Northern Idaho Fertilizer Guide

Spring Peas

Robert L. Mahler

FERTILIZER GUIDELINES, such as this one for spring peas, were developed by the University of Idaho and Washington State University based on relationships between soil tests and crop yield responses. The guidelines are based on research results and are designed to produce above-average yields if other factors are not limiting production. Thus, this fertilizer guide assumes the use of sound management practices.

The suggested fertilizer rates will be accurate for your field provided (1) your soil sample was properly taken and represents the areas to be cropped and (2) the crop and fertilizer history you supply is complete and accurate. For help in obtaining a proper soil sample, refer to University of Idaho Bulletin 704, *Soil Sampling*, or consult the Extension educator in your county.

Nitrogen

Spring peas are legumes that can obtain or "fix" a portion of the nitrogen (N) they require from the atmosphere. The fixing is done by bacteria (*Rhizobium leguminosarum*) that form nodules on the roots of spring peas. These bacteria are present in adequate amounts in most northern Idaho soils, especially in fields that have produced spring peas in the last 20 years.

Seed should be inoculated with this bacterium when (1) peas have not been grown in the field for 20 or more years before planting, or (2) soil pH is less than 5.2. Spring peas are most commonly inoculated with *Rhizobium* in a peat-based carrier using a custom inoculation, seed-applied system. Follow the inoculum manufacturer's recommendation for the inoculum rate per bushel of seed. If custom seed inoculation is not available, a peat-based carrier can be used with the planter box, seed-applied system.

In addition to fixed N, the soil often supplies some residual N as well as N from decomposing organic matter. Thus, N applications on spring peas in most cases have not been profitable. However, spring peas need to obtain some N from the soil early in their growth, before effective N-fixing nodules have formed. Spring peas get their early season, plant-available N from residual N that was not fully used by the previous cereal crop.

Phosphorus

Phosphorus (P) needs can be determined effectively with a soil test (Table 1). Incorporate P into the seedbed by whatever method is most convenient. Acceptable methods include (1) broadcast and plow-down or disk-in, (2) band, and (3) drill with seed. Do not allow direct contact between the seed and any fertilizer containing more than P. Germinating spring peas are extremely sensitive to salts contained in fertilizer N, K, and S. If heavy P applications are required to correct nutrient deficiencies, apply fertilizer before or during seedbed preparation or use a fertilizer that contains only P (0-44-0, for example).

Table 1. Phosphorus fertilizer rates for spring peas 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 by 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]$P_2O_5 \times 0.44 = P$, or $P \times 2.29 = P_2O_5$.

[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 2. Potassium fertilizer rates for spring peas 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 in the 0- to 12-inch depth.
[2]$K_2O \times 0.83 = K$, or $K \times 1.20 = K_2O$.

Potassium

Potassium (K) needs can be determined with a soil test (Table 2). Incorporate K into the seedbed by whatever method is most convenient. Acceptable methods include (1) broadcast and plow-down or disk-in, (2) band, and (3) drill with seed. Do not allow direct contact between the seed and the fertilizer because peas and spring peas are sensitive to salts during germination. If heavy K applications are required to correct nutrient deficiencies, apply fertilizer before or during seedbed preparation. Most soils in northern Idaho contain adequate levels of K for healthy pea yields. Consequently, the need for K applications to northern Idaho soils is minimal.

Sulfur

Without adequate sulfur (S), spring pea plants are unable to fix enough atmospheric N to meet their needs. Consequently, soils testing at less than 10 ppm SO_4-S should receive 15 pounds of S per acre. Avoid using granular elemental S on spring peas because this form of S becomes available to plants slowly. Elemental S also greatly reduces soil pH. Sulfur needs of spring peas based on a soil test are shown in Table 3.

Most soils in northern Idaho are S deficient. Consequently, applications of 15 pounds of S per acre (as sulfate S) are usually needed. Do NOT exceed S application rates of 20 pounds per acre as research has shown that excessive S application rates (more than 25 pounds per acre) may actually depress spring pea yields in the Palouse region.

Table 3. Sulfur fertilizer needs of spring peas 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—Spring peas grown in northern Idaho respond to boron (B) applications. Boron need can be determined by a soil test. Soils testing at less than 0.5 ppm B should receive 1 pound of B per acre. Boron can be toxic at excessive rates or when concentrated near seedlings. Boron fertilizer should always be broadcast, never banded. For more information on B and specific fertilizer materials, refer to University of Idaho CIS 1085, *Essential Plant Micronutrients: Boron in Idaho*.

Molybdenum—Spring peas grown in northern Idaho also respond to molybdenum (Mo). Because Mo is present in soil in only small amounts, soil Mo analysis is not commercially available. Consequently, base Mo fertilizer applications on cropping history and soil pH. Apply Mo as a seed treatment on spring peas at the rate of 1/8 to 1/2 ounce Mo per acre when (1) the soil pH is less than 5.7 or (2) every third time spring peas are grown in a field. Do not exceed 1/2 ounce Mo per acre because at higher rates the N-fixing bacteria may die. For more information on Mo, refer to University of Idaho CIS 1087, *Essential Plant and Animal Micronutrients: Molybdenum in Idaho*.

Zinc—Response of spring peas to zinc (Zn) applications is extremely rare. Zinc applications of 5 pounds per acre should be considered only where Zn soil test levels are less than 0.6 ppm. For more information on Zinc, refer to University of Idaho CIS 1088, *Essential Plant Micronutrients: Zinc in Idaho*.

Other micronutrients—Spring peas have not been reported to respond to applications of chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), nickel (Ni), or cobalt (Co). Therefore, applications of these materials in northern Idaho is unnecessary.

Soil pH

Spring peas thrive in soils with pH values of 5.6 or higher. Conversely, when soil pH falls below 5.4, yields may be severely impacted. When soil pH values fall below 5.4, consider lime additions of 1 to 2 tons per acre (the 2-ton rate is for soils with pH values less than 5.2) to reduce soil acidity. If you suspect that soil pH is low in the field you can also request a lime-requirement test from the same soil testing laboratory that analyzes the soil for plant-available N, P, K, and S. For additional information, refer to University of Idaho Extension's CIS 787, *Liming Materials*.

Visual Nutrient-Deficiency Symptoms

The most commonly observed nutrient-deficiency symptom is entire plants taking on a yellow-green color instead of a healthy, medium- to dark-green color. Unfortunately this visual symptom can signify an N, S, or Mo deficiency because all three nutrients directly or indirectly do the same thing in plants.

Nitrogen and S are components of amino acids. These amino acids link together to form proteins. Without enough protein, plants turn yellow-green instead of a vibrant green. For its part, Mo is a component of an enzyme that reduces nitrate in plants to an organic form, which is needed to make amino acids that form proteins.

To help identify the deficient nutrient, it is important to keep records of your fertilization practices. To ensure that N is not limiting, dig up a few pea plants and look for nodules on the roots. Adequate nodulation and the application of sulfur to the field based on low soil-test values often suggests that Mo is the deficient nutrient.

There is no test to determine Mo availability in soils, but it tends to be deficient in soils with pH values less than 5.5 and often will limit the yield of peas. There is no easy in-field fix for Mo deficiency during the growing season. The best remedy is to seed treat the next legume grown on the deficient field with Mo.

Easily diagnosed P and K deficiency symptoms are rarely visible on peas in the field during the growing season.

Agronomy/Water Quality Considerations

- Growing legumes such as lentils, spring peas, or garbanzo beans in rotation with cereal crops in northern Idaho is an excellent agronomic practice. The legume reduces weed, disease, and insect pressures in the following cereal crops. In addition, the legume will take up residual N left in the soil by the previous cereal crop. Even though legumes are capable of fixing all the nitrogen they need, field studies have shown that at least half of their N comes from residual soil N. From water quality and economic standpoints, this is important because it greatly reduces the threat of nitrate leaching into groundwater.
- Weeds, insects, diseases, and environmental stress can influence the effectiveness of a fertilizer program and reduce yields.
- Spring peas are capable of fixing most of the nitrogen they need from the atmosphere. Soils in northern Idaho generally contain adequate amounts of the soil bacteria (rhizobia) that are responsible for this nitrogen-fixation process. Consequently, inoculation of peas with rhizobia is not necessary in fields that have a history of pea or lentil production.
- Early planting of spring pea varieties is critical for maximum economic yields.
- Spring-planted peas have generally been planted in seedbeds having a minimum of straw residue on the soil surface. However, spring peas grown under conservation tillage systems with moderate levels of surface residue typically produce similar or higher yields than peas grown under low-residue, intensive tillage systems. The greatest yield benefits are in relatively dry years.
- To prevent soil compaction, avoid tillage at high soil moisture levels. Also avoid overworking the soil and creating a finely pulverized surface that is vulnerable to erosion and prone to sealing and crusting.
- Avoid planting in poorly drained areas.
- If you need further information on cultural practices contact the Extension educator in your county.
- Starter, or pop-up, fertilizers have limited success on spring peas. Starter fertilizers have been most effective when soils were cold and root growth could be stimulated by a readily available supply of P.
- Banding fertilizer improves P use efficiency. Consequently, if banding P, cut the recommended fertilizer application rate by 10 to 15 percent.

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 811, *The Relationship of Soil pH and Crop Yields in Northern Idaho*

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*, also available in print for $1.00

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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