with plant stress during the grain filling period.

Table 2. Grain and fiber yield and various agronomic traits of Canadian industrial hemp varieties.

Variety	Plant Stand (ft^2)	PLSE[1] (%)	Seedling Mortality (%)	Plant Height (inches)	Fiber Dry Stalk Yield (lb/a)	1000 KWT (g)	Test Weight (lb/bu)	Grain Yield (lb/a)	Grain Yield[2] 2-yr Avg. (lb/a)	Grain Yield[3] 3-yr Avg. (lb/a)
CRS-1	14.0	88	12	65	5873	15.4	35.6	1135	1513	1362
CFX-1	11.8	74	26	56	4379	15.4	37.4	1236	1644	1550
CFX-2	14.1	89	11	54	4482	15.3	38.1	1031	1490	1389
Grandi	13.4	84	16	50	3639	14.9	37.7	1157	1443	--
Katani	14.5	91	9	53	3395	14.6	39.0	1164	1492	--
Picolo	14.1	88	12	53	3603	14.1	38.5	1085	1386	--
Canda	13.4	84	16	68	6699	16.7	36.1	802	1404	1357
Delores	15.3	96	4	69	7199	15.4	33.6	817	1388	--
Joey	13.1	82	18	68	7048	16.0	36.1	905	1433	--
X-59	13.5	85	15	58	4943	15.0	33.6	979	1500	--
Mean	13.7	86	14	59	5126	15.3	36.6	1031		
C.V. %	9.3	9.3	55.9	4.5	8.1	5.0	3.0	10.6		
LSD 5%	1.9	11.6	11.6	3.9	606	1.1	1.6	158		
LSD 10%	1.5	9.6	9.6	3.2	503	0.9	1.3	131		

[1] Pure live seed emergence
[2] 2017 and 2018
[3] 2015, 2017, and 2018

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