Fall-Grown Oat Offers a Unique Forage Option: High Fiber Digestibility and High Energy

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In Oklahoma, wheat is used primarily as a dual-purpose (forage and grain) crop, but across the border in Arkansas these production practices are completely segregated.
Forage quality is exceptionally high, but fall/winter availability is frequently limiting.
## Description of Forages

<table>
<thead>
<tr>
<th>Species</th>
<th>Variety</th>
<th>Type</th>
<th>Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oat</td>
<td>Horizon 474</td>
<td>winter</td>
<td>U of Florida</td>
</tr>
<tr>
<td></td>
<td>Blaze</td>
<td>spring</td>
<td>U of Illinois</td>
</tr>
<tr>
<td>Wheat</td>
<td>AR 910*</td>
<td>soft-red winter</td>
<td>U of Arkansas</td>
</tr>
<tr>
<td></td>
<td>OK 101</td>
<td>hard-red winter</td>
<td>Oklahoma State U</td>
</tr>
<tr>
<td></td>
<td>Armor Prograze</td>
<td>winter</td>
<td>Cullum Seeds</td>
</tr>
<tr>
<td>Triticale</td>
<td>Monarch</td>
<td>winter</td>
<td>U of Florida</td>
</tr>
<tr>
<td>Rye</td>
<td>AGS 104</td>
<td>winter</td>
<td>U of Florida</td>
</tr>
<tr>
<td></td>
<td>Wintergrazer 70*</td>
<td>winter</td>
<td>Pennington Seed</td>
</tr>
</tbody>
</table>

* Now marketed by Delta King (McCory, AR) as GR 9108.
Blaze (spring) Oat

Horizon 474 (fall) Oat

December 14, 2004
AR 910 Wheat (soft red)

OK 101 Wheat (hard red)

December 14, 2004
Elongated vs. Vegetative
(Gunsaulis et al., 2008)

Elongated
- Horizon 474 oat
- Blaze oat
- Monarch triticale
- AGS 104 rye*

Vegetative
- AR 910 wheat
- OK 101 wheat
- Armor wheat
- Wintergrazer 70 rye

* Approximately three elongated tillers per foot of drill row.
Fall DM Yield (lbs/acre) – Fayetteville (AR) 2004

- **Elongated**
- **Vegetative**

Fayetteville Sampling Date

- Oct 19
- Nov 5
- Nov 16
- Dec 2
- Dec 14
- Dec 29

Yield values for different dates and growth stages.
Blaze Spring Oat (regrowth)
February 15, 2005

Horizon Fall Oat (regrowth)
February 15, 2005
Armor Prograze Wheat →
(regrowth)
February 15, 2005

← OK 101 Wheat
(regrowth)
February 15, 2005
Conclusions:

1. In Arkansas, forages that elongate will out-yield those that remain vegetative by about a 2:1 ratio before winter.

2. Oat will joint and elongate during late fall, but there is very little regrowth potential from oat after jointing.

3. Depending on weather, growth responses can be highly variable.
### Grazing Systems/Management: Comparisons of Autumn and Spring-Seeded Oats at 77 d Post-Seeding (Contreras-Govea and Albrecht, 2006)

<table>
<thead>
<tr>
<th></th>
<th>Autumn&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Spring/Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yield (Mg/ha)</strong></td>
<td>6.7</td>
<td>7.7</td>
</tr>
<tr>
<td><strong>Crude Protein, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaf</td>
<td>24.3</td>
<td>22.0</td>
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<tr>
<td>Stem</td>
<td>11.5</td>
<td>9.0</td>
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<tr>
<td>Whole Plant</td>
<td>18.0</td>
<td>13.5</td>
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<tr>
<td><strong>NDF, %</strong></td>
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<td></td>
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<tr>
<td>Leaf</td>
<td>42.6</td>
<td>46.8</td>
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<tr>
<td>Stem</td>
<td>56.5</td>
<td>70.7</td>
</tr>
<tr>
<td>Whole Plant</td>
<td>52.1</td>
<td>59.6</td>
</tr>
<tr>
<td><strong>Water Soluble CHO, %</strong></td>
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<td></td>
</tr>
<tr>
<td>Leaf</td>
<td>10.3</td>
<td>6.4</td>
</tr>
<tr>
<td>Stem</td>
<td>22.1</td>
<td>6.7</td>
</tr>
</tbody>
</table>

<sup>1</sup> Significant effect of season for all response variables (P ≤ 0.05).
Fall Forage Yield of Oat Cultivars at Prairie du Sac, WI (2006-2007)
NDF (%) – Prairie du Sac, WI (2006-2007)

- Sept 15
- Oct 7
- Nov 1

Oat (4)
Wheat (2)
NDF (%) for Oat Cultivars at Prairie du Sac, WI (2006-2007)
48-h NDFD (% of NDF) vs. Acid-Detergent Lignin

\[ Y = -7.8x + 82.3 \]
\[ r^2 = 0.830 \]
Ogle Oat

**2006**
- 15 Sep – vegetative
- 6 Oct - 3 nodes
- 30 Oct - 4 nodes

**2007**
- 19 Sep – 1 node
- 10 Oct - early boot
- 7 Nov - heading
2006
15 Sep – vegetative
6 Oct - 2 nodes
30 Oct - 2 nodes

2007
19 Sep – 1 node
10 Oct - 4 nodes
7 Nov – 5 nodes
Conclusions:

1. In Wisconsin, cereal-grain forages that elongate during fall will out-yield those that remain vegetative by about a 2:1 ratio before winter.

2. There is very little regrowth potential from oat, especially after jointing occurs.

3. With a planting date about 10 August, there appears to be a yield drag associated with slow-maturing oat cultivars.

4. Fall-grown oat cultivars exhibit different quality characteristics than observed with spring planting dates
   - lower NDF
   - lower lignin
   - greater nonfiber carbohydrates (sugars)
   - greater DM and fiber digestibility
   - relatively stable estimates of TDN
So ..... Which Cultivar Do I Plant? And When?
Effects of Planting Date and Oat Cultivar on Peak Yield of Fall-Grown Oat (Marshfield, WI; 2007-2009)

![Bar chart showing the peak DM yield (lbs/acre) for different oat cultivars and planting dates.]

- Peak DM Yield (lbs/acre)
- July 15
- August 1
- August 15
- Cultivars: Dane, Ogle, Vista, ForagePlus

- July 15: Dane (red), Ogle (blue), Vista (black), ForagePlus (green)
- August 1: Dane (red), Ogle (blue), Vista (black), ForagePlus (green)
- August 15: Dane (red), Ogle (blue), Vista (black), ForagePlus (green)
Effects of Harvest Date on DM Concentration
Effects of Cultivar and Harvest Date on TDN Per Acre (2007-2009)
48-h NDFD (% of NDF) vs. Acid-Detergent Lignin

\[ Y = 0.64x^2 - 11.9x + 89.1 \]

\[ R^2 = 0.949 \]
Conclusions

1. ForagePlus (forage-type) oat is likely to maximize both yield and nutritive value throughout central Wisconsin when planting dates are extended as late as the first week of August.

2. Delayed morphological development allows ForagePlus to benefit more extensively from the physiological process of hardening, in which plants accumulate solutes, especially sugars.

3. These accumulations of sugar tend to stabilize concentrations of NDF, in vitro digestibility, and TDN over late-fall harvest dates.

4. With late establishment (second week of August), the slower developmental rate of ForagePlus becomes an increasing liability.

5. Following late establishment, grain-type cultivars will often out-yield ForagePlus, and differences in nutritive value are much less distinct.
Questions?

U.S. Dairy Forage Research Center