Crop Profile for Peas (Dry) in Washington

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General Production Information

- Washington ranks #1 in edible dry pea production with 44.5% of U.S. production.
- In 1999, approximately 116,000 acres of dry peas were seeded and harvested by about 800 Washington growers. This acreage dropped to 80,000 in 2000.
- Ten-year average yields are approximately 2000 pounds per acre.
- At the 1999 value of $0.078 per pound, the crop’s cash value was $20.2 million for the year. In 2000, the price dropped to $0.05 per pound, for a cash value of $8 million.
- Production costs average $116 per acre with seed being a major portion of all unfixed costs. Fixed (non-cash) costs average an additional $92 per acre. This has resulted in a mean loss of $87 of gross income per acre for dry peas annually 1995 through 2000.

Production Regions

Dry pea production is concentrated primarily within a 90-mile radius of Pullman in an area called the Palouse. Counties include Whitman, Spokane, Garfield and Asotin. Irrigated acreage is found in the Columbia Basin counties of Grant, Adams, Benton, and Franklin. Irrigated acreage is in rotation with potato, and tends to be small in comparison to that of the Palouse counties.

General Information

The types of edible dry peas produced in Washington include regular green peas (majority), small sieve green peas, and yellow peas. Austrian winter peas, grown in rather small acreages for cattle and sheep forage, are not considered in this food crop profile. Historically, 50 percent of dry peas produced in the Pacific Northwest have been sold through the USDA PL480, Food for Peace Program, to underdeveloped countries. The 1995 USDA Farm Bill reduced government purchases of dry peas, resulting in most of the crop being sold on the highly competitive global market. Canada is the dominant entity, producing 2,104,000 acres of all dry pea types in 2000.
Cultural Practices

Dry pea (*Pisum sativum* L.) is a cool-season annual crop, mostly non-irrigated, and production is primarily on loam soils of the Palouse with 7 to 25% slopes. Annual precipitation is 18 to 23 inches in the primary production zone. Dry peas are also produced to a small extent under irrigation in the Columbia Basin as a short-season rotation crop. Elevation of the primary production zone is from 2000 to 3000 feet above sea level. Ideal seeding dates vary between April 15 and May 15, with a minimum soil temperature of 50 °F. A frost-free period of at least 110 days is required for the crop to mature. Pea roots can penetrate 60 inches in soil and utilize most of the soil moisture.

Dry peas are seeded by larger growers on the Palouse as a rotational crop with agronomic advantages for cereals. Enhanced winter wheat yields the following year make the pea crop financially worthwhile even when the crop itself loses revenue.

Seedbed preparation is essential for dry peas. Traditionally, a finely worked, firm seedbed is prepared for use with pre-plant herbicides. After seeding, a packer is used to smooth and firm the soil surface for good seed/soil contact.

All varieties and types of dry peas are seeded at a rate of 180 to 200 pounds of seed per acre. A plant stand of 15 to 20 plants per square foot after emergence is desired for optimum yield.

Peas are self-pollinating and hybrid varieties are available. Peas bloom about 50 days after emergence on the Palouse, with indeterminate varieties blooming until heat shuts them down in late June/early July. Determinate varieties produce a set number of pods, and then cease to bloom. Pods usually contain an average of 6 to 8 mature peas at harvest. Many growers in the Palouse swath their crop for pea bar combine threshing. The peas ripen and dry in the windrows. Newer varieties are often cut standing with a regular cereal-type header. Peas are never chemically desiccated on the Palouse or in the Blue Mountain production areas. Dry peas are harvested in August after a variable period needed for the crop to dry after swathing or letting the peas dry standing. A heavy rainstorm lasting for hours can result in bleaching of the ripe peas and quality loss, but such rains rarely occur in August.

Growers outside of the traditional pea area and in intermediate rainfall (15-inch) zones are experimenting with afila (semi-leafless) type regular green pea varieties in direct (no-till) seeding. Afila varieties allow combining of standing crop to reduce production practices and costs. However, afila peas have not yet been accepted by the industry due to the incipient shatter problem of currently available varieties. This practice needs further development before being widely accepted by the industry.

Harvested peas of all types are loaded from the bulk tank on the combine to a grain truck for shipment to
the buyer who has usually contracted the peas. All processing is done by the buyer. Peas are decorticated for sale, and packed in 50 lb. bags for shipment. Some are shipped in bulk containers to processors and overseas customers. Seed is not saved for future seeding. Growers purchase new seed each crop season, and most buy seed in their contract with the buyer (buyer specifies variety and provides the seed at cost).

**Insect Pests**

Insects are the major pest problem in dry peas. Treatment is required each year between emergence and harvest. Weed control is also very important each cropping season. Diseases are controlled largely by seed treatment fungicides.

**Aphids**

*Pea Aphid, Acyrthosiphon pisum* (Harris)

The pea aphid is the primary insect pest of dry peas in Washington. The pea aphid builds up to large numbers in irrigated alfalfa fields, migrating eastward to the drylands about the time of the first cutting of alfalfa hay in the Columbia Basin. Sheer numbers of pea aphids in outbreak years cause major economic damage to peas. Their feeding can reduce yields 350 lbs./acre in a season of moderate infestation. At $0.05 per lb., the loss per acre due to pea aphid damage is $17.50 at this level of injury.

While major outbreaks occur only every five to seven years, many growers must treat for pea aphid annually, as this insect serves to vector viruses including pea enation mosaic virus. These viruses damage the vascular tissue of the pea plant resulting in even greater yield losses than aphid feeding itself. Losses can be to the point of crop failure when both aphids and viruses have major outbreaks.

**Controls**

**Cultural**

No alternative control measures or cultural practices are available against pea aphid at present. While hymenopterous parasitoids (e.g. *Aphidius colmani*) readily attack pea aphid in pea fields, they are not effective in reducing aphid numbers nor preventing the spread of virus within fields. Likewise, ladybird beetles, lacewings, and spiders do not reduce aphid populations quickly enough in a cool-season, short-term annual crop.

**Chemical**
**Dimethoate (various trade names at 0.5 lbs. a.i.a).** 14-day PHI. Application is made to 100% of the crop, by air, at about 50 percent bloom. The lower label rate of 0.167 lb. a.i.a for dimethoate, even if used in combination with Imidan, is not sufficient for long-term aphid control, so two applications are necessary. This requires the grower to pay custom applicators two application fees. Using the higher label rate of 0.5 lbs. a.i.a, losses to aphids are near zero percent, with very low aphid populations through thirty days after treatment. After thirty days the damage period is past. Thus one application of dimethoate at the high rate (plus Imidan for pea weevil control) is typical, and effective as a standard treatment.

Other insecticides (esfenvalerate, malathion, disulfoton, carbaryl, methomyl, methyl parathion, and endosulfan) are registered for control of pea aphid and have been tried by growers/industry field persons. None affords a level of control comparable to dimethoate. Dimethoate is the most critical use of the Washington dry pea industry.

**Ongoing Research**

The U.S. Dry Pea and Lentil Commission and the Washington State Commission on Pesticide Registration have heavily funded research into "soft chemicals" for the control of pea aphid in dry peas. Products under test with strong possibilities for subsequent registration and/or emergency labeling in the absence of dimethoate include bifenthrin (Capture 2), cyfluthrin (Baythroid), imidaclorpid (Provado), and lambda-cyhalothrin (Warrior) as floral applications made at 50 percent bloom. Novartis is supporting research on thiomethoxam (Helix) as a seed treatment for consideration in both the United States and Canada at 0.375 fl. oz. cwt. seed. Enough data and industry support for very quick 24-c labeling for bifenthrin exists, with likelihood of a granted emergency exemption within days of application filing in the event of the loss of dimethoate.

**Weevils**

Pea Weevil, *Bruchus pisorum* L.

This *Bruchid* weevil is a 1/16th-inch, grayish-brown weevil that feeds on legumes and is a serious pest of dry peas in certain areas of Washington. Annual treatment is required. Pea weevil, not to be confused with pea leaf weevil, is a typical univoltine *Bruchid* seed pest. The adult pea weevils congregate on the pea flowers at early bloom, and mate after taking a pollen meal.

The female weevil makes a very small oviposition bite in the pea pod, then deposits the egg. Each developing pea in a pod can support one developing weevil larva. The larvae do not emerge from the pods, but rather emerge from the threshed peas as long as a month after harvest. The larvae are not visible in the infested peas, but decrease the weight of the pea. When the larva is ready to emerge from the pea, it cuts an operculum (hole with a flap lid) that is perfectly round, and leaves the interior of the pea hollow. The larvae pupate immediately after emergence, and overwinter as adults in duff.
In the past, the primary area of pea weevil infestation was centered around the town of Farmington, where damage often reaches 50 percent. Lesser damage occurs southwest of Pullman and throughout the pea production region. Dockage for pea weevil varies from year to year, and is a major factor in overall yield reduction as the weevil-damaged peas are cleaned from the seed prior to processing.

The economic threshold for treatment is two adults per 180-degree sweep with a 15-inch insect net. In 2000, 50+ adults per 50 feet of row were common through the pea-growing regions of the Pacific Northwest. This was a first, and indicates a trend of the pea weevil becoming a greater pest of peas.

Cultural

No effective biological or cultural controls exist for this pest in the Pacific Northwest region.

Biological

Dr. Steve Clement, USDA-ARS Entomologist based at Washington State University in Pullman, has identified pea weevil resistance genes that have been widely adapted into domestic peas in Australia. These peas require no insecticide treatment due to antibiosis produced by their genes. No resistant varieties are available in the United States at present.

Chemical

**Phosmet (Imidan 70 WP at 0.93 lb. aia in combination with Dimethoate at 0.5 lbs. aia or 0.167 lb aia ).** 7-day PHI for phosmet, 14-day PHI for dimethoate. This tank-mix combination applied by air is the industry standard for simultaneous treatment of pea weevil and pea aphid. The treatment is limited to one application per season by the dimethoate label for the 0.5 lb. aia rate. The very best control the authors and their cooperators have achieved for weevils with this combination is 90 percent (10% loss). Application is made at 50 percent bloom as for pea aphid without much concern for actual pea weevil sweep counts since they are very hard to locate in the field. All of the Washington commercial dry pea acreage is treated with this tank-mix combination.

Ongoing Research

The authors have conducted pea weevil trials near Farmington along with pea aphid research. Phosmet (Imidan 70 SP) is another organophosphate (OP) insecticide under consideration for elimination by the EPA at present, and the industry is most anxious to identify a "soft chemical" replacement in the event of loss of phosmet. The pyrethroid products tested for pea aphid control (bifenthrin, cyfluthrin, and lambda-cyhalothrin) provide about the same pea weevil control under heavy pressure as the dimethoate/phosmet standard, with 10 percent damage par. With pea gross income at best a breakeven proposition, other products with greater efficacy must be identified to justify costs of replacing older products. Since pea growers really grow peas as an important rotational crop for winter wheat, growers are willing to accept replacement products that are slightly more expensive. Efforts to determine a minimum rate of
potential OP replacements are included in current research trials as is timing of application for better control.

Pea Leaf Weevil, *Sitona lineata* (L.)

The adult pea leaf weevil, not to be confused with the pea weevil, attacks seedling pea plants and produces scalloped "bites" on the cotyledons and lower leaves. Typically, the damage is more severe on the edges of pea fields adjacent to grasslands, riparian zones, and similar refuges. Normally, pea leaf weevil is a cosmetic pest requiring no insecticide treatment. Occasionally, damage in some locations and in dry years produces economic loss of stands through destruction of apical meristem in seedling plants and/or damage to the "clam shell" (folded leaves containing flower buds) in older plants. When more than 25 percent of the leaves are notched or more than 0.2 to 1.0 weevils are visible per plant, economic injury is likely. Since production costs have been higher than returns in recent years, growers are understandably reluctant to treat for pea leaf weevil except in outbreak years. In 2000, 50% of Palouse pea acreage was treated for an outbreak; populations reached 20+ per square foot.

**Controls**

**Cultural**

There are no alternatives or cultural practices for pea leaf weevil control in dry peas. No natural enemies occur and no biological controls are available. Afila (semi-leafless) peas actually seem more susceptible to pea leaf weevil than conventional peas based on a trial the authors conducted near Dusty in 1999, where Columbia and Majorette varieties were compared under replication experimentation.

**Chemical**

**Phosmet** (*Imidan 70 WP at 0.93 lbs. aia*). 7-day PHI. This is a preferred organophosphate treatment by some producers and their field persons. It is very effective, being a stomach toxin for chewing insects.

**Carbaryl** (*Carbaryl 4L at 1.5 lbs. aia*). 21-day PHI. Also a preferred pea leaf weevil control product, carbaryl is the least expensive product available.

**Methyl Parathion** (*Methyl 4EC, Declare at 0.5 lbs. aia*). 10-day PHI. This chemical is labeled for use in dry peas but is not used in Washington due to restrictions, applicator reluctance, and slightly less effectiveness compared to carbaryl and phosmet.

**Ongoing Research**

Susceptibility of the various leaf types is being studied and research on experimental soft chemistry compounds for pea weevil control is being pursued in cooperation with Novartis. Thiomethoxam (*Adage*), a neonicontinoid seed treatment insecticide, shows promise. Zeneca Ag is seeking efficacy for
lambda-cyhalothrin (Warrior), a pyrethroid insecticide that would be applied after appearance of the pest.

The currently registered insecticides are either dithiocarbamate or organophosphate chemicals, and are under close scrutiny by the EPA. Research for acceptable replacements and alternatives is a critical need for Washington dry pea growers.

**Diseases**

**Root Rots, Seed Rot, Damping Off**
Various, including *Pythium* spp., *Rhizoctonia solani*, *Thelaviopsis basicola*, and *Phoma medicagnensis* var. *pinodella*.

Soilborne pathogens causing root rots, seed rot, and damping off at seeding and early emergence are of concern in the cool, moist Palouse soils. Seed treatments are used exclusively; no foliar fungicides are applied. Seed rot and damping off are generic terms applied to several soil fungi usually found in complex, including those listed above.

**Controls**

**Cultural**

Commonly, pea producers rotate to peas only once in three years to avoid these diseases.

**Biological**

Variety resistance is a common control for root diseases and for powdery mildew, downy mildew, and near wilt (*Fusarium oxysporum* f. sp. [*isi* races 1, 2, 5, and 6]). Many resistant cultivars have been developed for use in areas where these diseases are found.

**Chemical**

Where *Pythium* spp. become a problem, **Allegiance FL** (metalaxyl) at 0.75 fl oz/cwt and **Apron XL LS** at 0.32 to 0.64 fl oz/cwt. are applied as a fungicidal seed treatment.

**Ridomil Gold EC** at 0.5 to 1 pint per acre pre-plant incorporated or surface applied has not been effective in eastern Washington.
General fungicides applied as seed treatments for most Palouse growers are *Fusarium* spp. and *Rhizoctonia* spp. are **Maxim 4 FS** (fludioxonil) at 0.08 to 0.16 fl oz/cwt; **Thiram 50 WP** at 3 oz/cwt.; and or **Captan 50 WP** at 2.5 fl oz/cwt. Weak seed or damaged seed may be injured by these treatments.

**Viruses**
Various, including Pea Enation Mosaic

Viruses vectored by the pea aphid from alternate host legumes were mentioned in the insect section. Control of pea aphid is essential to virus control in dry peas.

**Controls**

**Biological**

Variety resistance is a common control for pea enation mosaic virus. Many resistant cultivars have been developed for use in areas where these diseases are found.

**Chemical**

While virus are not controlled directly, reduction of aphid populations prevents their spread. Aphid chemical controls are listed in the insect section.

**CRITICAL NEEDS FOR THE INDUSTRY**

The future of dry pea production in Washington requires replacement insecticides that are 1) affordable by the producer; 2) effective against the common pea pests; and, 3) "environmentally soft" i.e., not affecting non-target species and having low mammalian/avian toxicity.

**Weeds**

Peas are very poor competitors with weeds, which makes weed control a major production concern. Grass (wild oat, wind grass, quackgrass), and broadleaf (dog fennel, mustards, wild mustard, catchweed bedstraw, lambsquarters, and pigweed) weeds are primary pests throughout the production region due to their competitiveness for nutrients and moisture. Pea growers use a standard suite of herbicides annually for weed control.
Controls

Cultural

All growers practice crop rotation, which may include chemical fallow, to decrease weed pressure. This has included tillage for seedbed preparation after an application of glyphosate herbicide on winter annual weeds. Rotation with imazilone-resistant canola has opened up a new opportunity for following peas with a crop having several potent herbicides available, thus cleaning the field for subsequent wheat rotation.

Chemical

**Triallate (Far Go at 1.0 to 1.25 lb. a.i.).** Used for wild oat and other grass weed control. Must be pre-plant incorporated before seeding. Incorporation of this herbicide requires two passes with tillage (disking, harrowing), one behind the herbicide applicator and one at right angles to the application for good incorporation into the seed bed. Triallate is combined with imazethapyr.

**Pursuit (Imazethapyr at 0.047 lb. a.i.).** Used for broadleaf weed control. Must be pre-plant incorporated before seeding. Incorporation of this herbicide requires two passes with tillage (disking, harrowing), one behind the herbicide applicator and one at right angles to the application for good incorporation into the seed bed. Imazethapyr is applied in combination with triallate. This combination has become the industry standard, but can damage peas growing in wet soil, resulting in stunting and yellowing of the pea plants.

**Metribuzin (Sencor 75 DF at 0.188 - 0.375 lbs. a.i. pre-emergent use or 0.125 -0.248 lbs. a.i. post-emergent use).** (24c, WA-870008). 75-day PHI. A post-emergence herbicide primarily applied by air. Application is not common unless weed control is not achieved by the pre-plant incorporated herbicides.

**Bentazon (Basagran at 0.5 to 1.0 lb. a.i).** 30-day PHI. Used as post-emergence herbicide in peas by a small number of growers, bentazon is applied by air. Limited to 2 lbs. a.i per acre per calendar year. Bentazon can cause phytotoxicity, and is a competitor of metribuzin.

**Poast (sethoxydim) and Assure II (quizalofop P-ethyl)** are grass-specific herbicides which are more expensive and not warranted unless a grass weed problem exists that is not managed by one of the standard herbicides. They are not used due to cost.

MCPA, MCPB, trifluralin, ethalfluralin, pendemethalin, and metolachlor are available, but rarely applied due to label constraints, potential crop injury, or less potential control than newer herbicides.
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References


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