Influence of Cover Crops on Organic Dry Bean Production Systems

Erin C. Taylor, Karen A. Renner, and Christy L. Sprague

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Organic Reporting Session
Michigan is #1 Organic Dry Bean Producer

- Black beans #1 class produced

- Need to maximize
  - Weed control
  - Nutrient availability
  - Yields

- Cover crops could play an important role fulfilling these needs
IMPACT OF COVER CROPS ON ORGANIC DRY BEANS

- Locations
  - Kellogg Biological Station (Hickory Corners, MI)
  - MSU Student Organic Farm (East Lansing, MI)

- Split plot design
  - Main plot= Cover crop (4)
  - Sub-plot= Bean variety (4)
## Impact of Cover Crops on Organic Dry Beans

<table>
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<th>2010</th>
<th>2011</th>
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<tr>
<td>Clover</td>
<td>Radish</td>
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**Small grain**

- Red clover ‘Marathon’ 11 kg/ha
- Oilseed radish ‘Groundhog’ 12 kg/ha
- Rye ‘Wheeler’ 100-125 kg/ha
- No cover
DRY BEAN VARIETIES

Black-
‘Zorro’ & ‘Black Velvet’

Navy-
‘Vista’ and R99 (no-nod)
MEASURING COVER CROP IMPACT

- Weed biomass
  - After tined weeding and rotary hoeing (V2)
  - After cultivation was complete (R5)

- Nitrogen availability
  - Soil samples (Fall, @ planting, V2, R1, R5, Harvest)
  - Ion exchange resin strips (changed every 2 weeks)
  - Chlorophyll content (V2, R1, R5)
  - Seed nitrogen content
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  - Chlorophyll content (V2, R1, R5)
  - Seed nitrogen content

- Bean populations (V2 & Harvest) and yields
**Peak Cover Crop Biomass**

- **Dry biomass (lbs/A)**
  - Clover
  - Radish
  - Rye
  - No cover

**Locations:**
- KBS
- SOF
KBS > 3,000 LBS/A

SOF > 1,000 LBS/A
KBS > 1,500 LBS/A
SOF > 6,000 LBS/A
Bean varieties

- Did not respond differently to cover crop treatments
- Combined for analysis
Weed Dry Biomass (V2)

No effect of cover @ R5
NITROGEN: CHLOROPHYLL CONTENT (V2)

No effect of cover @ R1 and R5
**NITROGEN: SOF SOIL SAMPLES**

![Graph showing nitrate levels over time for different cover crops.](image-url)

- **X-axis:** Date
- **Y-axis:** Nitrate (mg/kg)
- **Legend:**
  - Purple: Clover
  - Orange: Radish
  - Green: Rye
  - Gray squares: No cover

Dates and corresponding nitrate levels:
- **6/6/11:** Clover (A), No cover (B), Radish (AB)
- **6/20/11:** Clover (A), No cover (AB), Radish (B)
- **7/4/11:** Clover (A), No cover (B), Radish (AB)
- **7/18/11:** Clover (A), No cover (B), Radish (AB)
- **8/1/11:** Clover (A), No cover (B), Radish (AB)
- **8/15/11:** Clover (A), No cover (B), Radish (AB)
- **8/29/11:** Clover (A), No cover (B), Radish (AB)

Note: The graph indicates the relative levels of nitrate for different cover crops over time, with specific dates showing varying levels of nitrate for each category.
Did not pick up significant difference among cover crops at any timing

4-6 weeks after planting = peak nitrate availability, similar to soil samples
**DRY BEAN POPULATIONS (V2)**

*Planting population = 120,000 seeds/A*
Dry Bean Yield

Yield (cwt/A)

KBS

SOF

Legend:
- Clover
- Radish
- Rye
- No cover

NS
# Yields: KBS

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<tr>
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<th>Clover 28.2</th>
<th>Rye 24.3</th>
<th>Oilseed 26.8</th>
<th>No Cover 26.4</th>
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<td>30.5</td>
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<td>R99 23.4B</td>
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# YIELDS: SOF

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CONCLUSIONS AFTER YEAR 1

KBS
- Cover crop biomass
- Weed suppression (V2)
- Bean populations (Harvest)
- Soil nitrate (V2)

SOF
- Cover crop biomass
- Weed suppression (V2)
- Bean yield
- Chlorophyll content (V2)
- Bean populations (Harvest)
- Soil nitrate (V2)

Legend:
- Clover
- Radish
- Rye
- No cover
CONCLUSIONS AFTER YEAR 1

- Cover crops suppressed weeds for dry bean crop
- Dry bean yields can be reduced if rye is incorporated late
- Increased chlorophyll/nitrogen content and soil availability at the V2 stage (following clover or oilseed radish) did not translate into greater yields
  - Was seed N/protein increased?
**Future Directions**

- Repeat experiment for 2 additional years
- Concurrently conduct larger scale trials on Michigan farms looking at the effect of cover crops on organic dry beans (see poster)
ACKNOWLEDGEMENTS

- Funding provided by the USDA-Organic Research and Extension Initiative
- MSU weed science crew
- MSU-SOF
- MSU-KBS
# YIELDS: ON-FARM

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