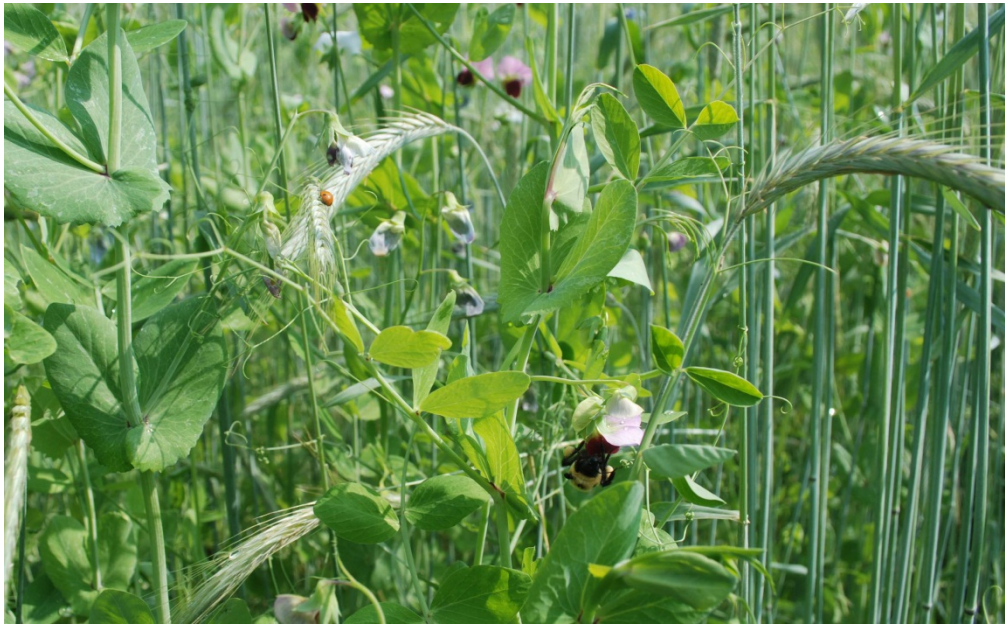


PLANT MATERIALS TECHNICAL NOTE

PEAS *Pisum sativum*

An Introduced Legume for Conservation Use in Montana and Wyoming

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Austrian winter pea in a cover crop mix (photo by Tanya Tolchin)

General Description

Peas, *Pisum sativum*, originated from areas in Ethiopia, the Mediterranean, and central Asia, with a secondary center of diversity in the Near East. Peas are a nutritious legume, containing 15 to 35 percent protein, and high concentrations of the essential amino acids lysine and tryptophan in the seed. There are many alternate names for peas including garden pea, field pea, spring pea, English pea, common pea, green pea (*Pisum sativum* ssp. *sativum*); and Austrian winter pea (*Pisum sativum* ssp. *sativum* var. *arvense*).

The pea is an annual, cool-season legume with a bluish-green waxy appearance, a hollow stem, and a vine-like growth habit. Leaves are alternate, pinnately compound, with one to several pairs of oval leaflets, and terminal tendrils. Modern cultivars have short vines about 2 feet long, are semi-leafless or have an 'afila'-type leaf in which the leaflets are converted into additional tendrils. The fruit is a closed pod, 1 to 4 inches long that often has a rough inner membrane. Ripe seeds are round, smooth or wrinkled, and can be green, yellow, beige, brown, red-orange, blue-red, dark violet to almost black, or spotted.

Adaptation or Range

Peas are adapted to many soil types, but grow best on fertile, light-textured, well-drained soils. The ideal soil pH range for pea production is 5.5 to 7.0. Peas are sensitive to soil salinity levels measuring greater than 4 decisiemens per meter of electrical conductivity. Due to a shallow root system limiting their ability to utilize stored soil water below 2 feet, they are sensitive to drought. Peas grow well with 16 to 39 inches of annual precipitation, but can also grow in dryland areas characterized by April and May rains, as they respond to these showers with increased vegetative growth and subsequent seed production.

Austrian winter pea (AWP) has only fair winter hardiness in Montana and Wyoming; however, breeding efforts to improve winter hardiness are ongoing at the University of Wyoming. It can be successfully spring or fall seeded in the valleys of the Intermountain West. In areas of Montana and Wyoming where late spring frosts are prevalent, a winter-hardy cultivar such as 'Melrose', 'Granger' or 'Commonwinter' may be used.

Pea seedlings can withstand considerable frost. Even if the frost is severe enough to kill the main stem, peas may re-grow from buds near the soil surface. Due to this setback in growth, however, plant maturity will be delayed. Seed germination rate increases with rising soil temperatures above 55° F, but at temperatures greater than 64° F, the percentage of seed germination decreases. Because of these growth traits, Washington, North Dakota, and Montana are the top three pea producing states in the U.S.



Austrian Winter Pea Cover Crop in Lake County, Montana

Conservation Uses

Peas are grown for food, seed, green manures, and in cover crop mixes for hay or grazing as they grow quickly. They are often mixed with cereal grains planted for hay or grazing to increase the protein level of the forage, and to provide soil cover. Columbian, AWP, 'Arvika', 'Grande', and 'Victoria' are forage peas used as a green manure or cool season cover crops because they are adapted to cold temperatures and grow well in many crop rotations. Pea seed and forage is utilized by many classes of livestock, deer, elk, and waterfowl.

Ease of Establishment

Peas are easy to establish, but require more moisture for germination than wheat due to their larger seed size. The larger seed size, however, enables them to be planted deeper, where soil moisture may be more available. Treating the pea seed with a labeled fungicide can improve emergence significantly, especially when planted into a cold, wet soil. The fungicide should be applied prior to planting, allowed to dry, and then *Rhizobium leguminosarum* inoculant applied. Check the fungicide label for compatibility with inoculants. Even if peas have been previously grown in a field, applying *Rhizobium* inoculant just prior to planting is an inexpensive way of ensuring adequate nodulation and nitrogen fixation. In addition, unless *Rhizobium* inoculant has been properly stored in a cool, dark place (not a freezer) from one growing season to the next, new inoculant should be purchased and applied.

Although peas grow well on soils with moderate fertility levels, application of nitrogen and phosphorus have proven beneficial on low fertility sites. Base fertilizer application rates on a current soil analysis.

Planting Rates

Depending on the pea cultivar and species, there can be 1,000 to 3,500 bulk pea seeds per pound. As a result, seeding rates vary with cultivar and species, as well as soil type, seed size, climate, disease pressure, and seeding method. Typical seeding rates range from 50 to 80 pounds Pure Live Seed (PLS) per acre when drill seeded and 90 to 100 pounds PLS per acre when broadcasted. Spring-planted peas are normally planted 1 to 3 inches deep in rows 6 to 12 inches apart in late-March or early April, similar to barley (*Hordeum vulgare*). Fall planting time is typically in late August, 1 to 2 weeks earlier than winter wheat (*Triticum aestivum*), and should only be considered in areas where winter wheat survival can be relied upon. This allows pea seedlings enough time to develop to the rosette stage and successfully over-winter. Plant winter peas in standing cereal grain stubble or deep furrows in order to capture snow and insulate the crop. Peas may winterkill if exposed to long periods of sub-zero weather without snow cover. Dormant fall planting of AWP (after November 1) has not been successful in Montana. Spring-planted peas flower 30 to 50 days after planting whereas fall-planted peas flower approximately 250 days after planting, with flowering lasting 2 to 4 weeks in both cases.

The cover crop mix seeding rates for peas depends on the desired percentage of peas in the mix. Many retail companies selling cover crop seed have “mix calculators” on their web sites, which show the grower the percentage of broadleaves, grasses, and legumes as the mix is being created. Other “mix calculator” ratings may include nitrogen fixation, C: N (carbon to nitrogen) ratio, biodiversity, and soil salinity, frost, drought, and grazing tolerances, as well as winter hardiness. Seeding rates, disease and insect pest ratings should be reviewed to make sure they are applicable to specific locations in Montana or Wyoming. When used in cover crop mixes, peas are planted at a 1-inch depth and are large enough to break through soil crusting at the surface, allowing the smaller-seeded species, such as canola (*Brassica napus*) and teff (*Eragrostis tef*), to readily emerge. Emergence of peas normally occurs within 10 to 14 days after planting.

Production

Peas produce large amounts of biomass, especially when grown in temperate climates. The biomass, however, breaks down quickly, and may not increase long-term soil organic matter. The decomposition of pea residue can be slowed by growing peas in combination with a cereal grain.

Nitrogen (N) credits following a pea grain crop have ranged from 0 to 20 pounds of N per acre and have averaged near 10 pounds of N per acre in Montana. When the pea crop is terminated early for forage or green manure, preceding a partial summer fallow period in late summer, the N credit can be doubled. If peas are grown in a rotation, the N credit generally increases with the number of times the peas are grown.

Pure stands of peas should be direct-combined from dried windrows to prevent pod shattering. Specialized pickup reels with fingers or spring-loaded lifters on the combine header may be used if the peas are lodged at harvest. To prevent seed cracking, harvest-time adjustments need to be made to the combine reel speed, cylinder speed, and the distance between concaves. The average seed yields in Montana from 2008 to 2012 were: Austrian winter peas 1,000 pounds per acre and dry edible peas 1,482 pounds per acre.



Mature Pea Plant with Pods

Limitations

Peas are susceptible to numerous fungal and viral diseases, as well as insect, mite, and nematode pests [see Diseases of Cool Season Legumes (Pulse Crops: Dry Pea, Lentil and Chickpea) MSU, EB0207 for more information]. These diseases and insect pests are more prevalent on pure stands of peas, rather than peas planted as part of a cover crop mix.

Peas are generally not recommended for warm season cover crop mixes. When seeded in July as part of a cover crop mix at the Bridger Plant Materials Center, the warm soil temperatures, shading from adjacent taller plants, and summer heat combined to inhibit pea emergence and growth. When planting cover crop mixes with tall warm season species, such as hybrid sorghum-sudangrass (*Sorghum bicolor* x *Sorghum bicolor* var. *sudanense*) or corn (*Zea mays*), on the eastern side of Montana and Wyoming, more above-ground legume biomass and root nodules are produced when warm season legumes such as soybean (*Glycine max*), or black and navy beans (both *Phaseolus vulgaris*) are planted instead of peas. If a warm season cover crop planting can be delayed until mid-August, peas in the mix may prove beneficial, as cooler weather in September and October supports more pea growth. On the western side of Montana or

Wyoming, where cooler summer nights are common even in summer, peas may be as or more productive than the warm season legumes listed above.

Peas do not suppress weeds as well as other cover crops. Weed suppression can be improved by selecting varieties with long vines, normal leaves, and growing them with awnless wheat, triticale, hay barley, oats, rye, or in a cover crop mix. When grown alone, a pre-emergent herbicide labeled for peas can be applied and incorporated into the top 1 to 2 inches of the seedbed prior to planting. If weedy annual grasses are a problem, there are labeled, post-emergent herbicides for use in peas grown in a pure stand.

Releases

Seed producers in Montana grow many cultivars of green, yellow, and forage field peas (see Montana Seed Growers Association 2013 Crop Directory).

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