

2024 SARE Trial Project Overview:

Determining Optimal Planting Density of Industrial Hemp in Cover Crop

Planting Date: June 1, 2024

Overview:

The industrial hemp variety, AST 530, was planted at three different planting densities on June 1, 2024. The variety was planted at 15, 25 and 50 pound per acre densities in 10' X 100' plots utilizing the methods and procedures outlined in this report. The trial was conducted on crop ground located in Shawnee County, Kansas.

The purpose of the trial was to determine the optimal planting density of the AST 530 industrial hemp variety utilizing the sustainable agricultural practices of cover cropping and no-till planting for the benefit of crop producers in the United States.

Methods/Procedures:

Soil Preparation

A red clover cover crop was frost seeded at a rate of 10lbs/acre in January of 2024. The established cover crop was then terminated 2 days before planting. Label rates of Sonalan were spray applied to the clover and incorporated into the soil by means of cultivation at ½ inch depth. Label rates of Glyphosate were spray applied to the soil surface immediately following the Sonalan incorporation.

Soil Tests: PH-7/ NPK readings-adequate

Planting

Fertilization: A granular mix of 200-50-60-14S pounds per acre of fertilizer with Urea as the nitrogen source was furrow applied at time of seeding.

Planter: A Great Plains no-till seed drill with disc opener and closing wheel was utilized to plant the trial plots on 7.5-inch row centers at ¼ to ½ inch depth. Rate settings were adjusted to the respective planting density per acre based on plot designation.

Production

Emergence Rate: 95% at 21 days after planting

Canopy: Early July

Pesticides: No pesticides were used in the trial

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Stand Height: There was no significant variance in the overall stand height of the trial plots when compared to the other populations. The combined mean of 20 of the trial plots was 7.5 feet in height.

Weed Pressure: Sonalan did not appear to have significant residual impact on weed pressure. Canopy was reached in adequate time to suppress nearly all the weed pressure. Morning glory made its way up some stalks, but did not impact plant vigor or yield.

General Observation: The AST 530 variety is a late flowering variety of industrial hemp. There were no significant signs of biotic or abiotic stress throughout the grow cycle. There was a significant dry period in late July to the middle of August which did not seem to impact the vegetative growth of the plants but may have impacted the flowering and seed development of the variety.

Harvest

Timing: Mid-October

The seed harvest was completed at a point at which the flower appeared fully developed, most of the calyxes were browning and a small amount of seed shatter at lower nodes was observed. The stalk harvest was completed 5 days after the seed harvest.

A significant factor in seed harvest timing was the avian pressure observed in the field. It is estimated that roughly 20-25% of seed yield was lost to the birds. A supersonic bird detouring device was placed near the field and was temporarily effective. It is highly recommended to utilize an avian spray deterrent when producing hemp for grain at scale.

Equipment:

Plot Combine- A Wintersteiger Nursery Master Elite plot combine with a 5 ft. draper reel header was utilized to combine the trial fields. A customization to the feeder opening was made to reduce seed loss at the junction. The threshing drum distance from concave was set at 10mm in the front and 20mm in the back. Drum speed was adjusted to $\frac{3}{4}$ speed and fan was set to high output. A standard grain sieve pan was used.

The final threshed seed had a good amount of flower matter in the bin. A more powerful fan reduces this significantly. A row crop combine with fan speed at $\frac{1}{4}$ output or less will remove material from the seed much better than our research combine.

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Seed lots were placed in research lot bins with airflow and dried to 10% moisture content. It is imperative to get seed in a dryer within hours of harvest to prevent overheating of the seed and spoilage.

Upon successful storage of the seed, the stalks were cut using a 6ft sickle mower. The five-day window post-seed harvest allowed the stalks to dry to 15% moisture content in the field. The stalk material was immediately windrowed, bailed, labeled and stored under cover. The average stalk diameter at harvest was .65 inches.

Post Harvest

A Metra 200CDC was utilized to clean the seed before bagging. This equipment utilizes a cyclone air system to remove stems, foreign matter, underdeveloped seeds and floral material from the final seed lot. Each trial plot's designated material was ran through the cleaner twice to ensure a clean final lot of seed. The airflow was set to 7.1mph and the gate opening set to 1.5. The air cleaner proved to be very effective at cleaning the seed.

Once cleaned, the seed was placed in designated double wall seed bags and weighed according to the trial plot from which it was harvested.

The stalk bales were weighed based on plot designations.

Harvest Results and Recommendation of Planting Density:

The table below contains these calculated harvest values along with estimated financial values based on current market conditions in 2024.

Density	Grain Yield(lb/Acre)	Fiber Yield(lb/Acre)	Grain Yield(\$/Acre)	Fiber Yield(\$/Acre)	Seed Cost/Acre	Estimated Transport/Acre	*Other Input/Acre	Gross Profit/Acre
15lb/acre	1037.60	3891.36	\$933.84	\$583.70	\$52.50	\$583.70	\$320.00	\$561.34
25lb/acre	1224.47	6635.64	\$1,102.02	\$995.35	\$87.50	\$995.35	\$320.00	\$694.52
50lb/acre	984.46	6374.28	\$886.01	\$956.14	\$175.00	\$956.14	\$320.00	\$391.01
Assumptions:								
Grain Value/Lb	\$0.90							
Fiber Value/Lb	\$0.15							
Seed Cost/Lb	\$3.50							
Transport Distance	50 miles							
*Other Inputs:								
Herbicide	Per Label							
Fertilizer	200-50-60-14S							
Cover Crop	10lbs/Acre							

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Based on the results of the 2024 density planting trial and procedures listed above, it was determined that a planting density of 25lbs per acre produces the highest grain and fiber yields when compared to the planting densities of 15lbs per acre and 50lbs per acre when utilizing the industrial hemp variety AST 530 as input seed.

The financial projections listed above are estimates based on market conditions in 2024 utilizing the production system documented in this trial that includes the sustainable agricultural practices of no-till farming and cover cropping. No harvested material was sold that was produced in this research study. The financial estimates listed above are for informational purposes only.