Field Peas for Feed

- Forage
- Grain
Table 2. Field pea grain, pea co-products and pea forage nutrient analysis.

<table>
<thead>
<tr>
<th>Item</th>
<th>Pea Grain</th>
<th>Pea Hulls</th>
<th>Pea Screenings</th>
<th>Pea Hay</th>
<th>Pea Straw</th>
<th>Pea Silage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter, %</td>
<td>88</td>
<td>92</td>
<td>90</td>
<td>88</td>
<td>89</td>
<td>35</td>
</tr>
<tr>
<td>% Dry Matter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crude protein, %</td>
<td>25.5</td>
<td>9.0</td>
<td>23.6</td>
<td>13.6</td>
<td>8.5</td>
<td>15.4</td>
</tr>
<tr>
<td>Total digestible nutrients, %</td>
<td>87.0</td>
<td>60.0</td>
<td>80.0</td>
<td>58.0</td>
<td>46.0</td>
<td>58.0</td>
</tr>
<tr>
<td>NEm, Mcal/lb</td>
<td>1.02</td>
<td>0.59</td>
<td>0.88</td>
<td>0.56</td>
<td>0.38</td>
<td>0.57</td>
</tr>
<tr>
<td>NEg, Macl/lb</td>
<td>0.67</td>
<td>0.33</td>
<td>0.59</td>
<td>0.27</td>
<td>0.13</td>
<td>0.31</td>
</tr>
<tr>
<td>Calcium, %</td>
<td>0.15</td>
<td>0.48</td>
<td>0.14</td>
<td>1.39</td>
<td>1.62</td>
<td>1.32</td>
</tr>
<tr>
<td>Phosphorus, %</td>
<td>0.44</td>
<td>0.09</td>
<td>0.48</td>
<td>0.28</td>
<td>0.11</td>
<td>0.22</td>
</tr>
</tbody>
</table>

Adapted from Lardy et al., 2009. Alternative Feeds for Ruminants. AS-1182 p. 21.
Field Peas

- Very nutrient dense grain
  - High protein
  - High rumen protein degradability
  - Highly digestible
  - Slower rate of digestion than barley
  - Energy similar to corn
  - Palatable
  - Feed value for ruminants 140% bushel of corn
  - Low calcium, high phosphorus

Table 1. Comparison of nutrient value of livestock feed grain with field peas

<table>
<thead>
<tr>
<th>Item</th>
<th>Field peas</th>
<th>Corn</th>
<th>Barley</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter, %</td>
<td>89</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>% Dry Matter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crude protein, %</td>
<td>25.5</td>
<td>9.8</td>
<td>13.2</td>
</tr>
<tr>
<td>Total digestible nutrients, %</td>
<td>87.0</td>
<td>90.0</td>
<td>85.0</td>
</tr>
<tr>
<td>NEg, Mcal/lb</td>
<td>0.67</td>
<td>0.68</td>
<td>0.63</td>
</tr>
<tr>
<td>Rumen undegradable protein, %</td>
<td>30.0</td>
<td>60.0</td>
<td>27.0</td>
</tr>
<tr>
<td>Calcium, %</td>
<td>0.15</td>
<td>0.03</td>
<td>0.05</td>
</tr>
<tr>
<td>Phosphorus, %</td>
<td>0.44</td>
<td>0.31</td>
<td>0.35</td>
</tr>
<tr>
<td>Fat, %</td>
<td>1.40</td>
<td>4.30</td>
<td>2.20</td>
</tr>
</tbody>
</table>

Adapted from Anderson et al., 2007. AS-1301 and NRC, 1996.
### Varietal Variation

<table>
<thead>
<tr>
<th>Item</th>
<th>Profi</th>
<th>Arvika</th>
<th>Carneval</th>
<th>Trapper</th>
<th>SEM&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP, % DM</td>
<td>22.6</td>
<td>26.1</td>
<td>22.6</td>
<td>19.4</td>
<td>-</td>
</tr>
<tr>
<td>0 h N disappearance, %</td>
<td>54.3&lt;sup&gt;c&lt;/sup&gt;</td>
<td>53.0&lt;sup&gt;c&lt;/sup&gt;</td>
<td>47.4&lt;sup&gt;c&lt;/sup&gt;</td>
<td>32.0&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.65</td>
</tr>
<tr>
<td>Slowly degradable, %</td>
<td>45.7&lt;sup&gt;b&lt;/sup&gt;</td>
<td>47.0&lt;sup&gt;b&lt;/sup&gt;</td>
<td>52.6&lt;sup&gt;b&lt;/sup&gt;</td>
<td>68.0&lt;sup&gt;c&lt;/sup&gt;</td>
<td>6.00</td>
</tr>
<tr>
<td>Rate of CP digestion, %/h</td>
<td>14.6&lt;sup&gt;d&lt;/sup&gt;</td>
<td>8.6&lt;sup&gt;c&lt;/sup&gt;</td>
<td>10.5&lt;sup&gt;d&lt;/sup&gt;</td>
<td>7.3&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.26</td>
</tr>
</tbody>
</table>

#### Estimated RDP, % of CP

| k<sup>f</sup> = 0.02 | 93.4<sup>c</sup> | 91.5<sup>c</sup> | 92.7<sup>c</sup> | 87.4<sup>b</sup> | 2.05           |
| k = 0.04            | 88.2<sup>c</sup> | 85.4<sup>c</sup> | 86.6<sup>c</sup> | 77.7<sup>b</sup> | 3.29           |
| k = 0.06            | 84.3<sup>c</sup> | 81.0<sup>c</sup> | 82.0<sup>c</sup> | 71.0<sup>b</sup> | 4.02           |

<sup>a</sup>n = 4. <sup>b</sup>,<sup>c</sup>,<sup>d</sup>,<sup>e</sup> Row means with different superscripts are different (P < 0.02).
<sup>f</sup>k = ruminal outflow rate (h<sup>-1</sup>). Adapted from Encinias et al. (2004).
Feeding Trials
NDSU
Carrington
Research
Extension Center

Creep Feed
Receiving Rations
Growing Finishing
Carcass Characteristics
Cow Supplementation
Heifer Supplementation
Processing - pelleting
Creep Feed

• Best combination for adg and feed conversion at 33-67% inclusion with wheat midds (3.1 vs 2.8)
• Gains greater with rolled versus ground or whole peas (3.31 vs 3.13)
Receiving Rations

• Rolled pulse grains at 17% of 60 percent concentrate receiving rations compared to canola as protein source increased intake from 15 lbs to 16.3 and adg from 3.6 to 4.0.

• Greater gains persisted on common corn based finishing diet fed to market weight.
Backgrounding

- Include in high forage diets as an energy and protein supplement
- 2-6 lbs per head per day depending on other feeds
- For higher gain targets feed with corn or oats

<table>
<thead>
<tr>
<th>Feed Name</th>
<th>As Fed Lbs/Head/Day</th>
<th>% of Ration</th>
<th>$/Head/Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRASS HAY</td>
<td>8.000</td>
<td>27.1</td>
<td>$0.20</td>
</tr>
<tr>
<td>SILG CORN</td>
<td>16.000</td>
<td>54.1</td>
<td>$0.24</td>
</tr>
<tr>
<td>PEA GRAIN</td>
<td>5.000</td>
<td>16.9</td>
<td>$0.50</td>
</tr>
<tr>
<td>32-0 BEEF SUPP</td>
<td>0.500</td>
<td>1.7</td>
<td>$0.10</td>
</tr>
<tr>
<td>FORT TM SALT</td>
<td>0.071</td>
<td>0.2</td>
<td>$0.01</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>29.571</strong>*</td>
<td></td>
<td><strong>$1.05</strong>*</td>
</tr>
</tbody>
</table>

* waste factor not included
Finishing

- 15-20% of ration typically will meet protein needs
- Depending on costs could be the only grain
- Peas and corn combination is complimentary
- Tendency for higher intake and performance or better conversion with pea inclusion

<table>
<thead>
<tr>
<th></th>
<th>2.00</th>
<th>2.25</th>
<th>2.50</th>
<th>3.00</th>
<th>3.50</th>
<th>4.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canola</td>
<td>125</td>
<td>3.53</td>
<td>3.64</td>
<td>3.75</td>
<td>3.86</td>
<td>3.96</td>
</tr>
<tr>
<td>Meal</td>
<td>150</td>
<td>4.03</td>
<td>4.13</td>
<td>4.24</td>
<td>4.34</td>
<td>4.43</td>
</tr>
<tr>
<td>$/ton</td>
<td>175</td>
<td>4.52</td>
<td>4.63</td>
<td>4.73</td>
<td>4.83</td>
<td>4.94</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>5.02</td>
<td>5.12</td>
<td>5.23</td>
<td>5.33</td>
<td>5.44</td>
</tr>
</tbody>
</table>
Carcass Traits “Pea Fed Beef”

• Peas in finishing ration at over 10% for over 76 days has resulted in increased tenderness and juiciness
• Warner-Bratzler shear test values reduced 1.5 lbs
• Taste Panel evaluation of juiciness and flavor
• Potential for specialty beef brand
Cow Supplementation

• Excellent protein and energy supplement for breeding herd
• Replacement for oilseed-grain mixes
• Source of rumen degraded protein for enhancing intake and digestibility of low quality forage
• Can be combined with ddg and other ingredients in cubes
Processing

- Not always a benefit
- Roll for calves in creep and in receiving rations
- Generally a benefit for cracking for feedlot cattle
- Do not need to be processed for cows
- Work well as an ingredient for binding pellets
- Heating or extruding not cost beneficial for cattle
Pea Forage

• High quality hay and silage
• Low fiber
• High protein
• High RFV
• High animal performance
• Difficulty in curing
• Less yield than grasses
• Often grown in combination with cereal
• Long vined forage varieties
Harvested Pea Forage

Table 1. Forage production and nutritional value of field pea and/or cereal grains* (3yr avg).

<table>
<thead>
<tr>
<th></th>
<th>DM Yield</th>
<th>Hay Yield</th>
<th>Silage Yield</th>
<th>Protein %</th>
<th>TDN %</th>
<th>RFV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tons/acre</td>
<td>15% Moist</td>
<td>40% DM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field Peas</td>
<td>1.95</td>
<td>2.29</td>
<td>4.88</td>
<td>16.95</td>
<td>67.37</td>
<td>145.57</td>
</tr>
<tr>
<td>Barley</td>
<td>1.78</td>
<td>2.09</td>
<td>4.45</td>
<td>9.74</td>
<td>64.08</td>
<td>126.76</td>
</tr>
<tr>
<td>Field Peas/Barley</td>
<td>2.18</td>
<td>2.56</td>
<td>5.45</td>
<td>13.65</td>
<td>65.12</td>
<td>132.75</td>
</tr>
<tr>
<td>Oats</td>
<td>1.78</td>
<td>2.1</td>
<td>4.45</td>
<td>9.44</td>
<td>60.58</td>
<td>116.09</td>
</tr>
<tr>
<td>Field Peas/Oats</td>
<td>2.17</td>
<td>2.55</td>
<td>5.42</td>
<td>12.48</td>
<td>62.94</td>
<td>118.74</td>
</tr>
</tbody>
</table>

*adapted from S. Zwinger, Carrington Res Ext Center Annual Report, 2011.
Pea Byproducts

• Hulls
  • By product of splitting
  • Very light and difficult to handle and store
  • Hull itself low in digestibility but often pea fragments
  • Feed values vary
    • Crude protein  9
    • TDN  60

• Starch
  • By product of fractionating for pea protein, fiber and flour
  • Fine powder
  • Poor flowability
  • Useful in binding pellets
  • Feed Values
    • Crude protein  13
    • TDN  87
Pea Screenings

• Highly variable in feed value depending on foreign matter and weed seeds
• Likely to include stones and dirt
• Splits equal feed value to peas
• For calves typically blend with other grain
• Good forage extender and supplement for cows

• Analysis:
  • Crude protein 23
  • TDN 80
  • Ca .14
  • Phos .48
Pea Residue

• Palatability best if baled or grazed shortly after harvest
• Generally preferred and higher quality than cereal straw
• Seeding fall cover crop into residue or light tillage to initiate volunteer growth can provide late season grazing

• Analysis:
  • Crude protein 5-8
  • TDN 46
  • Ca 1.6
  • Phos .11
### Feed and Forage Report

**DAIRYLAND LABORATORIES, INC.**  
Arcadia, WI 54612  
Telephone 608-323-2123  
Report date: 2/3/2017  
Sample number: 001-1702-010847

**TO:** John Dhuyvetter  
5400 S Highway 83  
Minot, ND 58701  
SAMPLED BY: John Dhuyvetter  
SAMPLED FOR: VEGAS VARY

**PRODUCT:** field pea straw  
(1B - D )

<table>
<thead>
<tr>
<th>Component</th>
<th>Dry Basis</th>
<th>Average</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>%</td>
<td>24.04%</td>
<td></td>
</tr>
<tr>
<td>Dry Matter</td>
<td>%</td>
<td>75.96%</td>
<td></td>
</tr>
<tr>
<td>Crude Protein</td>
<td>%DM</td>
<td>0.58%</td>
<td>2.91 - 16.91</td>
</tr>
<tr>
<td>aNDF</td>
<td>%DM</td>
<td>65.84%</td>
<td>46.37 - 80.25</td>
</tr>
<tr>
<td>aNDFom</td>
<td>%DM</td>
<td>64.11%</td>
<td>45.91 - 78.30</td>
</tr>
<tr>
<td>ND-ICP est w/ SS</td>
<td>%DM</td>
<td>1.37%</td>
<td>0.56 - 6.42</td>
</tr>
<tr>
<td>Fat (EE)</td>
<td>%DM</td>
<td>1.30%</td>
<td>1.25 - 3.61</td>
</tr>
<tr>
<td>Ash</td>
<td>%DM</td>
<td>9.61%</td>
<td>5.44 - 14.08</td>
</tr>
<tr>
<td>NFC</td>
<td>%</td>
<td>17.77%</td>
<td></td>
</tr>
</tbody>
</table>

OARDC
Other Livestock

• Swine
  • Limit use in starter diets due to anti nutritional factors
  • For growing and finishing can replace all SBOM by supplementing synthetic methionine or in combination with canola meal
  • Must be ground or pelleted
  • Up to 30% of lactating sow ration

• Poultry
  • 10-40 % of laying hen ration
  • 20-30% broiler and turkey

• Sheep

• Dairy
OTHER PULSES

LENTIL
CHICKPEA
FABA BEAN

- high protein 25-33%
- some anti nutritional factors
- starch 35-45%
- fiber 5-10%, low fats
- high lysine
- low methionine and threonine
- limit 20-30% diet
Summary

• Pulse crops are widely grown in western ND as part of diverse rotation

• In addition to being an important cash crop can also be homegrown feed/supplement to support livestock operation

• Good feed qualities as forage, grain, low grade grain, or grain processing byproducts