

# Canola: Nitrogen & Sulfur Management



cycling rate organic residue placement matter timing

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

## SOIL & TISSUE TESTING

Soil tests are the basis for determining N application rates, and can help with S rates. Samples should be taken to at least 2 feet depth. Soil tests from samples taken in the spring rather than fall better reflect N available to the crop that growing season.

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.

Optical sensors, such as GreenSeeker, can guide in-season N application in years with high yield potential or direct N to areas of a field with higher than average yield potential. The optimum window for using N sensor technology to recommend top-dressed N fertilizer is from the 6-leaf stage to the start of flowering. Unfortunately, regionally appropriate N fertilization suggestions for given sensor readings in canola are currently not available.

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

Nitrogen fertilization rates are based on yield potential and must consider residual soil nitrate-N, organic matter contributions, and adjustments for previous crop history (see *Developing Fertilizer Recommendations for Agriculture*). MSU fertilizer guidelines suggest optimal total available N (soil N to 2 feet plus fertilizer N) of 3.25 lb N per bushel, however, this can vary greatly depending on location and year. A bushel of canola removes about 2 lb N and 1/3 lb S

from the field when harvested (*Fertilizer Guidelines for Montana Crops*).

Canola is easily damaged by seed-placed fertilizer. Safe seed-placed rates depend on the fertilizer source, opener, row spacing, soil texture, and seed bed conditions. Use online calculators (listed at end) to get estimated safe rates. Safe fertilizer N rates need to be reduced if P fertilizer, such as 11-52-0, is seed-placed. For example, if 11-52-0 is seed placed at 25 lb/acre, then the safe rate of N fertilizer needs to be reduced by about 3 lb N/acre.

Canola can only respond to N if S is not limiting. Applying N:S in a 7:1 balance can benefit yield if both N and S are deficient, however, the N:S ratio is irrelevant if S is sufficient.

Sulfur fertilization rates are based on a combination of field history, crop appearance, response to test strips, and tissue and soil testing. Although it is challenging to get reliable soil S tests, soils with less than 20 lb S/acre in the top 2 feet are most likely S deficient.

Sulfate broadcast at seeding at 18 to 20 lb S/acre should be adequate for dryland canola. 21-0-0-24 can be safely seed-placed at 9 lb S/acre when placed alone in loam soil, but the safe rate is lower in dry, coarse soils or with the addition of 11-52-0. In-season S deficiency can be treated with up to 20 lb S/acre of 12-0-0-26 or 21-0-0-24.

## SOURCE

The choice of readily available nutrient sources, e.g., urea (46-0-0) vs. 28-0-0 or 32-0-0 should be selected based on cost per pound of available nutrient, ease of application, leaf burn potential, probability of germination issues if seed-placed, and potential for volatilization loss to the air or leaching.

Polymer coated urea (PCU) allows higher N rates to be applied in seed-rows (Figure 1). However, safe rates of seed-placed PCU are dependent on how the prill was handled and soil conditions at seeding. Polymer coated N release is slow in cool, dry conditions, so blending PCU with safe rates of non-coated urea may provide sufficient early N and safe high seed-placed rates.

PCU and urea treated with N-(n-butyl) thiophosphoric triamide (NBPT, active ingredient of Agrotain®, N-Fix, Arborite® AG) lose less N as ammonia gas than regular urea when broadcast or shallow banded and may increase yields (see *Enhanced Efficiency Fertilizers*).

Legumes in rotation are a good N source for canola. Animal manure can be an excellent N source but contains variable nutrient amounts and should be tested for nutrient content to calculate application rates. It may also contain herbicide residue.

Elemental S is slow to dissolve and does not provide enough sulfate until 2 to 4 years after it is applied, unless it is finely ground or suspended (which makes it highly corrosive). In contrast, 12-0-0-26 or 21-0-0-24 can increase yields the year of application, and in the following 2 crop years.

### TIMING & PLACEMENT

Nitrogen and S are best managed based on growing conditions. They must be plant available before the beginning of stem elongation. Nitrogen is ideally applied as a split application, with 50 to 65% of the suggested amount applied at seeding and the remainder to meet the current production potential applied by the 5- to 6-leaf stage. Nitrogen can be side banded, pre-plant banded or early-spring broadcasted with incorporation. Urea must be banded at least 2 inches deep (prior to packing) to minimize volatilization loss. 28-0-0 and 32-0-0 are better subsurface than surface banded.

Adequate S is critical for canola at emergence. Sulfur sources and their application timing are presented in Table 1. Rescue treatments can be broadcast or foliar applied as sulfate up to early flowering, the earlier the better. However, foliar applications should wait until after the fifth leaf emergence to minimize leaf burn. Both surface and foliar rescue treatments rely on subsequent irrigation or rain to move S into the soil.

### For more information:

*Developing Fertilizer Guidelines from Montana Crops* MT200703AG

*Enhanced Efficiency Fertilizers* EB0188

*Fertilizer Guidelines for Montana Crops* EB0161

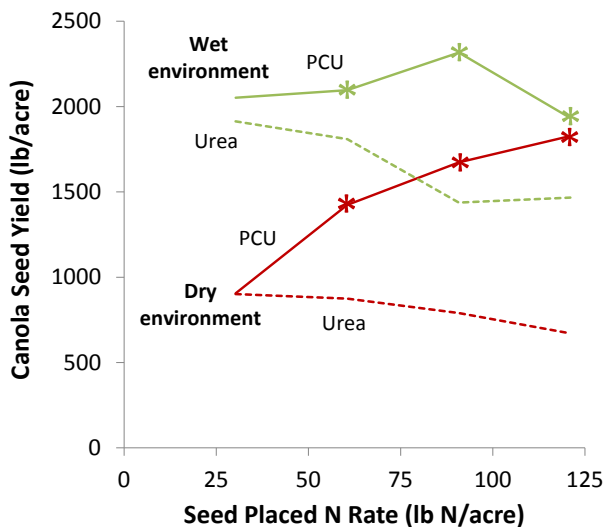
*Soil Nutrient Management for Canola* EB0224

*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>



**Figure 1. Canola yield with seed-placed urea and polymer coated urea (PCU) at increasing N rates in a wet and dry seedbed environment. \* PCU yields > urea yields within same environment.**

	2-plus years prior	Prior crop	Fall	Spring, before or at seeding
<b>Sulfate: on soil surface or incorporated</b>	👎	😊	😊	😊
<b>Elemental-S: incorporated</b>	😊	😊	👎	👎
<b>Rapid release elemental-S</b>	👎	😊	😊	👎

😊 Ideal    😊 Not ideal but may benefit yield    👎 Not recommended