Pea and Lentil
Clarice Coyne
USDA - WSU

HORT 320, Olericulture
October 20, 2014
Pullman’s National Lentil Festival
Protein rich foods
**Pulses high protein, low fat**

### Pulses

<table>
<thead>
<tr>
<th>FOOD</th>
<th>Lentils</th>
<th>Dry Peas</th>
<th>Chickpeas</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALORIES</td>
<td>115</td>
<td>116</td>
<td>135</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>0.4g</td>
<td>0.4g</td>
<td>2.2g</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>0mg</td>
<td>0mg</td>
<td>0mg</td>
</tr>
<tr>
<td>Protein</td>
<td>9.0g</td>
<td>8.3g</td>
<td>7.3g</td>
</tr>
<tr>
<td>Iron</td>
<td>3.3mg</td>
<td>1.3mg</td>
<td>2.4mg</td>
</tr>
<tr>
<td>Fiber</td>
<td>7.8g</td>
<td>8.2g</td>
<td>6.3g</td>
</tr>
<tr>
<td>COST</td>
<td>$0.07/Serving</td>
<td>$0.07/Serving</td>
<td>$0.11/Serving</td>
</tr>
</tbody>
</table>

### Meats

<table>
<thead>
<tr>
<th>FOOD</th>
<th>Chicken</th>
<th>Beef</th>
<th>Pork</th>
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<tbody>
<tr>
<td>CALORIES</td>
<td>167</td>
<td>143</td>
<td>189</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>1.86g</td>
<td>1.62g</td>
<td>3.81g</td>
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<tr>
<td>Cholesterol</td>
<td>71mg</td>
<td>68mg</td>
<td>57mg</td>
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<tr>
<td>Protein</td>
<td>25.3g</td>
<td>24.7g</td>
<td>20.8g</td>
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<tr>
<td>Iron</td>
<td>0.91mg</td>
<td>2.5mg</td>
<td>0.58mg</td>
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<tr>
<td>Fiber</td>
<td>0g</td>
<td>0g</td>
<td>0g</td>
</tr>
<tr>
<td>COST</td>
<td>$0.67/Serving</td>
<td>$1.07/Serving</td>
<td>$0.71/Serving</td>
</tr>
</tbody>
</table>
Lecture Goals

• Botanical classification/taxonomy
  – Family, genus, species, [variety, if appropriate]
  – Related species/crops

• Use and importance
  – Center of origin
  – Story of domestication and early uses
    • What cultures have historically used it and how
  – Current uses [and where it is grown/used]
    • Culinary and/or medicinal
  – Economic and cultural importance, specific to Washington

• Production [geared to Washington]
  – Propagation
  – Production/culture
  – Disease and pest issues
  – Disease and pest control
  – Harvest
  – Post-harvest handling

• Marketing and financial implications
  – Primary marketing channels for WA grown
Botanic classification

- Pea
- Family *Leguminosae*
- Genus *Pisum*
- Species *sativum*
Pea (*Pisum sativum*)

**Center of Origin**
- Fertile Crescent – Israel, Lebanon, Syria, Turkey, Iraq
- **Central Asia** – Iran, Afghanistan, Pakistan and Turkmenistan

**Domestication**
- One of the oldest domesticated crops
- 10,000 BC in the Near East and Mediterranean regions
- Europe- Stone and Bronze ages
- India 200 BC
Lentil (*Lens culinaris*)

**Center of Origin**
- Fertile Crescent –
  - Israel, Lebanon, Jordan, Palestinian Authority, Syria, Turkey, Iraq

**Domestication**
- One of the oldest domesticated crops
- One of 8 founder crops
- 11,000 BP in the Near East and Mediterranean regions
- Pre-Pottery Neolithic period
Botanic classification

- Lentil
- Family *Leguminosae*
- Genus *Lens*
- Species *culinaris*
Other *Leguminosae* crops

- Legumes!
- Soybean
- Bean (next lecture)
- Peanuts
- Chickpea
- Forages
  - Alfalfa
- Symbiosis
  - Symbiotic bacteria (*Rhizobia*) fix atmospheric nitrogen in root nodules
- Pods
Uses of pea and lentil

Food value

• Immature pea
  – Vegetable

• Dry pea seed
  – Soups
  – Flour
  – Starch

• Dry lentil
  – Soups
  – Flour

Feed and fodder value

• Seed for animal feed
• Plant for animal fodder
Immature pea - vegetable
Green pea, world production

China

Tonnes
Significance to WA agriculture

• Vegetable pea
• Two markets
  – Growing the seed crop
  – Growing the vegetable for frozen market

• 2012
• Green processing pea
  – #25
  – $35.2 million

• Wrinkled seed pea
  – #40
  – $6.7 million
Green pea production in WA

10 years ago, Skagit County would be included, production moved to the Columbia Basin.
Growing green pea

**Preparation**
- uniform fertility, soil type, slope, and drainage
- good supply of available soil moisture
- optimum soil temperature is 50-75°F
- plowed, harrowed and a cultipacker used lightly to ensure a firm seed-bed.

**Timing**
- lower Columbia Basin, pea planting begins in late February, and ends about mid-May at the higher elevations - foothills of the Blue Mountains.
- Orderly harvest
  - accumulated heat unit (AHU) system
Accumulated heat unit (AHU) system

- AHU is defined as the accumulated difference between the base temperature for crop growth and the mean of the daily maximum and minimum air temperatures.
- Used to select early and main season varieties.
- Using a 40 F base, early varieties currently used require about 1200 heat units and late varieties about 1500 heat units to reach a 100 tenderometer maturity.
Planting green pea

-most is grown on contract
-except market gardeners
Planting green pea

- 1.5 – 2 inches deep
- 480,000 plants per acre
  - Uniformity is key for uniform color and uniform maturity
- Inoculate with *Rhizobium* bacteria
- Soil sampling to determine fertilization requirements

- Band with
  - 15-20 # N/A
  - 40-75 # P/A
  - 60 # K/A
- The processor determines time of harvest according to tenderometer reading
- late May through late July harvest
## Variety selection

### Green Pea Specifications

<table>
<thead>
<tr>
<th>Variety</th>
<th>Leaf Type</th>
<th>Western Heat Units</th>
<th>Node to First Bloom</th>
<th>Days to 100 TR</th>
<th>Plant Height (inches)</th>
<th>Pods/Peduncle</th>
<th>Peas/Pod Size Index</th>
<th>Percent Distribution at 100 TR (inches)</th>
<th>Disease Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
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<tr>
<td>Marias</td>
<td>Normal</td>
<td>1290</td>
<td>10</td>
<td>50</td>
<td>14-16</td>
<td>2</td>
<td>8</td>
<td>3.60</td>
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<td>Span 290F (International)</td>
<td>Normal</td>
<td>1300</td>
<td>9-10</td>
<td>59</td>
<td>14-16</td>
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<td>8</td>
<td>3.53</td>
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<td>CMG-307F</td>
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<td>19</td>
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<td>8</td>
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<tr>
<td>CMG-416AF</td>
<td>Afla</td>
<td>1320</td>
<td>10-11</td>
<td>60</td>
<td>21</td>
<td>2</td>
<td>8-9</td>
<td>3.90</td>
<td>0</td>
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<tr>
<td>Portage</td>
<td>Afla</td>
<td>1325</td>
<td>10</td>
<td>60</td>
<td>22</td>
<td>2</td>
<td>7-8</td>
<td>3.78</td>
<td>1</td>
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<td>Savannah</td>
<td>Afla</td>
<td>1370</td>
<td>10-11</td>
<td>61</td>
<td>22</td>
<td>2</td>
<td>7-8</td>
<td>4.01</td>
<td>2</td>
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<td>Samish</td>
<td>Normal</td>
<td>1455</td>
<td>12</td>
<td>65</td>
<td>24</td>
<td>2-3</td>
<td>8-9</td>
<td>3.64</td>
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<tr>
<td>Bonito 264F</td>
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<td>1540</td>
<td>14-15</td>
<td>67</td>
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<td>1550</td>
<td>15</td>
<td>67</td>
<td>20</td>
<td>2</td>
<td>8-9</td>
<td>3.69</td>
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</tbody>
</table>

**Processing/Freezer Peas**
Vegetable pea field

University of Delaware
Green pea pod stripping harvester

Speed to freezer!
Sugar snap pea harvester

pod stripping harvesters
May to early August
Snap pea harvest

- Edible pod peas tend to lose part of their sugar content, on which much of their flavor depends, unless they are promptly cooled to near 32 F and maintained at a relative humidity of 90-95%, after picking.
- **Forced air cooling**, using 32 F air with 90-95% humidity, is the preferred method of cooling since it does not result in surface moisture, and minimizes the risk of decay should subsequent temperatures during handling go over 34 F.
- **Hydrocooling** may be used when the producer is close to the market, and temperature can be held to 32 F throughout all marketing steps to the consumer. With hydrocooling, edible pod peas packed in baskets can be hydrocooled from 70 to 34 F in about 12 minutes when the water temperature is 32 F.
- **Vacuum cooling** also is possible, but the edible pod peas must be pre-wet to obtain cooling similar to that by hydrocooling.
- After precooling, the peas should be packed with crushed ice (top ice) to maintain freshness and turgidity. Adequate use of top ice provides the required high humidity (95 %) to prevent wilting.
Marketing

- Vegetable green pea consumption pattern in USA is flat
- Frozen and canned
Marketing – snap pea

• Consumption increasing, frozen
Significance to WA agriculture

- Dry edible pea
- Lentil

- 2012
- Dry edible pea
  - #28
  - $21.6 million
- Lentil
  - #27
  - $23.3 million
Dry pea and lentil production in WA - the Palouse
Dry pea market classes

Dry pea
- Yellow
- Green
- Marrowfat (minor)

Split and decorticated
- Yellow
- Green
- Austrian winter feed pea (minor)
Dry pea

Dry pea - food

Winter pea - feed
Lentil market classes

- Small brown lentil
- Red Lentils (decorticated)
- Large green lentil
Dry pea, world production

Tonnes

- Peas, dry Canada
- Peas, dry Russian
- Peas, dry China
- Peas, dry India
- Peas, dry France
- Peas, dry USA
- Peas, dry Ukraine
- Peas, dry Australia
- Peas, dry Ethiopia
- Peas, dry Germany
Lentil, world production

Tonnes

Canada  India  Australia  Turkey  USA  Nepal  Ethiopia  China  Syria  Iran

Tonnes
Dry pea and lentil production notes

Preparation

- Seed treatment
  - Fungicides (Phythium)
  - Insecticide (wire worms, leaf weevil)
  - Moly
- Seedbed
  - Finely worked or no-till
- Soil temperature
  - Above 40 F (April-May)

Planting

- Air seeder or grain drill
  - 1 to 3 inches deep
- Plant April-mid May
- 300,000 plants/A
- Soil test
  - 20-30 # N available
  - Additional P and K (pea heavy feeder)
Planting lentil and pea
Weed control

• Pea and lentil poor competitors
  – Cultural practice
    • Crop rotation
    • Mechanical/field preparation
  – Herbicides
    • Challenging environment for registration due to the minor crop status of pea and lentil
    • No GMO pea or lentil grown in the world due to market conditions
Lentil field
Pests

Aphid – important pest of pea and lentil – spreads viruses

Seed weevil –
main pest of dry pea production
Pests - Control

Aphid – Insecticidal spray

Seed weevil – insecticidal spray
Disease problems on pea in WA

- Fusarium wilt
- Ascochyta blight (minor)
- Powdery mildew
- Root rots
- Bacterial blight (minor in irrigated vegetables)
Disease control on pea in WA

Fusarium wilt

Root rots

Plant breeders use genetic resistance

Powdery mildew

Bob Arthur, Crites Seed breeder
Disease of lentil in WA

White mold – minor problem

Control – genetic resistance
Dry pea harvest
Carefully!

August-determinate, afila type
Lentil harvest problem, it’s a short plant
Lentil harvest

Lentil maturing

Lentil combine after windrowing
Solution-windrowing

- Swathing occurs when about 30 percent of the lowermost pods turn tan and their seeds rattle. Doing so under conditions of higher humidity may reduce shattering.
Combining
Marketing
Dry pea and lentil, commodities

EXPORTED
Countries USA exports lentils to:

Tonnes

- Turkey: 300,000
- UAE: 150,000
- Sri Lanka: 125,000
- Egypt: 100,000
- Algeria: 75,000
- India: 50,000
- Bangladesh: 37,500
- Pakistan: 25,000
- Iraq: 20,000
- Sudan: 15,000
- Colombia: 12,500
- Spain: 10,000
- Iran: 7,500
- Mexico: 5,000
- Saudi Arabia: 2,500
- Italy: 2,500
- Venezuela: 2,500
- UK: 2,500
- Germany: 2,500
Countries USA exports dry pea to:

Tonnes

- India: 1,800,000 Tonnes
- China: 700,000 Tonnes
- Bangladesh: 200,000 Tonnes
- Spain: 150,000 Tonnes
- Belgium: 120,000 Tonnes
- Germany: 100,000 Tonnes
- Pakistan: 90,000 Tonnes
- Italy: 80,000 Tonnes
- Norway: 70,000 Tonnes
- USA: 60,000 Tonnes
- Ethiopia: 50,000 Tonnes
- Netherlands: 40,000 Tonnes
- Kenya: 30,000 Tonnes
- UAE: 20,000 Tonnes
- Brazil: 10,000 Tonnes
- Philippines: 5,000 Tonnes
- Turkey: 4,000 Tonnes
- Sri Lanka: 3,000 Tonnes
- UK: 2,000 Tonnes
- Peru: 1,000 Tonnes
Marketing commodities- dry pea and lentil

- Cooperatives, eg PNW
- Exporters, eg Brocke & Sons
- USA Dry Pea and Lentil Council

- network of staff managing offices worldwide, the USADPLC maintains and develops new markets with new product launches, informative and awareness campaigns and promotions
History on the Palouse
Lentil 1916
Pea 1920s
Thank you for your attention

• Questions?
• Clare Coyne, coynec@wsu.edu