Establishment Research

Sunn Hemp Response to Planting Date and Mixes

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What’s the Question?

1) What is the impact of planting date on Sunn hemp biomass production and nitrogen (N) content? 2) Can Sunn hemp be planted in a mixture with sorghum-sudan to reduce seed cost without sacrificing system performance?

Why Does it Matter?

Sunn hemp is a potential cover crop for summer fallow in Wisconsin. Potential applications include prevented plant acres (Wisconsin averaged nearly 74,000 acres annually from 2009 to 2018), intentional fallow for soil improvement in organic systems or following short-season crops.

Warm season annual legumes are relatively untested here, but Sunn hemp performs better than other species in the southern U. S. which is why we believe it can outperform other annual legumes in Wisconsin. Sunn hemp also partitions N in its tissues, concentrating it in leaves and floral heads, leaving the stem with a relatively high carbon: nitrogen ratio. This differential could lead to available N for the following crop through leaf decomposition as well as increased soil organic matter from the recalcitrant stems. Sunn hemp has also demonstrated the ability to suppress many plant-parasitic nematodes and can’t set seed in our climate, eliminating the potential to volunteer. Unfortunately, its seed cost is high relative to other options, so it must produce multiple benefits.

In short...

- Sunn hemp is highly responsive to planting date.
- Relative yield potential declined 1.3% per day from the first planting on June 15th.
- Sunn hemp performs well in warm, dry conditions but does not tolerate saturated soils.
- In a mix with sorghum-sudan, a 50:50 seeding ratio optimizes yield (biomass and N) while reducing seed cost per unit of production.
What are the Results?

We conducted field trials from 2014 to 2017 near East Troy, WI. Sunn hemp was highly responsive to planting date and yield declined linearly from June 15th, the earliest planting date (Figure 1). The relative yield loss was 1.3% per day from June 15th and September 1st plantings either failed to germinate or produced poor stands with inconsequential production. Though not tested, we surmise that planting earlier than mid-June could result in greater biomass yield. Earlier planting dates also had higher C:N ratios at maturity than later dates (37.7 vs. 16.4) indicating a potential for increasing soil organic matter content. Biomass N content is reported in Figure 2. Nitrogen content for the first 3 planting dates were not significantly different due to increased tissue N with advancing planting date.

In warm growing seasons, Sunn hemp performed better (91% greater) under drier conditions and it appears intolerant of wet/saturated soils, especially during July when growing degree day accumulation is greatest.

In a mix with sorghum-sudan, reducing the percentage of Sunn hemp seed not only reduced total seed cost but also decreased its contribution to total biomass yield and N content (Figure 3). Variable seeding ratios in mixes produced similar total biomass yield and N content which were not significantly different from sole-seeded sorghum-sudan and significantly greater than sole-seeded Sunn hemp.

We did not measure N fixation. Presuming that some of the N in Sunn hemp is fixed, to maximize N addition, it should be sole-seeded. To maximize system N retention, sorghum-sudan should be sole-seeded. As a compromise between cost and benefit, a 50:50 ratio appears optimum. Per unit cost of production for biomass, N and C content is presented in Table 1.

<table>
<thead>
<tr>
<th>Ratio SH:SS</th>
<th>DM ($/ton)</th>
<th>N ($/pound)</th>
<th>C ($/ton)</th>
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<tbody>
<tr>
<td>100:0</td>
<td>20.57</td>
<td>0.59</td>
<td>52.49</td>
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<td>6.42</td>
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<td>0:100</td>
<td>4.02</td>
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</tbody>
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Table 1. Estimated per unit cost of production for biomass DM and N, C content based on seed ratio and 2018 seed prices*. (*Avg. of 9 sources)
What’s the Status of the Research? Are There Updates?

These studies were completed in 2017. Beginning in 2019, we will be investigating changes in tissue C:N with planting date, comparing leaves with stems, yield from earlier planting as well as 3 planting ratios (100:0, 50:50 and 0:100 for nematode suppression including soybean cyst nematode.