**Final Report**

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**Impact of previous crop on soybean and canola yield**

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Situation

Some farmers desire to include both soybean and canola in their crop rotation. Some research and farmer experience indicate that soybeans grow just as well on canola ground as on wheat ground. Since both crops are moderately susceptible to sclerotinia stem rot, some farmers have avoided planting them close together in a crop rotation. However, while not ideal from a sclerotinia standpoint, there is some evidence there may be an advantage to growing soybean on canola ground or vice versa. Growers want to know if this synergism is real and, if so, is it great enough to offset the risk of growing two sclerotinia-susceptible crops back to back. This study is designed to test that theory in the northern plains where soybean and canola are commonly grown. If the hypothesis is true, then the main benefit would be potentially higher soybean yields following a profitable canola crop.

Research Objectives:

1: Determine if soybean yield is greater following canola than wheat

2: Determine if canola yield is greater following soybean than wheat

Methods:

These objectives were accomplished using a 3-year crop sequence to evaluate soybean and canola production grown back-to-back. Crops were grown as shown in Table 1 and Table 2 below. For example, treatment 1 consisted of Wheat-Wheat-Soybean (W-W-S) and Treatment 2 consisted of Wheat-Canola-Soybean (W-C-S). The two treatments could only be compared after year 2015 and 2016. Canola following wheat or soybean were compared in Treatments 3 and 4.

|  |
| --- |
| Table 1. Planned crop sequence to evaluate effect of previous crop on soybean and canola yield. |
| Treatment | 2013 | 2014 | 2015 |
| 1 | Wheat | Wheat | Soybean |
| 2 | Wheat | Canola | Soybean |
|  |  |  |  |
| 3 | Wheat | Wheat | Canola |
| 4 | Wheat | Soybean | Canola |

|  |
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| Table 2. Repeat of planned crop sequence in Table 1. |
| Treatment | 2014 | 2015 | 2016 |
| 1 | Wheat | Wheat | Soybean |
| 2 | Wheat | Canola | Soybean |
|  |  |  |  |
| 3 | Wheat | Wheat | Canola |
| 4 | Wheat | Soybean | Canola |

**Research Results:**

Below are the 2013-2015 results for soybean grown on wheat (W-W-S) compared to soybean grown on canola ground (W-C-S).

Minot

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | bu/A | lb/bu | ---%--- |
| **W-W-S** | **4.5 a** | **22.9 a** | **32.7 a** | **58.2 a** | **15.9 a** |
| **W-C-S** | **5.1 a** | **20.9 a** | **32.8 a** | **58.3 a** | **16.2 a** |

Langdon

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | bu/A | lb/bu | ---%--- |
| **W-W-S** | **5.3 a** | **38.3 a** | **39.5 a** | **57.3 a** | **15.9 a** |
| **W-C-S** | **6.3 a** | **37.2 a** | **41.1 a** | **57.0 b** | **16.1 a** |

Carrington

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | bu/A | lb/bu | ---%--- |
| **W-W-S** | **5.0 a** | **26.1 a** | **34.9 a** | **58.0 a** | **xx.x a** |
| **W-C-S** | **4.7 a** | **23.0 b** | **33.5 a** | **58.2 a** | **xx.x a** |

There was no significant difference in yield at any location between soybean grown on wheat ground compared to soybean grown on canola ground. Generally, there were no differences in crop density, height, test weight, and oil content. At Carrington, soybean height was greater for soybean grown on wheat, but there was no difference in height at Minot and Langdon. These differences were minor.

Below are the 2013-2015 results for canola grown on wheat (W-W-C) compared to canola grown on soybean ground (W-S-C).

Minot

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | lb/A | lb/bu | ---%--- |
| **W-W-C** | **10.7 a** | **28.3 a** | **2005 a** | **51.5 a** | **40.4 a** |
| **W-S-C** | **9.1 a** | **28.7 a** | **2213 a** | **51.7 a** | **39.4 b** |

Langdon

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | lb/A | lb/bu | ---%--- |
| **W-W-C** | **12.4 a** | **56.7 a** | **3335 a** | **51.9 a** | **49.3 a** |
| **W-S-C** | **11.6 a** | **56.2 a** | **3330 a** | **52.1 a** | **48.4 a** |

Carrington

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | lb/A | lb/bu | ---%--- |
| **W-W-C** | **11.1 a** | **41.1 a** | **2150 a** | **52.0 a** | **43.1 a** |
| **W-S-C** | **12.6 a** | **41.2 a** | **1976 a** | **52.2 a** | **43.1 a** |

Roseau

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | lb/A | lb/bu | ---%--- |
| **W-W-C** | **9.3 a** | **41.1 a** | **1430 a** | ---- | **52.0 a** |
| **W-S-C** | **8.4 a** | **41.1 a** | **1817 b** | ---- | **49.0 b** |

There was essentially no significant difference at any of the three ND locations for the variables measured. Canola yield, test weight, height, density, and oil were similar whether canola was grown on wheat ground or soybean ground. At Roseau, canola yield was greater on soybean ground than wheat ground.

Below are the 2014-2016 results for soybean grown on wheat (W-W-S) compared to soybean grown on canola ground (W-C-S).

Minot

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | bu/A | lb/bu | ---%--- |
| **W-W-S** | **6.7 a** | **33.0 a** | **33.9 a** | **58.7 a** | **xx.x** |
| **W-C-S** | **7.1 a** | **30.4 a** | **31.0 a** | **58.5 a** | **xx.x** |

Langdon

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | bu/A | lb/bu | ---%--- |
| **W-W-S** | **7.0 a** | **37.1 a** | **54.8 a** | **57.1 a** | **15.0 a** |
| **W-C-S** | **5.5 a** | **38.8 a** | **56.1 a** | **57.3 a** | **14.8 a** |

Carrington

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | bu/A | lb/bu | ---%--- |
| **W-W-S** | **4.0 a** | **29.1 a** | **51.3 a** | **55.5 a** | **15.7 a** |
| **W-C-S** | **4.4 a** | **29.1 a** | **48.5 a** | **56.9 a** |  **14.8 a** |

Roseau

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | bu/A | lb/bu | ---%--- |
| **W-W-S** | **4.2 a** | **53.3 a** | **50.6 a** | **----** | **----** |
| **W-C-S** | **3.5 a** | **53.3 a** | **55.4 a** | **----** | **----** |

There were no statistical differences at any of the four locations for soybean on wheat compared to soybean on canola ground.

Below are the 2014-2016 results for canola grown on wheat (W-W-C) compared to canola grown on soybean ground (W-S-C).

Minot

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | lb/A | lb/bu | ---%--- |
| **W-W-C** | **10.3 a** | **38.4 a** | **1892 a** | **50.1 a** | **xx.x** |
| **W-S-C** | **11.0 a** | **37.7 a** | **1825 a** | **50.2 a** | **xx.x** |

Langdon

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | lb/A | lb/bu | ---%--- |
| **W-W-C** | **13.4 a** | **48.0 a** | **2840 a** | **52.4 a** | **48.1 a** |
| **W-S-C** | **12.9 a** | **47.5 a** | **2756 a** | **52.6 a** | **48.7 a** |

Carrington

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | lb/A | lb/bu | ---%--- |
| **W-W-C** | **9.3 a** | **29.6 a** | **2008 a** | **42.6 a** | **38.5 a** |
| **W-S-C** | **9.9 a** | **29.5 a** | **2105 a** | **43.6 a** | **40.2 a** |

Roseau

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rotation** | **Density** | **Height** | **Yield** | **Test wt** | **Oil** |
|  | sq ft | in | lb/A | lb/bu | ---%--- |
| **W-W-C** | **11.5 a** | **43.0 a** | **2309 a** | **----** | **48.1 a** |
| **W-S-C** | **11.8 a** | **46.0 a** | **2546 a** | **----** | **48.2 a** |

There were no statistical differences at any of the four locations for canola on wheat compared to canola on soybean ground.

Discussion:

We conducted the study for two rotation cycles. In general, we observed no significant advantage or disadvantage from growing soybean on canola ground or from growing canola on soybean ground. Sclerotinia incidence was very low at all locations. This can be viewed as a positive situation for farmers that want to grow both soybean and canola in a rotation with wheat. Based on this information, it appears that farmers can profitably have both soybean and canola in a rotation. However, farmers must monitor for sclerotinia and make the necessary fungicide applications if weather conditions favor sclerotinia.