University of Idaho Extension

CIS 785

Northern Idaho Fertilizer Guide

Winter Rapeseed

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THESE FERTILIZER GUIDELINES were developed from research at the University of Idaho. They assume the use of good management practices. The suggested fertilizer rates are designed to produce above-average yields unless other factors are limiting production.

The suggested fertilizer rates will be accurate for your field provided (1) soil samples are properly taken and represent the area to be fertilized, and (2) the crop history you supply is complete and accurate. For soil sampling instructions, refer to University of Idaho Extension bulletin 704, *Soil Sampling*. Soil sampling should be done within 1 month of planting.

Optimal production and returns from rapeseed are achieved when the crop is managed properly. Low yields are most often caused by poor stands, inadequate fertilization, and poor control of cabbage seedpod weevil. Managing summer fallow for effective water conservation and erosion, avoiding soil compaction, and not planting in fields that become waterlogged during winter and early spring are essential for economic returns from proper fertilization.

Nitrogen

Total nitrogen need based on potential yield—The total nitrogen (N) requirement can be estimated from the field's potential yield based on historic crop records (Table 1). Annual precipitation may modify the total N needed because of N leaching through soils in the higher precipitation areas of northern Idaho. This precipitation variable is accounted for in Table 1.

Table 1. Estimated total N needed by a winter rapeseed crop based on potential yield and annual precipitation.

	Estimated total N need		
Potential yield	< 20 inches	20 to 23 inches	> 23 inches
(lb/acre)	(lb/acre)	(lb/acre)	(lb/acre)
1,500	155	165	180
2,000	185	200	230
2,500	220	245	270
3,000	255	290	310
3,500	285	320	345
4,000	305	350	385

Once the *total* amount of N needed to produce a winter rapeseed crop is known, the following equation can be used to determine the amount of *fertilizer* N to be applied to meet this need:

$$\text{Fertilizer } N \text{ needed} = \underset{\text{(Table 1)}}{\text{Total } N \text{ need based on potential yield}} - \left(\underset{\text{(Table 2)}}{\text{Mineralizable } N} + \underset{\text{(Table 3)}}{\text{Soil test } N} \right)$$

Mineralizable nitrogen—Soils vary in their capacities to release N from organic matter during the growing season. The rate or amount of N released depends on factors such as the amount of soil organic matter, soil erosion, available soil moisture, tillage practice, and soil temperature during the growing season.

Estimated mineralization values for N release are shown in Table 2. Soils that are farmed using reduced tillage systems are disturbed less than conventionally tilled soils and are often colder in spring. Consequently, N mineralization rates are slightly lower under reduced tillage, and N fertilization rates are often slightly higher.

Table 2. Mineralizable nitrogen release rates for northern Idaho soils.

Organic matter content	Tillage: Conventional	Tillage: Reduced
(%)	-------(lb N/acre/year)-------	
< 1.0	20	17
1.0	20	17
1.1	22	19
1.2	24	20
1.3	26	22
1.4	28	24
1.5	30	26
1.6	32	27
1.7	34	29
1.8	36	31
1.9	38	32
2.0	40	34
2.1	42	36
2.2	44	37
2.3	46	39
2.4	48	41
2.5	50	43
2.6	52	44
2.7	54	46
2.8	56	48
2.9	58	49
3.0 +	60	51

Soil test nitrogen—The amount of inorganic N in the soil can be evaluated most effectively with a soil test. Take samples from the crop's entire rooting depth because nitrate-nitrogen (NO_3-N) is mobile in soil. Winter rapeseed can efficiently remove 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 to pounds per acre, add the N values (ppm) for each foot of sampling depth and multiply by 3.5 (Table 3).

Table 3. Calculation to convert N soil test results in parts per million to pounds per acre.

Depth	Soil test results: NO_3-N	Soil test results: NH_4-N[1]	Soil test results: Total	Factor		Total N[2]
(inches)	(ppm)	(ppm)	(ppm)			(lb/acre)
0 to 12	5	1	6	x 3.5	=	21
12 to 24	6	—	6	x 3.5	=	21
24 to 36	8	—	8	x 3.5	=	28
Total	19	1	20	x 3.5	=	70

[1] Soil test NH_4-N results are from the first foot only
[2] ppm x 3.5 = lb/acre

Fertilizer nitrogen—The calculation for N fertilizer needed is:

Total N needed (Table 1)		______
Minus mineralizable N (Table 2)	-	______
Minus soil test N (lb/acre) (Table 3)	-	______
Equals N fertilizer required (lb/acre)	=	______

Example: With a potential yield of 2,500 pounds per acre, annual precipitation of 22 inches, 2.5 percent organic matter (conventional tillage), and soil levels of inorganic N from soil test values in Table 3, the calculation for fertilizer N needed is:

Total N needed (Table 1)		245
Minus mineralizable N (Table 2)	-	50
Minus soil test N (Table 3)	-	70
Equals fertilizer N required		125

The calculation assumes winter rapeseed is planted into fallow ground. If stubble from a previous crop is left standing through the winter and summer and incorporated into the soil before planting, extra N will be needed for cereal residue breakdown. Add 15 pounds available N for each ton of straw or nonlegume residue up to 50 pounds N per acre. See Table 4 for the specific amount of N to be applied.

Table 4. Nitrogen needed for cereal straw (residue) breakdown.

Residue	N need
(tons/acre)	(lb/acre)
0	0
0.5	7.5
1	15
1.5	22.5
2	30
2.5	37.5
3	45
3.5 or more	50

Note: One ton of residue is produced for each 20 bushels of wheat or 1,400 pounds of barley grain grown per acre.
Note: If stubble is left standing and not incorporated use 50% of the N rate suggested in the above table.

Phosphorus

Winter rapeseed has a moderate requirement for phosphorus (P) (Table 5). Phosphorus deficiencies in rapeseed are difficult to diagnose visually. Usually the plants remain dark green, but growth is stunted. Because phosphorus is not mobile in soils, it must be banded or incorporated into the soil for efficient utilization by rapeseed. Commonly, P is broadcast incorporated or drill banded.

Table 5. Phosphorus fertilizer rates for winter rapeseed 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	more than 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).

Table 6. Potassium fertilizer rates based on a soil test.

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

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

Potassium

Potassium (K) levels are normally sufficient for rapeseed production, but K should be applied when soils test low (Table 6). Fertilizer can be effectively broadcast incorporated or drill banded. Fertilizer can be placed 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 25 pounds of nutrient per acre and K should not exceed 15 pounds per acre. Use the most convenient application method.

Sulfur

Adequate levels of sulfur (S) are necessary for maximum production of winter rapeseed. Without adequate S the rapeseed will appear light green to yellow. Plants require S to use N efficiently. Because S is mobile in soils, it is prone to leaching during winter and early spring. Consequently, soil testing for S is important. Sulfur needs based on soil test results are shown in Table 7. Sulfur application rates should never exceed 25 pounds per acre.

Sulfur can be surface applied and will move into the soil with precipitation. Elemental S is not recommended because it becomes available to plants slowly.

Table 7. Sulfur fertilizer needs based on a soil test.

Soil test S (0 to 12 inches)	S application rate	
(ppm SO_4-S)	(ppm S)	(lb/acre)
0 to 10	0 to 4	20
over 10	over 4	0

Micronutrients

Boron—Winter rapeseed 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. For information on B and availability of specific fertilizer materials, see University of Idaho 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, see University of Idaho CIS 1088, *Essential Plant Micronutrients: Zinc in Idaho*. Rapeseed growers in the Kootenai River Valley of Boundary County should watch for Zn deficiencies.

Other micronutrients—Winter rapeseed should not respond to applications of chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), or nickel (Ni). Extensive field experiments on micronutrients have not been conducted. Micronutrient applications often are more likely to create toxicity problems than to correct deficiencies. Avoid applications of these materials in northern Idaho. However, growers in the Kootenai River Valley of Boundary County should watch for manganese deficiencies.

Agronomy/Water quality considerations

- Weeds, insects, diseases, and environmental stress can influence the effectiveness of a fertilizer program and reduce 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 nitrate. Thus, N applied in the early fall, regardless of its form, is subject to leaching in areas of heavy precipitation.

- N-Serve and other N stabilizers block conversion of ammonium to nitrate. Results obtained from N stabilizers are inconsistent although N fertilizer losses have been reduced in some areas. N stabilizers have not been effective in deep, dark-colored soils that have high organic matter contents.
- Cutover timberlands (which usually have clayey subsoils) are not as susceptible to leaching losses because of the low permeability of the subsoil. Low permeability, however, makes these soils subject to wetness or waterlogging that can result in N loss by denitrification (conversion of nitrate into gaseous forms of N that dissipate into the atmosphere).
- Nitrogen fertilizer applications should be split between spring and fall in areas receiving more than 18 inches of annual precipitation. Research has shown that heavy fall applications can reduce rapeseed's winter hardiness. Fall-applied N is also susceptible to leaching. Consequently, no more than 50 percent of the required N should be applied in the fall. In areas receiving less than 18 inches of annual precipitation, including traditionally summer-fallowed areas, all N may be applied in the fall.
- 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 in the fall. Sulfur may also be applied with N in the spring.
- 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 efficiency. Consequently, if applying N, P, or both in a band, cut the recommended fertilizer application rates by 10 to 15 percent.
- 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.
- Contact the UI Extension educator in your county if you need more information.

Further Reading

These publications are available through the UI Extension publishing catalog: www.cals.uidaho.edu/edcomm/catalog.asp

BUL 704, *Soil Sampling*

CIS 787, *Liming Materials*

CIS 1085, *Essential Plant Micronutrients: Boron in Idaho*

CIS 1087, *Essential Plant and Animal Micronutrients: Molybdenum in Idaho*

CIS 1088, *Essential Plant Micronutrients: Zinc in Idaho*

Northern Idaho fertilizer guides

CIS 447, *Alfalfa*

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*

CIS 911, *Northern Idaho Lawns*

CIS 920, *Spring Barley*

CIS 954, *Winter Barley*

CIS 1012, *Spring Canola*

CIS 1083, *Lentils*

CIS 1084, *Spring Peas*

CIS 1101, *Soft White Spring Wheat*

CIS 1135, *Oats*

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