Potential of Intercropping Peas and Oats for Grain and Silage Production
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Introduction
Intercropping is an agricultural practice of cultivating two different crops in the same place at the same time (Andrews & Kassam 1976). Benefits to intercropping can lead to greater yield and quality compared to the sole crop. However, carefully planning and suitable conditions need to occur for each crop to be complementary (creating a higher overall yield), rather than antagonistic (showing reduced yields). Reasons for additional yield with intercropping may be the result of greater efficiency in the use of nutrients, light, and water (Szumigalski & Van Acker 2008). Forage Quality parameters such as crude protein (CP), neutral detergent fiber (NDF) generally improve compared to sole crop parameters (Strydhorst et al. 2008). Harvest timing can be delayed with oat/pea intercrop silage as the peas will maintain a higher moisture value than oats. This intercrop helps lengthen the optimum time period for silage harvesting. Intercropping is not a new concept and has been used by farmers for several generations. However, recent improvements in farm machinery and individual variety characteristics have once again increased producer’s interests in intercropping.

Intercropping is not only measured by total yield of products, but as a total economical value (total Space) by combining each crop value, or by Land Equivalent Ratio (LER). The LER is a measure of how much land would be required to achieve intercrop yields with crops grown as pure stands. When the LER is greater than 1.0, over-yielding is occurring and the intercrop is more productive than the component crops grown as sole crops. When the LER is less than 1.0, no over-yielding is occurring and the sole crops are more productive than the intercrop. For example of an intercrop of pea-oat yield was 1.20, it would take 20% more land to equal that final yield as separate components.

The purpose of this trial was to examine the effect of several seeding rate combinations of pea-oat intercropping on total silage yield, forage quality characteristics, and final grain yield.

Methods

Six rows per plot were direct seeded May 12th into wheat stubble at a depth of 1" using Seed Hawk™ dual knife openers with 9.5" spacing. Soil test was taken prior to seeding. Fertilizer was side band at a rate of 40 lbs/ac N and 30 lbs/ac P. All pea treatments were inoculated with proper granular based Rhizobium leguminosarum bv. Mimosae. Residual soil fertility was relatively low (Table 1). Treatments were arranged in a Randomized Complete Block Design (RCBD) and replicated three times. Through a calculation error the “full rate” for peas was about 33% less than normal. Seeding rates were as follows: 1. Oats full rate (120 lbs/ac) - variety ‘Furlong’ 2. Peas full rate (120 lbs/ac) - variety ‘CDC Striker’ 3. Oat 1/2 rate + Pea 1/2 rate 4. Oat 2/3 rate + Pea 2/3 rate 5. Oat full rate + Pea full rate

Results

There were significant differences in silage yield (p<0.0085) among treatments but not total grain yield and total LER (Table 2).

Table 1: Soil fertility of site prior to seeding

<table>
<thead>
<tr>
<th>Sample</th>
<th>P ppm (alan)</th>
<th>K ppm (alan)</th>
<th>S ppm (alan)</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-6&quot;</td>
<td>12</td>
<td>14</td>
<td>429</td>
<td>16</td>
</tr>
<tr>
<td>6-21&quot;</td>
<td>36</td>
<td>21</td>
<td>33</td>
<td>54</td>
</tr>
</tbody>
</table>

Plots were harvested for silage using a plot flail mower at the soft dough stage of the oats on August 5th. Total dry matter was calculated by determining total plot wet weight and subtracting moisture percentage from subsamples taken at harvest and dried. Dried subsamples were combined into composite samples from all three replicates and set to Central Testing Labs (Winnipeg, MB) to determine feed quality characteristics.

Silage Dry Matter

Forage quality characteristics generally improved for oats when intercropped with peas (Table 3). Multiple parameters such as crude protein, Ca, Mg, K, NDF, and PFF improved when oats were intercropped with peas.

Table 3: Forage quality parameters of various oat and pea intercrop combinations compared to sole crops of oat and pea.

<table>
<thead>
<tr>
<th>Seeding Rate Combination</th>
<th>Grain (kgs/ha)</th>
<th>Silage (kgs/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oat 2/3 rate + Pea 2/3 rate</td>
<td>529</td>
<td>4372</td>
</tr>
<tr>
<td>Oat 2/3 rate + Pea full rate</td>
<td>610</td>
<td>4704</td>
</tr>
<tr>
<td>Oat full rate + Pea 1/2 rate</td>
<td>648</td>
<td>4977</td>
</tr>
<tr>
<td>Oat full rate + Pea full rate</td>
<td>678</td>
<td>5187</td>
</tr>
</tbody>
</table>

There were no significant difference in total grain yield (graph 2) and total LER. However, the variation (CV) was too high (20%) to have confidence in this data. Despite this we did observe that the competitive nature of oats greatly suppressed the yield potential of peas in intercropped treatments (graph 2). Further decrease the results was the higher than usual Oat seeding rate and lower than usual rate for Peas in the trial. By reducing the population of oats significantly (ex. 25% of normal rate) and increasing Peas to full rate, there would be more even intercrop ratio within the grain component and a larger difference in the feed quality.

Conclusions

Intercropping oats and peas proved to boost overall silage dry matter yield and their respective feed quality characteristics compared to sole crops. Oats proved to be highly competitive and dominated the final grain sample when intercropped with peas. A more in-depth combination of seeding rates with less oats in the mixture may encourage a greater potential of peas in the system, and therefore a higher overall yield.

Literature Used

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