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Evaluation of Soybean Cyst Nematode Seed Treatments

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**What is the objective of this project?**

The goal of this project is to evaluate the efficacy of nematicide seed treatments for the soybean cyst nematode.

**Why is this research important to farmers?**

Soybean Cyst Nematode (SCN) is the most important yield-limiting disease threat to soybean production in the United States. SCN is a parasitic worm that lives and reproduces on soybean roots, severely stresses plants, and can cause very high yield loss. In 2003, SCN was found in North Dakota for the first time, and has continued to spread throughout the state.

Management tools are available which include resistant varieties, good crop rotation strategies, and, possibly, nematicide seed treatments. Nematicide seed treatments may provide an additional management tool to manage SCN, especially in situations where very high egg levels exist or the nematode is beginning to overcome the resistance in PI88788. While the pathogen is still managed by PI88788 in the vast majority of ND, we do have areas of very high egg levels.

However, before growers use these, it is important to evaluate the seed treatment products locally. One of the primary seed treatments is a biological (Clariva), which is likely sensitive to local environments. Importantly, if the seed treatment products do not effectively manage SCN in our environment, it is important that growers do not incur this extra input cost.

**How is this project conducted?**

Eight SCN seed treatment trials were established in four fields with high egg levels (as determined by 2015 fall sampling) near Wyndmere, Absaraka, Prosper, and Galesburg. Syngenta and Bayer products were evaluated in separate but adjacent trials. All SCN seed treatment trials were planted in a randomized complete block design. Plots were initially planted in 22 feet row lengths by 10 feet wide. After allies were cut, total plot area was 14 feet long by 10 feet wide. The 2016 trials in Wyndmere, Absaraka, Prosper, and Galesburg were planted on May 7, May 9, May 8, and May 6, respectively, and harvested on October 2, October 3, October 13, and October 8, respectively.

To determine early season and harvest egg levels, ten oil cores were taken from the center two rows of each soybean plot using a one inch soil probe, approximately two inches from the plant stems. Samples were mixed, bagged, kept cool and brought to the NDSU diagnostic laboratory for assessment. Total number of cysts on root were evaluated by arbitrarily extracting ten plants per plot. Plants were cleaned gently with water and cysts were visually counted. Additional diseases were evaluated visually, including Sudden Death Syndrome (SDS) and Brown Stem Rot (BSR).

**What are the results?**

In each location, egg levels were relatively low, which was likely due to a relatively unfavorable season for SCN development (Tables 1-8). Relatively low egg levels made it difficult to separate treatments. However, statistical differences in some measures at some locations were observed. Early phytotoxicity was observed with ILeVO treatments, but it was limited to cotyledons and was not observed by the second evaluation. This was not surprising, as ILeVO is known to express a ‘halo effect’ on cotyledon edges. Sudden Death Syndrome and Brown Stem Rot were not observed. Although statistical differences in yield were not found, treatments with a nematicide generally had a numerically higher yield than the standard base packages. Evaluation of these seed treatments in future years will be critical to assess their efficacy, particularly in a higher disease pressure environment.

Table 1. Evaluation of Syngenta seed treatments for nematode management in **Wyndmere, ND**, 2016.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Treatment | Egg Count (#egg & J2/100 cc soil)a | | Phytotoxicity Incidence (%) | | Phytotoxicity Severity (%) | | Stand Count (25 sq ft) | | Cyst Count (10 plants/plot)b | BSR Incidence (%)c | SDS Incidence (%)c | Yield (bu/ac) |
|  | 6/7 | 9/19 | 6/7 | 6/20 | 6/7 | 6/20 | 6/7 | 6/20 | 7/13 | 9/7 | 9/7 | 10/2 |
| CruiserMaxx Vibrance | 232 | 920 | 3.2 | 0 | 2.7 | 0 | 167.2 | 159.3 | 6.5 | 0 | 0 | 55.093 |
| Clariva Complete Beans | 261.3 | 1088 | 0.3 | 0 | 0.3 | 0 | 156.5 | 155.5 | 5.32 | 0 | 0 | 55.133 |
| Clariva Complete Beans + Mertect 340F | 293.3 | 800 | 9 | 0 | 5.2 | 0 | 157.8 | 153.7 | 5.92 | 0 | 0 | 56.235 |
| LSD P=.05 | 245.95 | 544.5 | 10.66 | . | 5.85 | . | 15.59 | 8.95 | 3.529 | . | . | 2.6799 |
| Standard Deviation | 191.19 | 423.27 | 8.28 | 0 | 4.54 | 0 | 12.12 | 6.96 | 2.743 | 0 | 0 | 2.0832 |
| CV | 72.91 | 45.22 | 198.83 | 0 | 166.95 | 0 | 7.55 | 4.46 | 46.4 | 0 | 0 | 3.75 |

a10 soil cores were taken from the center two rows of each soybean plot using a one inch soil probe, approximately two inches from the plant stems. Samples were mixed, bagged, kept cool and brought to the NDSU diagnostic laboratory for assessment.

bTen plants per plot were arbitrarily extracted, cleaned gently with water, and cysts were visually counted.

cSudden Death Syndrome (SDS) and Brown Stem Rot (BSR) were visually assessed in each plot at approximately growth stages R5-R6

Table 2. Evaluation of Syngenta seed treatments for nematode management in **Absaraka, ND**, 2016.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Treatment | Egg Count (#egg & J2/100 cc soil)a | | Phytotoxicity Incidence (%) | | Phytotoxicity Severity (%) | | Stand Count (25 sq ft) | | Cyst Count (10 plants/plot)b | BSR Incidence (%)c | SDS Incidence (%)c | Yield (bu/ac) |
|  | 6/7 | 9/1 | 6/7 | 6/20 | 6/7 | 6/20 | 6/7 | 6/20 | 7/13 | 9/7 | 9/7 | 10/3 |
| CruiserMaxx Vibrance | 1607.2 | 2800 | 0 | 0 | 0 | 0 | 172 | 162.5 | 7.33 | 0 | 0 | 37.5 |
| Clariva Complete Beans | 1384 | 2400 | 0.3 | 0 | 0.3 | 0 | 156.3 | 169.2 | 2.22 | 0 | 0 | 35.49 |
| Clariva Complete Beans + Mertect 340F | 1994.7 | 2058 | 17.3 | 0 | 11 | 0 | 143.8 | 170 | 2.42 | 0 | 0 | 38.04 |
| LSD P=.05 | 1222.08 | 805.22 | 7.6 | . | 3.44 | . | 36.08 | 20.43 | 10.803 | . | . | 5.6216 |
| Standard Deviation | 949.99 | 625.94 | 5.91 | 0 | 2.67 | 0 | 28.05 | 15.88 | 8.398 | 0 | 0 | 4.37 |
| CV | 57.16 | 25.87 | 100.3 | 0 | 70.81 | 0 | 17.82 | 9.5 | 210.54 | 0 | 0 | 11.81 |

a10 soil cores were taken from the center two rows of each soybean plot using a one inch soil probe, approximately two inches from the plant stems. Samples were mixed, bagged, kept cool and brought to the NDSU diagnostic laboratory for assessment.

bTen plants per plot were arbitrarily extracted, cleaned gently with water, and cysts were visually counted.

cSudden Death Syndrome (SDS) and Brown Stem Rot (BSR) were visually assessed in each plot at approximately growth stages R5-R6

Table 3. Evaluation of Syngenta seed treatments for nematode management in **Prosper, ND**, 2016.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Treatment | Egg Count (#egg & J2/100 cc soil)a | | Phytotoxicity Incidence (%) | | Phytotoxicity Severity (%) | | Stand Count (25 sq ft) | | Cyst Count (10 plants/plot)b | BSR Incidence (%)c | SDS Incidence (%)c | Yield (bu/ac) |
|  | 6/8 | 9/22 | 6/8 | 6/21 | 6/8 | 6/21 | 6/8 | 6/21 | 7/20 | 9/7 | 9/7 | 10/13 |
| CruiserMaxx Vibrance | 970.7 | 957.3 | 0.3 | 0 | 1.2 | 0 | 179.7 | 182.2 | 0.88 | 0 | 0 | 48.66 |
| Clariva Complete Beans | 752 | 741.3 | 0.7 | 0 | 1.5 | 0 | 167.5 | 185 | 1.07 | 0 | 0 | 48.89 |
| Clariva Complete Beans + Mertect 340F | 765.3 | 1184 | 40.8 | 0 | 12.2 | 0 | 186.3 | 185.5 | 1.58 | 0 | 0 | 48.36 |
| LSD P=.05 | 795.94 | 649.88 | 17.74 | . | 5.1 | . | 28.4 | 8.41 | 0.782 | . | . | 4.1693 |
| Standard Deviation | 618.73 | 505.19 | 13.79 | 0 | 3.96 | 0 | 22.08 | 6.54 | 0.608 | 0 | 0 | 3.241 |
| CV | 69.05 | 52.57 | 98.88 | 0 | 80.11 | 0 | 12.42 | 3.55 | 51.64 | 0 | 0 | 6.66 |

a10 soil cores were taken from the center two rows of each soybean plot using a one inch soil probe, approximately two inches from the plant stems. Samples were mixed, bagged, kept cool and brought to the NDSU diagnostic laboratory for assessment.

bTen plants per plot were arbitrarily extracted, cleaned gently with water, and cysts were visually counted.

cSudden Death Syndrome (SDS) and Brown Stem Rot (BSR) were visually assessed in each plot at approximately growth stages R5-R6

Table 4. Evaluation of Syngenta seed treatments for nematode management in **Galesburg, ND**, 2016.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Treatment | Egg Count (#egg & J2/100 cc soil)a | | Phytotoxicity Incidence (%) | | Phytotoxicity Severity (%) | | Stand Count (25 sq ft) | | Cyst Count (10 plants/plot)b | BSR Incidence (%)c | SDS Incidence (%)c | Yield (bu/ac) |
|  | 6/8 | 9/9 | 6/8 | 6/21 | 6/8 | 6/21 | 6/8 | 6/21 | 7/20 | 9/7 | 9/7 | 10/13 |
| CruiserMaxx Vibrance | 458.7 | 85.3 | 0 | 0 | 0 | 0 | 167.3 | 172.8 | 0.87 | 0 | 0 | 55.59 |
| Clariva Complete Beans | 426.7 | 296 | 0 | 0 | 0 | 0 | 176.8 | 178 | 0.88 | 0 | 0 | 62.33 |
| Clariva Complete Beans + Mertect 340F | 421.3 | 173.3 | 46.7 | 0 | 14.8 | 0 | 184.2 | 181.8 | 1.82 | 0 | 0 | 62.67 |
| LSD P=.05 | 364 | 244.774 | 14.6 | . | 6.24 | . | 9.23 | 9.26 | 1.874 | . | . | 6.8498 |
| Standard Deviation | 282.96 | 190.25 | 11.35 | 0 | 4.85 | 0 | 7.17 | 7.2 | 1.457 | 0 | 0 | 5.3247 |
| CV | 64.96 | 102.9 | 72.98 | 0 | 98.09 | 0 | 4.07 | 4.05 | 122.54 | 0 | 0 | 8.85 |

a10 soil cores were taken from the center two rows of each soybean plot using a one inch soil probe, approximately two inches from the plant stems. Samples were mixed, bagged, kept cool and brought to the NDSU diagnostic laboratory for assessment.

bTen plants per plot were arbitrarily extracted, cleaned gently with water, and cysts were visually counted.

cSudden Death Syndrome (SDS) and Brown Stem Rot (BSR) were visually assessed in each plot at approximately growth stages R5-R6

Table 5. Evaluation of Bayer seed treatments for nematode management in **Wyndmere, ND**, 2016.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Treatment | Egg Count (#egg & J2/100 cc soil)a | | Phytotoxicity Incidence (%) | | Phytotoxicity Severity (%) | | Stand Count (25 sq ft) | | Cyst Count (10 plants/plot)b | BSR Incidence (%)c | SDS Incidence (%)c | Yield (bu/ac) |
|  | 6/7 | 9/19 | 6/7 | 6/20 | 6/7 | 6/20 | 6/7 | 6/20 | 7/13 | 9/7 | 9/7 | 10/2 |
| Base package | 189.3 | 1056 | 0 | 0 | 0 | 0 | 123.2 | 146 | 17.03 | 0 | 0 | 42.26 |
| Poncho Votivo | 136 | 2976 | 0 | 0 | 0 | 0 | 132.3 | 156.2 | 11.9 | 0 | 0 | 46.98 |
| ILeVO | 205.3 | 1701.3 | 80 | 0 | 17.5 | 0 | 132.7 | 134.5 | 11.48 | 0 | 0 | 45.01 |
| Poncho Votivo + ILeVO | 242.7 | 2210.7 | 20 | 0 | 19 | 0 | 138 | 147.7 | 8.82 | 0 | 0 | 47.63 |
| LSD P=.05 | 159.24 | 1749.29 | 7.78 | . | 16.3 | . | 13.38 | 12.5 | 9.104 | . | . | 7.8045 |
| Standard Deviation | 129.4 | 1421.5 | 6.32 | 0 | 13.25 | 0 | 10.87 | 10.15 | 7.398 | 0 | 0 | 6.3421 |
| CV | 66.93 | 71.58 | 25.3 | 0 | 145.17 | 0 | 8.27 | 6.95 | 60.11 | 0 | 0 | 13.95 |

a10 soil cores were taken from the center two rows of each soybean plot using a one inch soil probe, approximately two inches from the plant stems. Samples were mixed, bagged, kept cool and brought to the NDSU diagnostic laboratory for assessment.

bTen plants per plot were arbitrarily extracted, cleaned gently with water, and cysts were visually counted.

cSudden Death Syndrome (SDS) and Brown Stem Rot (BSR) were visually assessed in each plot at approximately growth stages R5-R6

Table 6. Evaluation of Bayer seed treatments for nematode management in **Absaraka, ND**, 2016.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Treatment | Egg Count (#egg & J2/100 cc soil)a | | Phytotoxicity Incidence (%) | | Phytotoxicity Severity (%) | | Stand Count (25 sq ft) | | Cyst Count (10 plants/plot)b | BSR Incidence (%)c | SDS Incidence (%)c | Yield (bu/ac) |
|  | 6/7 | 9/1 | 6/7 | 6/20 | 6/7 | 6/20 | 6/7 | 6/20 | 7/13 | 9/7 | 9/7 | 10/3 |
| Base package | 1346.7 | 6378.7 | 0 | 0 | 0 | 0 | 141 | 174.2 | 12.27 | 0 | 0 | 29.89 |
| Poncho Votivo | 1194.7 | 5400 | 0 | 0 | 0 | 0 | 131.7 | 171.2 | 14.82 | 0 | 0 | 31.3 |
| ILeVO | 600 | 9360 | 75 | 3.7 | 14.8 | 3.7 | 123.2 | 166.8 | 14.45 | 0 | 0 | 35.07 |
| Poncho Votivo + ILeVO | 1194.7 | 5917.3 | 27.5 | 5 | 19.8 | 2.3 | 115.5 | 167.8 | 10.1 | 0 | 0 | 34.23 |
| LSD P=.05 | 880.22 | 5144.6 | 5.76 | 6.55 | 8.92 | 4.71 | 22.13 | 16.47 | 10.678 | . | . | 6.2307 |
| Standard Deviation | 715.28 | 4180.59 | 4.68 | 5.32 | 7.24 | 3.83 | 17.98 | 13.39 | 8.677 | 0 | 0 | 5.0632 |
| CV | 65.99 | 61.81 | 18.25 | 245.67 | 83.6 | 255.12 | 14.06 | 7.87 | 67.22 | 0 | 0 | 15.52 |

a10 soil cores were taken from the center two rows of each soybean plot using a one inch soil probe, approximately two inches from the plant stems. Samples were mixed, bagged, kept cool and brought to the NDSU diagnostic laboratory for assessment.

bTen plants per plot were arbitrarily extracted, cleaned gently with water, and cysts were visually counted.

cSudden Death Syndrome (SDS) and Brown Stem Rot (BSR) were visually assessed in each plot at approximately growth stages R5-R6

Table 7. Evaluation of Bayer seed treatments for nematode management in **Prosper, ND**, 2016.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Treatment | Egg Count (#egg & J2/100 cc soil)a | | Phytotoxicity Incidence (%) | | Phytotoxicity Severity (%) | | Stand Count (25 sq ft) | | Cyst Count (10 plants/plot)b | BSR Incidence (%)c | SDS Incidence (%)c | Yield (bu/ac) |
|  | 6/8 | 9/22 | 6/8 | 6/21 | 6/8 | 6/21 | 6/8 | 6/21 | 7/20 | 9/7 | 9/7 | 10/13 |
| Base package | 602.7 | 2301.3 | 1.5 | 0 | 0.7 | 0 | 154 | 168.2 | 6.7 | 0 | 0 | 7.463 |
| Poncho Votivo | 637.3 | 1981.3 | 8.7 | 0 | 1 | 0 | 158 | 163.2 | 10.08 | 0 | 0 | 5.445 |
| ILeVO | 778.7 | 2840 | 77.3 | 0 | 23.2 | 0 | 149 | 165.2 | 4.15 | 0 | 0 | 6.473 |
| Poncho Votivo + ILeVO | 352 | 2541.3 | 82.5 | 0 | 22.5 | 0 | 148.8 | 161.7 | 8.85 | 0 | 0 | 9.482 |
| LSD P=.05 | 465.66 | 1381.6 | 23.94 | . | 10.54 | . | 9.53 | 8.89 | 9.21 | . | . | 5.8671 |
| Standard Deviation | 378.4 | 1122.71 | 19.45 | 0 | 8.57 | 0 | 7.75 | 7.23 | 7.484 | 0 | 0 | 4.7677 |
| CV | 63.85 | 46.47 | 45.77 | 0 | 72.39 | 0 | 5.08 | 4.39 | 100.51 | 0 | 0 | 66.07 |

a10 soil cores were taken from the center two rows of each soybean plot using a one inch soil probe, approximately two inches from the plant stems. Samples were mixed, bagged, kept cool and brought to the NDSU diagnostic laboratory for assessment.

bTen plants per plot were arbitrarily extracted, cleaned gently with water, and cysts were visually counted.

cSudden Death Syndrome (SDS) and Brown Stem Rot (BSR) were visually assessed in each plot at approximately growth stages R5-R6

Table 8. Evaluation of Bayer seed treatments for nematode management in **Galesburg, ND**, 2016.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Treatment | Egg Count (#egg & J2/100 cc soil)a | | Phytotoxicity Incidence (%) | | Phytotoxicity Severity (%) | | Stand Count (25 sq ft) | | Cyst Count (10 plants/plot)b | BSR Incidence (%)c | SDS Incidence (%)c | Yield (bu/ac) |
|  | 6/8 | 9/9 | 6/8 | 6/21 | 6/8 | 6/21 | 6/8 | 6/21 | 7/20 | 9/7 | 9/7 | 10/13 |
| Base package | 826.7 | 514.7 | 47.5 | 0 | 7.7 | 0 | 139.8 | 155.5 | 12.5 | 0 | 0 | 46.15 |
| Poncho Votivo | 530.7 | 981.3 | 16.7 | 0 | 5 | 0 | 135.8 | 159.2 | 3.93 | 0 | 0 | 48.77 |
| ILeVO | 836.3 | 520 | 25.8 | 0 | 5.3 | 0 | 141.8 | 146.2 | 14.25 | 0 | 0 | 51.74 |
| Poncho Votivo + ILeVO | 526.7 | 480 | 54.5 | 0 | 16 | 0 | 146.3 | 169.5 | 14.78 | 0 | 0 | 49.12 |
| LSD P=.05 | 497.57 | 731.68 | 47.54 | . | 13.73 | . | 18.45 | 24.97 | 20.417 | . | . | 8.812 |
| Standard Deviation | 404.34 | 594.58 | 38.63 | 0 | 11.16 | 0 | 14.99 | 20.29 | 16.591 | 0 | 0 | 7.1608 |
| CV | 53.55 | 95.28 | 106.95 | 0 | 131.24 | 0 | 10.63 | 12.87 | 145.96 | 0 | 0 | 14.63 |

a10 soil cores were taken from the center two rows of each soybean plot using a one inch soil probe, approximately two inches from the plant stems. Samples were mixed, bagged, kept cool and brought to the NDSU diagnostic laboratory for assessment.

bTen plants per plot were arbitrarily extracted, cleaned gently with water, and cysts were visually counted.

cSudden Death Syndrome (SDS) and Brown Stem Rot (BSR) were visually assessed in each plot at approximately growth stages R5-R6