HEMP PROGRAM

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YOUR ANALYTICAL EXPERTS

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HEMP PROGRAM

HEMP FERTILIZER RECOMMENDATIONS

INTRODUCTION

- Hemp growers know that to produce a healthy high yielding and profitable crop, a sound fertility plan is important
- Planning and agronomic information is critical to dialog the optimal fertility plan
- A&L has been providing agronomic research-based nutrition recommendations for 35 years. Please refer to A&L's CropTech Hemp Fertility Program for more information.
- These A&L Hemp recommendations can be used to guide agronomic decision. Please contact us to review your specific data so a customized plan can be developed
- Additional information from soil testing can be a foundational bases, as well as crop yield objectives, agronomic practices, growing zone, weather data and hemp genetics

CROPTECH HEMP PROGRAM

A&L Canada Laboratories Inc. provides a wide variety of microbiological and analytical tests for HEMP under the Cannabis Act and Hemp regulations Canada

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NITROGEN

*Nitrogen application of hemp will vary depending on:

- the age of the crop
- the hemp variety
- previous history, and
- the soil type

Table One

NITROGEN	PHOSPHORUS					POTASSIUM					
*	VL	L	M	G	H	VL	L	M	G	H	
120-180	150	115	90	70	50	275	240	200	150	100	Total
20 - 50	40	40	30	30	30	30	30	30	20	20	Starter mix 2x2

All starters should contain zinc at one pound for every 10 pounds of P in starter.
Total of 35 Lbs Sulfur - 1/3 in planter and 2/3 broadcast

- Hemp requires 34 pounds/ton of production and depending on the use nitrogen applications will vary
- Total N here is 120-180 depending on the end use of this crop and expected yield levels
- Use tissue analysis is season and maintain sufficient nutrient levels throughout the season
- Fibre yield and seed yield tend to increase with the dose of nitrogen and excess nitrogen in the soil promotes seed production -- the total fibre content appears to be relatively unaffected by nitrogen levels
- Early nitrogen application at planting increases hemp yield compared to split application of 50% at planting and 50% at the 50 cm stage
- Split application of N with later application increases seed yield. A tissue program to monitor levels is advised to keep levels in the productive range
- After tissue results confirm levels if you need to apply more you can foliar feed urea-based Nitrogen's to bring up the N level in the tissue or side dress more N as Ca nitrate
- If you have Light sand soils, with C.E.C. less than 12 OR low organic soils, an additional 25lbs. of N per acre in addition to side dress application will be required
- Monitor crop with a tissue program as yields, particularly CBD yield, can be very sensitive to N deficiency -- this crop can run out of N fast
- Spoon-feeding the crop throughout the season is the best method of N application where possible
- ***CAUTION*** over feeding with nitrogen will increase disease pressure excessive N will also reduce yield

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NITROGEN RECOMMENDATIONS FOR CBD PRODUCTION

- Growing Hemp for CBD is different in that you are growing a crop focused on the nutraceutical components of the crop and nutrition is a big influencer on the plant's ability to produce these compounds.
- Unlike seed and fibre production that require large amounts of N, the production of these compounds can be diluted by too much vegetative growth and total concentration will be reduced.
- However, too little N is just as big an issue therefore this becomes a real balancing act in plant nutrition.
- The concentration of these compounds is a function of the plants ability to produce certain alkaloids that is influenced by Phosphorus, Potassium, Calcium, Sulfur, Boron primarily -- however all the nutrients in balance play a role
- The fact that an aggressive nitrogen program can cause a dilution effect requires nutrient monitoring and spoon-feeding N to this crop to maintain sufficiency but not excess

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PHOSPHORUS

- Although it is generally understood that Hemp is easy to grow in most soil conditions, it is better to grow in fertile soils to get the optimal yields and quality
- P levels of greater than 30 ppm are usually thought to be enough but, in most cases, aim for a good too high %P level for the best production
- Flower initiation is largely dependent of P levels in the plant
- A foliar program that consists of P and Mg just before flowering will increase the amount of flower and seed set which will increase the CBD content

Table Two

	% PHOSPHORUS Soil Optimum Level Based on C.E.C.			
	<9	10-13	14-17	>18
Very Low	0 - 4	0 - 3	0 - 2	0 - 1
Low	5 - 9	4 - 6	3 - 4	2 - 3
Medium	9 - 12	7 - 9	5 - 6	4 - 5
Good	12 - 15	10 - 12	7 - 9	6 - 7
High	18+	13+	10+	8+

POTASSIUM

- The need for Potash in the Hemp crop is high and early K levels are important for optimum yield and quality
- Maintain tissue levels in early season to reduce the amount of disease pressure on the crop and establish yield potential
- A Hemp crop will remove 17.6 kg of K_2O per ton of yield -- Maintain and build levels of K in soils to optimum %K for soil type (see TABLE TWO - Soil Optimum Level Based on C.E.C.)
- K is important for yield and quality of CBD in Hemp
  - When the %K is low in a field or in a dry season additional application of K in season will be necessary to meet yield and quality demands
  - Maintain good Mg levels in order to improve quality and yield
  - K:Mg on soil report should be between .2-.35
  - Apply Mg with K in side-dress treatment if required
- All forms of K can be used however use with caution to reduce the salt effect on the root system
- Small more frequent applications of K are more effective than single large applications -- In heavy soils that are low in K or during a season of drought frequent applications of K will increase the availability to the growing crop
- Foliar K throughout the season helps the plant get carbohydrates to the root -- In seasons of limited sunlight K levels will be difficult to maintain in the plant

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MAGNESIUM

- Magnesium is required by the plant to enhance the uptake of P
  - With poor Mg levels disease will sometimes become a problem as the plant has difficulty using the P
  - If Mg levels are less than 125 ppm regardless of the rating an application of 50 lbs/per acre per season should be used
  - Soil levels need to be greater than 10% saturation but never exceed 20%
- Magnesium is a constituent of chlorophyll and also plays a major role in P utilization by the plant which will impact the flowering and seed production -- A magnesium deficiency will result in colour loss in the leaves and the appearance of necrotic lesions with will increase the susceptibility of disease.
- Since Hemp is a large user of calcium and potassium and for top production we need to apply large amounts of these nutrients it is important to pay attention to the Mg as we could induce Mg deficiency with these applications.

BORON

- Application of boron is important to maintain quality and yield of CBD
  - Apply 1-1.5lbs per acre of boron prior to planting the crop
  - Foliar apply boron in season based on tissue levels. (i.e. PPI spray of Sol U Bor.) however never apply more than ¼ pound of actual boron per application
  - If more is needed it is better to apply more frequent applications

ZINC

- Zinc is required by the plant for chlorophyll production and leaf area production
- Zinc forms tryptophan and then IAA which is a growth regulator responsible for all meristematic growth and cell differentiation (formation of cells leaf size and flower size and quality)

CALCIUM

- Calcium requirements for Hemp is high, a Hemp crop will remove large amounts of Ca from the soil, approximately 13 pounds kg/ton
- The soil pH must be in the range of 6.2 – 6.8 to ensure good uptake of nutrients and adequate root growth -- Research has shown that soil pH has a marked effect on root development and before we plant a crop we must fist of all make sure the pH is adequate
- In addition to lime application and raising the pH to 6.5, it is recommend increasing the %Ca in the soil to about 70% -- This cannot be done with lime or the pH will be too high and possibly create nutrient availability problems, therefore it is recommended applications of Ca in the form of Ca sulphate or gypsum

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MANGANESE

- In poor Manganese soils, an application of Mn at planting time is required
  - Mn levels should be greater than 30 ppm but in Hemp Mn levels between 40 and 60 ppm are best, if levels are lower than this apply 15 pounds per acre of Mn two year in a row broadcast to build levels -- wait a year and retest soils to evaluate soil Mn levels
  - An additional 15 pounds may be required per acre to bring levels up above 30 ppm
  - While building levels of soils a foliar program will be required to maintain sufficient levels in the crop until soils levels are adequate and able to supply Mn to the crop
  - If using a planter mix 2x2, 3 – 5 pounds per acre in the row will supply adequate Mn -- This is a more economical approach to supplying Mn but the broadcast treatment is a better long term corrective

Table Three

APPROXIMATE POUNDS OF NUTRIENTS REMOVED BY HEMP (POUNDS/TON)

	N	P_2O_5	K_2O	S
Total	180	42.2	190	2.3
Grain	6.7	3.2	1.7	0.51
Uptake/Day in pounds	6.1	1.4	6.44	

**taken from Canadian Hemp Trade Alliance and based on 5.35 tons per acre yield*

Table Four

AVERAGE TISSUE VALUES

Nutrient	Mid-season
N	2.4
P	.42
K	1.77
Ca	.81
Mg	.59
S	.45

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Table Five

SOIL OPTIMUM LEVELS BASED ON C.E.C

		0-6	7-15	16-25	25+
P	POOR	0 - 25	0 - 23	0 - 18	0 - 13
	MEDIUM	26 - 55	24 - 43	19 - 33	14 - 23
	GOOD	56 - 93	44 - 83	34 - 55	24 - 43
	HIGH	94+	84+	56+	44+
K	POOR	0 - 45	0 - 60	0 - 80	0 - 100
	MEDIUM	46 - 90	81 - 160	101 - 200	101 - 200
	GOOD	91 - 180	161 - 320	201 - 400	201 - 400
	HIGH	181+	321+	401+	401+
Ca	POOR	0 - 200	0 - 400	0 - 600	0 - 1000
	MEDIUM	201 - 400	401 - 800	601 - 1200	1001 - 2000
	GOOD	401 - 800	801 - 1600	1201 - 2400	2001 - 6000
	HIGH	801+	1601+	2401+	6001+
Mg	POOR	0 - 25	0 - 50	0 - 75	0 - 100
	MEDIUM	26 - 50	50 - 100	76 - 150	101 - 200
	GOOD	51 - 100	101 - 200	151 - 300	201 - 600
	HIGH	101+	201+	301+	601+

Table Six

% SATURATION OF CATIONS				
% K Saturation	4 - 6	3 - 5	2 - 4	2 - 3
% Mg Saturation	10 - 20	8 - 20	5 - 20	5 - 20
% Ca Saturation	60 - 80	60 - 80	60 - 80	60 - 80

Note – ranges based on A&L research based on Fisher et al research

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HEMP PRODUCTION USEFUL TIPS

- Hemp is a strong bio-accumulator therefore elements picked up by the plant could be detected in final CBD production. Health Canada has very strict requirements on both pesticide residue and heavy metals in finished product and has zero tolerance.
- Testing soils for Health Canada Regulated Heavy Metals and Pesticide Residues is essential to ensure you are off to a good start
- Nutrition is key to the profitability of any crop, and hemp is no exception
- Very important to soil test fields regularly prior to planting hemp so that accurate nutrition plans can be made

A&L Canada Laboratories provides a full suite of Hemp testing services from initial soil testing through to final CBD potency

Contact A&L Canada for more information:

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