University of Idaho
College of Agricultural and Life Sciences

CIS 1012

Northern Idaho Fertilizer Guide

Spring Canola

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Nitrogen (N), phosphorus (P), sulfur (S), and boron (B) are the nutrients most likely to limit spring canola production in northern Idaho.

The fertilization guidelines contained in this publication are preliminary. The nitrogen (N) recommendations are based on four years of field trials in northern Idaho and on Canadian research. The P, K, S, and B rates are based on research in winter rapeseed in northern Idaho.

The suggested fertilizer rates will be accurate for your field if (1) your soil samples are properly taken and represent the area to be fertilized and (2) the crop history you supply is complete and accurate. The recommendations also assume the use of good management practices. For soil sampling instructions, refer to University of Idaho Bulletin 704, *Soil Sampling*. Sample the soil within 1 month of planting.

You can achieve optimal production and maximum returns from spring canola by managing the crop properly. Low yields are most often caused by delayed seeding, nonadapted varieties, poor stands, inadequate fertilization, or poor control of insects, weeds, or both.

Nitrogen

Total nitrogen need based on potential yield—Estimate the total N requirement based on the yield you expect given the growing conditions and your management practices (Table 1).

Once you know the *total* amount of N needed to produce a spring canola crop, use the following equation to determine the amount of fertilizer N to apply to meet this need.

Table 1. Estimated total N needed by a spring canola crop based on potential yield.

Potential yield	Total N needed
(lb/acre)	(lb/acre)
1,000	105
1,500	140
2,000	175
2,500	210
3,000	230

$$\text{Fertilizer } N \text{ needed} = \left(\underset{\text{(Table 1)}}{N \text{ needed based on potential yield}} + \underset{\text{(Table 2)}}{N \text{ needed for residue breakdown}} \right) - \left(\underset{\text{(Tables 3 \& 4)}}{\text{Mineralizable } N} + \underset{\text{(Table 5)}}{\text{Soil test } N} \right)$$

Nitrogen needed for residue breakdown—Nitrogen is needed to break down straw from the previous cereal crop. Apply 15 pounds N for each ton of straw incorporated into the soil up to 50 pounds N per acre (Table 2). Remember, 1 ton of residue is produced for each 20 bushels of wheat or 1,400 pounds of barley grain produced.

Table 2. Nitrogen needed for cereal straw (residue) breakdown.

Residue	N to add
(tons)	(lb/acre)
0	0
0.5	7.5
1	15
2	30
3	45
4	50
More than 4	50

Note: One ton of residue is produced for each 20 bu of wheat or 1,400 lb of barley grain produced.

Nitrogen credit from previous legume crop—If the previous crop was a legume (peas, chickpeas, alfalfa, clover, birdsfoot trefoil, or lentils), the residue constitutes a small nitrogen credit. This credit is much smaller for a spring-seeded crop such as spring canola because at least 60 percent of the legume residue has already broken down and the resulting plant-available N will be accounted for in a soil test. The N credit value for the previous legume can be obtained in Table 3. This value should be subtracted from the total N needed to produce the spring canola crop.

Table 3. Nitrogen credit for legume straw (residue) breakdown.

Residue	N credit
(tons)	(lb/acre)
0	0
0.5	3
1	6
1.5	9
2	12
3	18
4	24

Note: One ton of legume residue is produced from 1,000 pounds of lentil or pea grain produced.

Table 4. Mineralizable N release rates for northern Idaho soils.

Organic matter content	N released during growing season
(%)	(lb/acre)
Less than 2	25
2 to 3	45
3 to 4	60
More than 4	75

Mineralizable nitrogen—Northern Idaho soils release mineralizable N (N contained in organic matter) in proportion to their organic matter contents (Table 4). Low levels of mineralizable N are released from soils on severely eroded clay knobs and hilltops, soils in cutover timberlands, soils in areas of low precipitation, soils with low water-holding capacities, and soils with low organic matter contents.

Soil test nitrogen—You can evaluate the amount of inorganic N in the soil most effectively with a soil test. Take soil samples from the crop's entire rooting depth because nitrate-nitrogen (NO_3-N) is mobile in soil. Spring canola is capable of efficiently removing N to a depth of 3 feet or more unless its roots are blocked by a restricting layer.

Soil test values include both NO_3-N and ammonium-nitrogen (NH_4-N) in the first foot of the soil profile. NO_3-N should be sampled in 1-foot increments to the crop's effective rooting depth. To convert soil test NO_3-N and NH_4-N values in parts per million (ppm) to pounds N per acre, add the N values in ppm for each foot increment of sampling depth and multiply by 3.5 (Table 5).

Table 5. Calculation to convert N soil test results in parts per million to pounds per acre.

Depth	Soil test results			Factor		Total N[2]
	NO_3-N	NH_4-N[1]	Total N			
(inches)	(ppm)	(ppm)	(ppm)			(lb/acre)
0 to 12	5	1	6	x 3.5	=	21
12 to 24	2	—	2	x 3.5	=	7
24 to 36	4	—	4	x 3.5	=	14
Total	11	1	12	x 3.5	=	42

[1] Ammonium (NH_4-N) content is usually low and is often not included in soil test analyses.
[2] ppm x 3.5 = lb/acre.

Example—With a potential yield of 2,000 pounds per acre, 2 tons of straw residue, no legume residue, 2.0 percent soil organic matter, and soil levels of inorganic N from soil test values in Table 5, the calculation for fertilizer N needed is:

Total N needed (lb/acre) (Table 1 + Table 2)	(175 + 30)		205
Minus mineralizable N (lb/acre) (Table 3 + Table 4)	(0 + 45)	–	45
Minus soil test N (lb/acre) (Table 5)		–	42
Equals N fertilizer needed (lb/acre)		=	118

Phosphorus

Phosphorus deficiencies in spring canola are difficult to diagnose visually. Usually the plants remain dark green, but their growth is stunted.

Spring canola has a moderate requirement for P (Table 6). Because P is not mobile in soils, it must be banded or incorporated into the soil. Commonly, P is broadcast-incorporated or drill-banded.

Table 6. Phosphorus fertilizer rates for spring canola based on a soil test.

Soil test P (0 to 12 inches)[1]			Application rate[2]	
NaOAc	Bray I	$NaHCO_3$	P_2O_5	P
(ppm)	(ppm)	(ppm)	(lb/acre)	(lb/acre)
0 to 2	0 to 20	0 to 8	60	26
2 to 3	20 to 30	8 to 10	40	18
3 to 4	30 to 40	10 to 12	20	9
over 4	over 40	over 12	0[3]	0

[1] Soil test P can be determined by three different procedures: sodium acetate (NaOAc), Bray I method, or sodium bicarbonate ($NaHCO_3$). Sodium bicarbonate should not be used on soils with pH values less than 6.2. Use the column indicated by your soil test report.
[2] P_2O_5 x 0.44 = P, or P x 2.29 = P_2O_5.
[3] Under reduced tillage, apply up to 20 lb P_2O_5 per acre on soils testing in excess of 4 ppm P (NaOAc soil test).

Potassium

Potassium (K) levels in northern Idaho soils are normally sufficient for spring canola production. Apply K when soils test low (Table 7).

Table 7. Potassium fertilizer rates based on a soil test.

Soil test K (0 to 12 inches)[1]	Application rate[2]	
	K_2O	K
(ppm)	(lb/acre)	(lb/acre)
0 to 50	80	66
50 to 75	60	50
more than 75	0	0

[1] Sodium acetate extractable K.
[2] K_2O x 0.83 = K, or K x 1.20 = K_2O.

Potassium fertilizer can be surface broadcast-incorporated or drill-banded with the seed, below the seed, or to the side of the seed. When applied with the seed, total

N and K (as K_2O) should not exceed 20 pounds of nutrient per acre. Use whichever application method is most convenient.

Sulfur

Without adequate S, canola will appear light green to yellow and production will be less than maximum. Canola plants require S for efficient use of N. Because S is mobile in soils, it is prone to leaching during the early spring. Consequently, soil testing for S is important. Apply 20 to 25 pounds of S per acre to soils containing less than 10 ppm SO_4-S. Sulfur can be surface-applied and will move into the soil with precipitation. Elemental S is not recommended because it becomes available to plants too slowly. Sulfur needs of spring canola based on a soil test are shown in Table 8.

Table 8. Sulfur fertilizer needs of spring canola based on a soil test.

Soil test S (1 to 12 inches)		S application rate
(ppm SO_4-S)	(ppm S)	(lb/acre)
0 to 10	0 to 4	25
over 10	over 4	0

Lime

Spring canola yield responses to lime additions (which increase soil pH) have not been documented in northern Idaho. However, soil pH values in northern Idaho have declined dramatically over the past 40 years. This steep decline has led to a reduction in yields of several crops.

Try experimental lime applications if soil pH is less than 5.3 to determine whether canola gives an economical response. Apply needed lime at a rate of 1 to 2 tons per acre and mix it thoroughly into the soil. For additional information see CIS 811, *The Relationship of Soil pH and Crop Yields in Northern Idaho*.

Micronutrients

Boron—Spring canola requires high levels of boron (B). On deficient soils—soils testing at less than 0.5 ppm B—apply 1 to 1.5 pounds of B in a uniform broadcast application. *Never band B*.

Boron can be toxic to canola if overapplied. Apply B only when soils are deficient. For information on B and availability of specific fertilizer materials, see CIS 1085, *Essential Plant Micronutrients: Boron in Idaho*.

Zinc—Zinc (Zn) deficiencies are rare, occurring only in severely eroded soils. If soils are severely eroded and a soil test for Zn shows less than 0.6 ppm of Zn, consult CIS 1088, *Essential Plant Micronutrients: Zinc in Idaho*, for recommendations. Canola growers in the Kootenai River Valley of Boundary County should soil test for Zn and watch for Zn plant deficiency symptoms.

Other micronutrients—Spring canola should not respond to applications of chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), or molybdenum (Mo). However, growers in the Kootenai River Valley of Boundary County should watch for manganese deficiencies.

Extensive field experiments on micronutrients have not been conducted. Still, micronutrient applications often are more likely to create toxicity problems than to correct deficiencies. Avoid applications of these materials in northern Idaho unless they are indicated by soil or tissue tests.

Agronomy/Water quality considerations

- Weeds, insects, diseases, and environmental stress can influence the effectiveness of a fertilizer program and reduce yields.
- Early planting of spring canola has been shown to result in the highest yields.
- Poor N management can result in excessive nitrate leaching and groundwater pollution under certain conditions. Poor management practices can cause excessive erosion and contamination of surface waters with P.
- The ammoniacal forms of N (ammonium and ammonia) do not leach as readily as nitrate. When temperature and moisture are favorable for plant growth, however, ammoniacal N and urea are quickly converted to the nitrate form at temperatures above 50ºF. Thus, N applied in the spring, regardless of its form, is subject to leaching in areas of heavy precipitation.
- Starter, or pop-up, fertilizers have had limited success. Starter fertilizers have been most effective when soils were cold and root growth could be stimulated by a readily available supply of both P and N.
- Avoid banding high amounts of fertilizer close to the seed. High amounts of N and K can result in salt damage during germination.
- Banding fertilizer improves N and P use efficiencies. Consequently, if applying N, P, or both in a band, cut the recommended fertilizer application rates by 10 to 15 percent.
- Phosphorus can either be banded below the seed or applied before planting and incorporated. Banding below the seed appears to be the most efficient method.
- Potassium can be surface broadcast, broadcast incorporated, or banded below the seed. Banding below the seed appears to be the most efficient method.
- Sulfur can either be incorporated or surface applied.
- Lower soil disturbance in reduced tillage systems results in lower soil temperature, which in turn reduces

organic matter mineralization rates. Consequently, N fertilization rates are often slightly higher in reduced tillage systems.

Further reading

BUL 704, *Soil Sampling*, $2.00
CIS 1085, *Essential Plant Micronutrients: Boron in Idaho*, $3.00
CIS 1088, *Essential Plant Micronutrients: Zinc in Idaho*, $3.00

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CIS 453, *Winter Wheat*
CIS 785, *Winter Rapeseed*
CIS 788, *Bluegrass Seed*
CIS 815, *Blueberries, Raspberries, and Strawberries*
CIS 820, *Grass Seedings for Conservation Programs*
CIS 826, *Chickpeas*
CIS 851, *Legume and Legume-Grass Pastures*
CIS 853, *Grass Pastures*
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CIS 1012, *Spring Canola*
CIS 1083, *Lentils*
CIS 1084, *Spring Peas*
CIS 1101, *Soft White Spring Wheat*

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