

Industrial Hemp Grain Yield Optimization Of Nitrogen Rates

Purpose:

Identify optimum nitrogen rates for yield and plant characteristics and to evaluate hemp variety performance characteristics.

Methods:

Valley Bio in cooperation with Stone Farms, OSCIA and OMAFRA conducted nitrogen rate and variety trials during the summers of 2011 and 2012.

Nitrogen Trials

For the nitrogen trials a parcel of land that was cropped with hemp in 2011 and hay previously was selected. The hemp residue was worked the previous fall after hemp grain harvest. The soil is very sandy with poorer fertility (see Table 3). Nitrogen was applied using 46-0-0 urea through a 10 foot Gandy (volumetric meter) to make 40 foot treatment strips. Treatments were arranged in a randomized pattern with 2 replicates from 0 to 200kg/ha in 50 kg increments for a total of 10 strips/plots. The ground was then worked to a depth of 3 inches using high speed Lemken tillage tool to prepare the seedbed and incorporate the urea. Seeding was done using a Great Plains 1510P grain drill in 7.5 inch rows at 30lbs/acre. Following the 9th of May the plots did not receive any further treatments for fertility, weed or pest control.

The harvest of the nitrogen treatments was occurred on the 24st September with a John Deere 8820 and a 30 ft. MacDon draper, harvesting the centers of the treatments for measurement in a weigh wagon. Representative grain samples were pulled to measure moisture, dockage and clean bushel weights.

Results:

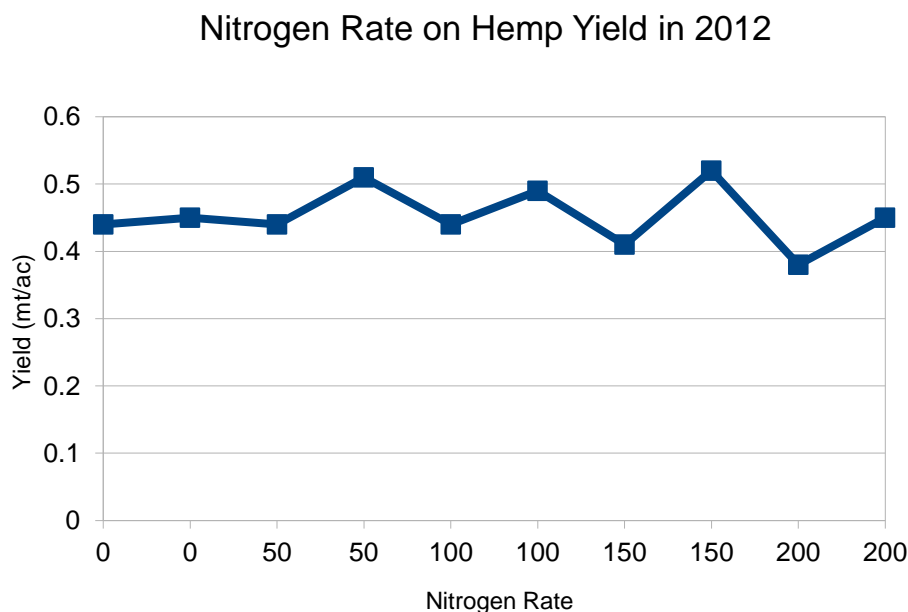
OMAFRA Emerging crop specialist, Scott Banks, collected data and tabulated results for the nitrogen trials. See Table 1 and Figure 1 below. The collected data shows no response across all plots. Historically the recommended rate for nitrogen in hemp has been 60-80 lbs./acre. Results from the 2011 trial indicated the potential for higher yield returns with increase nitrogen use. In the 2012 crop year a severe drought was experienced in the Renfrew County region. This plot was also located on very sandy and drought prone soil that was excessively dry through the entire growing season. It is believed that the dry weather played a significant role in the trial result in 2012. Table 2 below shows rainfall data for the closest available station.

Table 1: Hemp Grain Yield Response to Nitrogen Rates 2012

Treatment	Nitrogen Rate (lbs./ac)	Moisture (%)	Test Wt. (lbs./bu)	Yield @14.5% (mt/ac)	Yield @14.5% (bu/ac)	Avg. Yield @14.5% (bu/ac)
1	0	18.70%	35.8	0.44	22	
6	0	18.40%	36.9	0.45	22.7	22.4
2	50	18.50%	33.6	0.44	22	
8	50	18.20%	38.5	0.51	25.5	23.7
3	100	19.70%	35.9	0.44	22	
10	100	18.60%	35.1	0.49	24.8	23.4
4	150	19.80%	36.2	0.41	20.6	
7	150	19.20%	36.3	0.52	26.1	23.4
5	200	19.00%	36.4	0.38	19.3	
9	200	20.80%	35.3	0.45	22.7	21

Site details: Renfrew Cty, Variety Anka, Seeded at 28 lbs./ac, Planted 09-may-12, Harvested 24-sep-12, burndown glyphosate 04-may-12, Tillage Conventional, Previous Crop Hemp.

Figure 1: Hemp Grain Yield Response to Nitrogen Rates 2012



Summary:

The results collected do not follow past experience with nitrogen application in hemp, which have showed a very strong response. Given the drought symptoms observed in the crop, wilting, plant mortality, stunting, early maturity, and accompanying rainfall data, the limiting factor for yield in this year was very likely water availability. For better reliability in results further trials and data need to be collected. It would be recommended that this trial be replicated in future years.

Table 2: Nearest Available Rainfall Thom Reid – Renfrew SCIA:

2012 Rainfall - Renfrew County						
Co-Operator	May	June	July	August	Sept	Total
Tom Reid, Renfrew	45	44	22	98	104	313
2012 Average	41	51	25	72	89	278
1990 - 2011 Average	68	82	90	79	79	397
2011 Average	98	97	69	64	45	373

Table 3: 6 inch soil analysis from the N rates on Hemp plot:

Description	Hemp 6" May 7- 2012		
pH	6.09	Zinc	1.1
Buffer pH	6.59	Zinc Index	22.67
Organic Matter	2.7	Manganese	13.15
Phosphorus (ppm)	12.17	Manganese Index	24.46
Potassium (ppm)	67.97	Copper	0.72
Calcium (ppm)	876.5	Iron	30.08
Magnesium (ppm)	83.85	CEC (MEQ/100g)	6.71
Boron	0.3		

Next Steps:

Hemp production is increasing across Canada and is forecast by the Canadian Hemp Trade Alliance to reach 100,000 acres for grain production by 2014. Ontario has significant potential to participate in this new crop that fits well with current Ontario crop rotations. Hemp should be considered for further funding in Ontario to help gain a better understanding of hemp agronomics and growth potential for the province.

To further validate and confirm this trial, the protocol should be repeated in 2013 at a suitable location, possibly in combination with starter or foliar applications of N-P-K combinations.

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Location of Project Final Report:

This report will be available as part of the 2012 Crop Advances Reports and available on the Ontario Soil & Crop Improvement Association website.