

Canola: P, K, & Micronutrient Management



cycling
rate
organic matter
placement
residue
timing

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This Soil Scoop presents the basics of soil phosphorus (P), potassium (K), and micronutrient management for canola. More details and references are presented in the MSU Extension bulletin *Soil Nutrient Management for Canola*. The basics of nitrogen (N) and sulfur (S) management are presented in The Soil Scoop *Canola: Nitrogen & Sulfur Management*.

SOIL & TISSUE TESTING

Soil tests are the basis for selecting optimum P and K application rates (see *Interpretation of Soil Test Reports*). Samples should be taken to a 6 inch depth for P, K, and micronutrients.

Even though plant tissue sufficiency levels are published for canola, there is too much variability among cultivars, plant stage and sampling time of day to make reliable nutrient management decisions based solely on tissue testing.

Plant symptoms to identify nutrient deficiencies are described and illustrated in *Soil Nutrient Management for Canola*; yet it is better to rely on soil test recommendations and/or nutrient removal rates because once symptoms appear, yield has likely already been lost.

RATE

Phosphorus and K rate guidelines are based on soil test levels (Table 1 and 2), and do not vary with yield potential. If the fertilization goal is to 'maintain' soil nutrient levels, fertilizer P and K rates can be matched with crop removal amounts if yield potential is known. Specifically, a bushel of canola removes about 1.2 lb P_2O_5 and 0.60 lb K_2O from the field when harvested (*Fertilizer Guidelines for Montana Crops*).

Although canola is a good scavenger of P and K, P in close proximity to seedling roots in the first 2 to 6 weeks after germination is critical for high yield. Therefore, 10 to 15 lb P_2O_5 /acre seed-placed P can be helpful even when soil tests indicate P may be adequate (Olsen P > 16 ppm), especially in cool or dry soil. Canola is easily damaged by seed-placed fertilizer. Safe seed-placed rates depend on the fertilizer

source, opener, row spacing, and seed bed conditions. Use an online calculator (listed at end) to get estimated safe rates.

Seed-placed $K_2O + N$ should not be higher than 10 lb/acre, or 4 lb/acre in sandy soils. This affects the ability to seed-place P, since every 10 lb P_2O_5 as 11-52-0 contains 2 lb N. If 8 lb K_2O /acre are seed-placed, then only 10 lb P_2O_5 /acre as 11-52-0 can also be seed-placed. It's more important to have P close to the seed than to have K close to seed.

Micronutrients are taken up in very small amounts. Their fertilization rates are based on a combination of crop appearance, response to test strips, and tissue and soil testing. Deficiency symptoms may appear under cool wet conditions, only to disappear as the soil warms. Published critical soil and tissue test levels should only be used as rough estimates of sufficiency. The risk of yield loss due to toxic effects from excess micronutrient fertilization may be higher than yield loss due to deficiency. Although *Soil Nutrient Management for Canola* presents general guidelines for micronutrient fertilization, the best test for deficiency is on-farm fertilizer strip trials. Routine application is not suggested.

SOURCE

Readily available nutrient sources (e.g., 11-52-0 vs. 18-46-0) should be selected based on cost per pound of available nutrient, ease of application, and chance of germination issues if applied with the seed. Rock phosphate is slow to dissolve into plant available P and generally does not provide enough phosphate within the season. It requires 6 to 8 times the amount to produce the same response as 11-52-0 or 18-46-0.

Trials with specialty P products have not consistently increased yields. The main benefit of many specialized fertilizers is to allow application of higher rates in the seed row, which simplifies application and saves time. Polymer coated P or liquid ammonium polyphosphate (10-34-0) can be safely seed-row placed up to 35 lb P_2O_5 /acre. The addition of specialized bacteria that may increase nutrient

availability has not translated to increased yields. Since specialized amendments are a fast evolving field, on-farm strip trials and common sense are valuable when considering soil amendments.

Animal manure is an excellent source of P, K and micronutrients, but contains variable nutrient amounts and should be tested for nutrient content to calculate application rates. It may also contain herbicide residue.

TIMING & PLACEMENT

Phosphorus is best built up in the soil prior to seeding and applied with the seed in low safe amounts to be near the emerging seedlings' roots. If more P is needed at seeding than is safe to seed-place, pre-plant subsurface banding in the fall or spring, or side banding at seeding are also options. Broadcast P is least efficient and generally not recommended. Even with incorporation, broadcast P requires 2 to 4 times the banded rates to get the same yield response. Banding N with P away from the seed may help with P uptake as long as N is less than 80 or 60 lb N/acre in 12- or 16-inch row spacing respectively. Higher N interferes with root growth into the band to access P.

Potassium can be broadcast in the fall or winter before planting. If applied at seeding, it should not be placed with the seed, rather it is best banded below and to the side of the seed row. Broadcast incorporated K requires up to twice the rates as banded applications for the same yield.

The major challenge of micronutrient fertilization is adequate distribution of very small amounts of fertilizer. Most micronutrients are best broadcast and incorporated before seeding, though this is not possible in direct seeded operations. Banding and seed-row placement options are increasing as new products become available that contain micronutrients within other prills such as 11-52-0. Foliar applications can provide micronutrients with even distribution, but generally not in sufficient amounts to correct severe deficiencies.

For more information:

Fertilizer Guidelines for Montana Crops EB0161

Interpretation of Soil Test Reports MT200702AG

Soil Nutrient Management for Canola EB0224

The Soil Scoop <http://landresources.montana.edu/soilfertility/soilscoop.html>

Available under "Extension publications" at <http://landresources.montana.edu/soilfertility/> or at MSU Extension Publications, (406) 994-3273, <http://msuextension.org/store>.

Safe seed-placed fertilizer rate calculator

· IPNI Online Fertilizer Damage Tool <http://anz.ipni.net/article/ANZ-3076>

Table 1. Banded^a P fertilizer guidelines for canola in Montana based on soil analysis^b.

| Olsen P Soil Test Level (ppm) | P ₂ O ₅ (lb/acre) |
|-------------------------------|-----------------------------------------|
| 0 | 45 |
| 4 | 40 |
| 8 | 35 |
| 12 | 30 |
| 16 ^c | 25 |

Table 2. Banded^a K fertilizer guidelines for canola in Montana based on soil analysis^b.

| K Soil Test Level (ppm) | K ₂ O (lb/acre) |
|-------------------------|----------------------------|
| 0 | 45 |
| 50 | 40 |
| 100 | 35 |
| 150 | 30 |
| 200 | 25 |
| 250 ^d | 20 |

^a Will need more if surface broadcast, especially at low soil test levels.

^b *Fertilizer Guidelines for Montana Crops*

^c If P soil test level is above 16 ppm then consider using removal rate (see text) or seed-place 10 lb P₂O₅/acre.

^d If K soil test level is above 250 ppm then consider using removal rate (see text).