Breeding Fall Planted Pulse Crops

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Cool Season Food Legumes – Ideal components in direct seeded systems?

- Require low inputs, even in conventional systems
- Fix atmospheric Nitrogen
- Break weed and disease cycles in cereal cropping systems
- Important, established rotational crop in cereal-based rain-fed systems
- Autumn-sown opportunity
Cool season food legumes in a direct seed system

• Challenges
  – Insect pressure
  – Poor competitors with weeds

– Diseases
  • Soil borne: Fusarium spp; Aphanomyces root rot; Pythium seed rot
  • Foliar: Powdery Mildew, Phoma, Bacterial blight
  • Viruses: Pea Enation Mosaic Virus, Bean Leaf Roll Virus, Pea Seedborne Mosaic Virus
Autumn-sown Grain Legumes
Developing Autumn-Sown Pulse Crops

Rationale

Provides an alternative rotational crop in low rainfall areas.
Shift field work from spring to autumn.
Higher yield potential.
U.S. marketing regulations changed in 2009.
Excellent potential for cover crop.
Developing Autumn-Sown Pulse Crops

Major Issues/Concerns

Optimal planting time and methods.
Effective, efficient weed control.
Market Class acceptance.
Resistance to biotic stresses.
Adequate levels of cold tolerance.
Precipitation Zones in Washington
Winter Legume Breeding Objectives

**Peas**
Food: White flowers, clear seed coat, green or yellow cotyledons, semi-dwarf, semi-leafless. Resistance to PSbMV, PEMV and Race 1
AWP: Pigmented flowers and seed coat. Disease resistance.
Cover Crop: Maximize above ground and below ground biomass production. Disease resistance.

**Lentils**
Small Green, Medium Green, and Spanish Brown market classes. Good lodging tolerance, resistance to PEMV.

**Chickpeas**
Improved cold tolerance, white flowers, erect growth habit, small kabuli-large desi, Ascochyta blight resistance.

**Faba Beans**
Improved cold tolerance, white flowers. Any seed size. PEMV resistance.
Winter Legume Breeding Approaches

Traditional

- Spring x Winter; Winter x Winter crosses
- First generations grown in moderately stressful environment.
- Early generation segregating populations sent to target environments for evaluation and selection.
- Advanced breeding lines to target environments.
- Agronomic Studies.

Molecular

- Mapping populations (winter x spring)
- Re-sequencing
Why Winter Legumes?
21 November 2015

Wilke Farm
Davenport, WA
Why Winter Legumes?
18 April 2015

Advanced Winter Yield Trial

Advanced Spring Yield Trial
Why Winter Legumes?
8 June 2015

Spring Advanced Yield Trial

Winter Advanced Yield Trial
Why Winter Legumes?
30 June 2015
### 2014 Autumn-sown vs. Spring-sown Peas
Average Yield (lbs/ac) by Location

<table>
<thead>
<tr>
<th>Crop</th>
<th>Garfield</th>
<th>Pullman</th>
<th>Dayton</th>
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<tr>
<td>Winter Peas</td>
<td>5135</td>
<td>4159</td>
<td>3164</td>
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<tr>
<td>Spring Peas</td>
<td>1589</td>
<td>2116</td>
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High Yield Potential

Winter Pea

Spring Pea
The Way Forward

• Dedicated Breeding Programs
  – Food Quality (yellow or green)
  – Austrian Winter
  – Cover Crop

• Target Environments: Segregating Populations and Yield Trials
  – WA, ID, MT, OR, NE, KS, NC, TX, WI, MD, NY

• Seed Production
  – WA, ID, OR
Current Status

Common (AWP)

Windham

DS Admiral

Hampton

PS11300287W

PS11300289W
# New Winter Peas

<table>
<thead>
<tr>
<th>Entry</th>
<th>Type</th>
<th>Plnt Ht (cm)</th>
<th>PHI</th>
<th>HSW (g)</th>
<th>Yield (kg/ha)</th>
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<tbody>
<tr>
<td>Windham</td>
<td>Ghost</td>
<td>56</td>
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<td>Lynx</td>
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<tr>
<td>Trials Avg</td>
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<td>LSD (0.05)</td>
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