OREGON STATE UNIVERSITY EXTENSION SERVICE

Green Pea Nutrient Management

Inland Northwest—east of the Cascades

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Photo: Clive Kaiser, © Oregon State University

Good management practices are essential to optimize crop response to fertilizer inputs. Response to fertilization depends on adequate available water over the growing season. Other optimal practices include:

- Good seedbed preparation
- Crop rotation
- Use of adapted varieties
- Proper weed control
- Proper insect and disease control
- Proper seeding methods
- Timely planting and harvesting

Soil pH

While traditional tillage can provide a good seed bed, minimum tillage or direct seeding can help conserve soil organic matter and soil water; improve water infiltration; limit exposure of the weed seed bank to light, thus reducing germination; and reduce the need for weed control. However, long-term minimum tillage or no-till practices may lead to the development of acidified layers in the soil profile. For more on managing soil pH in these systems, see *Evaluating Soil Nutrients and pH by Depth in Situations of Limited or No Tillage in Western Oregon* (EM 9014). Follow recommended soil sampling and testing procedures to estimate fertilizer needs. Keep in mind that peas root primarily in the top 2 feet of soil. For the purposes of this publication, all recommendations are based on the results from a representative sample from the top 1 foot of soil. For pea production, "low soil pH" is less than 5.5.

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Crop rotation

Crop rotation to suppress disease pressure is another important management practice. Where possible, avoid rotations of 2 or 3 years between pea crops. Short rotations can lead to the build-up of soilborne pathogens and yield reduction. Where soilborne disease pressure is high, up to 6 years without legumes in the rotation can be required to suppress damping-off pathogens such as *Fusarium*. The typical rotation in dryland production areas of eastern Washington and north-central and north-eastern Oregon is 3 years, which will not suppress these plant diseases.

Inoculation

When peas have not been in the rotation in the last 3 years, they require inoculation with a fresh, effective, live culture of *Rhizobium leguminosarum* specific to peas. Inoculation is an easy, inexpensive, risk-reducing practice that is becoming standard regardless of the length of the rotation. Inoculate pea seed immediately before planting to provide an adequate rhizobium population for good nodulation. Follow the storage and handling recommendations on the product label.

Soil pH below 5.5 in the surface foot of soil and low calcium concentrations will reduce populations of *R. leguminosarum* and nodulation. When soil pH is below 5.5 in the top foot or if stratified pH is below 5.5 in the upper 6 inches, inoculum should be added to the pea seed regardless of the rotation interval. Other elements essential for nodulation include phosphorus (P), iron, sulfur, and molybdenum.

Inoculation is less important in fields that are in a 2-year pea-wheat rotation, particularly if pea yields have been satisfactory. Where potatoes are grown in rotation with peas and soils are fumigated, inoculation is necessary.

See "**Nitrogen (N)**" to learn more about the relationship between soil N levels, nodulation, N fixation by legumes, and the value of *R. leguminosarum* inoculation.

Fertilizer Recommendations

Fertilizer placement

Fertilizer placement is an important management practice in any production system. When banding fertilizer, avoid placing nitrogen (N), potassium (K), or sulfur (S) with the seed. These nutrients are highly soluble and may damage emerging roots. Instead, place fertilizers 2 inches directly below or 2 inches below and to the side of the seed. In legumes, placing N away from the roots also encourages nodulation. P may be placed with the seed at amounts of less than 10 lb/acre P_2O_5. Seedling injury from banded fertilizers tends to be more serious:

- In drier or coarse-textured, sandy soils
- When high rates are banded, including bands at wider row spacing
- Where the fertilizer band is placed less than 2 inches from the seed

In the recommendations that follow, the higher rates are recommended when water is not limited during the growing season. When water is limited, choose the lower rate. Recommendations are based on field experiments conducted in Hermiston, OR.

Nitrogen (N)

In most cases, supplemental N is not required for peas since *R. leguminosarum* can fix atmospheric N. If soil tests indicate a need for N, apply 15–20 lb N/acre banded with P and K, if indicated, at planting. Peas generally respond to N when soil pH is low, because low pH results in poor nodulation. When N from any source is supplied, peas take up more soil N and depend less on fixed N. The same is true when residual soil N levels are more than 35 to 40 lb/acre[1]. Too much N supports excess vegetative growth and may result in weaker plants that are more susceptible to *Sclerotinia* and other diseases.

A water-soluble formulation of N such as calcium nitrate may be applied through fertigation, although it is fairly expensive. Avoid liquid fertilizers made from urea. They are prone to volatilization at soil pH above 8.0 and at temperatures above 77°F. Ammonium-based fertilizers acidify the soil. See "Lime" below for more on acid soils.

[1] http://publications.gov.sk.ca/documents/20/86385-0c18f233-c517-4510-b398-e08fd216aad2.pdf

For organic production systems, see the "Organic Fertilizer and Cover Crop Calculator" developed by OSU.

Phosphorus (P)

Phosphorus is essential for vigorous, even growth of seedlings. Band P to optimize availability to emerging roots and to reduce application rates. While P can be broadcast and incorporated prior to planting, P applied in this way will be less available to emerging roots. Double or triple superphosphate is more available to plant roots and has the added advantage of supplying calcium as well.

Base the decision to apply P, and the amount of P to apply, on soil test analysis (Table 1). Confirm the test method used by your lab before deciding how much P to apply.

Table 1. Phosphorus fertilizer rates for peas based on results from the Olsen soil test (sodium bicarbonate extract). Rates are for banded applications. If P is to be broadcast, apply at twice the rate recommended in the table.

Soil P concentration (ppm)	Amount of P as P_2O_5 (lb/acre) to apply
0–10	40–60
10–20	0–40
>20	0

Potassium (K)

Apply K fertilizers only if a soil test identifies a deficiency. Apply and incorporate K before planting, or band quantities less than 20 lb/acre at planting. If banding N, P, and K, do not exceed 60 lb N+P+K/acre. If additional K is required, broadcast and incorporate it into the soil prior to planting. Table 2 provides recommended K rates based on soil test K levels.

Table 2. Potassium fertilizer rates for peas based on broadcast application methods

Soil K concentration (ppm)	Amount K as K_2O (lb/acre) to apply
0–75	90–120
75–150	60–90
150–200	40–60
>200	0

Sulfur (S)

Plants absorb S in the form of sulfate (SO_4). Soil bacteria convert elemental S and certain thiosulfate and sulfide forms to sulfate before S becomes available to the plant. This conversion is more rapid when soils are warm and moist, but does require time. For that reason, plan ahead when providing S to early-planted annual crops. Apply elemental S in the fall or at regular intervals so that sulfate is available when required. Conversion of S to sulfate will acidify the soil and lower soil pH.

Peas have a low S requirement that can be provided with an application of 15–20 lb S/acre as sulfate at planting if the soil test result is less than 10 ppm sulfate-sulfur (SO_4S). A sulfur soil test has limited value in making S recommendations. However, when soil test results indicate more than 20 ppm S, additional S will likely not improve yields.

Ammonium thiosulfate applied at planting may injure emerging roots.

Other nutrients

The response of peas to micronutrients has been mixed; however, low soil boron (B) can limit yield when other nutrients are adequate. In research trials, the application of 0.5 to 1 lb B/acre increased yields by up to 500 lb/acre when boron soil-test results were below 0.5 ppm. Boron should be broadcast. Never apply boron with the seed.

Zinc applied at rates of up to 5 lb/acre may increase yields when the soil zinc test is below 0.8 ppm. Zinc can be broadcast or banded.

Molybdenum becomes less available at low soil pH. Apply molybdenum when soil pH drops below 5.5, as peas are at risk of nodulation problems and possibly molybdenum deficiency. A seed coat application of molybdenum may improve performance and delay the need for lime. Growers in Washington have seen improved nodulation from added molybdenum on lower pH, sandy soils.

Lime

In studies in eastern Oregon and eastern Washington, pea yields did not increase significantly after liming. However, soil pH below 5.5 in the top foot limits N fixation and pea growth. Under such conditions, consider applying 1 to 2 t/acre of ≤100-score lime. A lime requirement soil test will support

a more accurate decision. Apply lime and incorporate it into the surface 6 inches of soil at least several weeks before seeding. A lime application is effective for several years. See *Eastern Oregon Liming Guide* (EM 9060).

For More Information

Acidifying Soil for Crop Production: Inland Pacific Northwest (PNW 599-E) https://catalog.extension.oregonstate.edu/pnw599

Eastern Oregon Liming Guide (EM 9060) https://catalog.extension.oregonstate.edu/em9060

Evaluating Soil Nutrients and pH by Depth in Situations of Limited or No Tillage in Western Oregon (EM 9014) https://catalog.extension.oregonstate.edu/em9014

Laboratories serving Oregon: Soil, Water, Plant Tissue, and Feed Analysis (EM 8677) https://catalog.extension.oregonstate.edu/em8677

Monitoring soil nutrients using a management unit approach (PNW 570) https://catalog.extension.oregonstate.edu/pnw570

Northern Idaho Fertilizer Guide: Peas and Lentils. University of Idaho. http://www.webpages.uidaho.edu/~karenl/wq/wqfert/cis448.html

Soil Test Interpretation Guide (EC 1478) https://catalog.extension.oregonstate.edu/ec1478

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