Evaluating Soybean Pod Set and Retention Strategies

Purpose:

The vast majority of soybean yield gains achieved by producers over the last 30 years have come from new varieties developed through plant breeding. Soybean growers are seeking agronomic solutions to further increase soybean yields. The soybean plant has incredible yield potential which has been shown to be in excess of 100 bu/ac. A typical soybean plant produces many more flowers (Figure 1.) and pods during the growing season than are taken to yield. About 60 to 75 percent of all soybean flowers produced end up aborting, never contributing to yield. About half this abortion occurs before the flowers develop into young pods while the other half is due to pod abortion. The reason why such a large percentage of flowers and pods are aborted is not well understood. Various strategies have been suggested that could help the plant retain more pods, including increasing stress, reducing stress, stem cutting, growth hormones, and biostimulants. This project assessed various management strategies that were intended to increase the plants ability to set and retain additional pods during the reproductive growth stages, with the aim of increasing crop yields.

Figure 1. Flowering Cluster of Soybean

Methods:

Treatments were designed to add nutrients, stress, or protection at various times during the plant development cycle. These strategies fell into four categories:

A. stem cutting, growth stimulators and foliar fungicides (Treatments 1-8, below),
B. improving soil fertility and applying late season nitrogen to decrease plant stress (Treatments 9-12, below),
C. foliar feeding combined with biostimulants (Treatments 14-15, below),

D. a combination of the previous three strategies (Treatments 16-18, below). The treatments used in the trials are listed below, with soybeans planted in 15” rows at a population of 185,000 seeds/acre unless otherwise noted:

Table 1. Treatment Listing

1. Control (Untreated)
2. Stem Cutting at the V1 growth stage
3. Stem Cutting at V3
4. GRX applied at V3
5. GRX applied at V3 and GRX applied at R2
6. GRX + Priaxor foliar fungicide applied at V3 and GRX + Priaxor applied at R2
7. GRX + Cobra herbicide applied at V3 and GRX applied at R2
8. GRX + Priaxor + Cobra at V3 and GRX + Priaxor at R2
9. Potassium Thiosulphate applied by Y-drop sprayer nozzle at R2
10. 0-0-60 @ 105 lbs/ac broadcast
11. 0-0-60 @ 105 lbs/ac broadcast + MESZ @ 187 lbs/ac applied in a 2”x2” band
12. 0-0-60 @ 105 lbs/ac broadcast + MESZ @ 187 lbs/ac applied in a 2”x2” band and Nitrogen @ 170 lbs/ac broadcast at R3
13. Untreated 30” rows planted at 120,000 seeds/acre
14. 30” rows + SoyPowerPK (in-furrow), PercN Phos at V1, PercN Phos at V4, CropKarb at R3 and CropKarb at R4
15. 15” rows + SoyPowerPK (in-furrow), PercN Phos at V1, PercN Phos at V4, CropKarb at R3 and CropKarb at R4
16. 15” rows + SoyPowerPK (in-furrow), PercN Phos at V1, PercN Phos at V4, CropKarb at R3, CropKarb at R4, 0-0-60 @ 105 lbs/ac broadcast + MESZ @ 187 lbs/ac applied in a 2”x2” band and Nitrogen @ 170 lbs/ac broadcast at R3
17. 15” rows + SoyPowerPK (in-furrow), PercN Phos at V1, PercN Phos at V4, CropKarb at R3, CropKarb at R4, 0-0-60 @ 105 lbs/ac broadcast + MESZ @ 187 lbs/ac applied in a 2”x2” band, Nitrogen @ 170 lbs/ac broadcast at R3, GRX + Priaxor at V3, Mn at V4 and GRX + Priaxor at R2
18. Same as Treatment 17, using a second soybean variety

Trials were planted with a Kearney 15” John Deere custom planter. Applications of in-furrow liquid inputs and 2”x2” fertilizer bands were applied using planter add-ons. Foliar application of herbicide, fungicide, and foliar fertilizers were applied by a 40 foot Hardi 3 point hitch sprayer at the growth stages indicated in the treatment list above.

Trial sites were established at three locations in 2014; Bornholm (Perth), Lucan (Middlesex) and St. Thomas (Elgin). Each treatment was 20’ X 90’ and replicated 3 times.

Results:

Table 2 shows yield results from three trial locations in 2014. Average yields were calculated from 3 replications at each site.

Table 2. Soybean Yield Response to Pod Set and Retention Treatments across all Sites in 2014

Trt #	Treatment Name	Average Yield at Location (bu/ac)			Average Yield across all Locations (bu/ac)	Yield Advantage (bu/ac)
		St. Thomas	Lucan	Perth		
1	See Treatment List above.	57.3	45.9	54.4	52.5	-
2		48.5	39.1	35.5	41.1	***-11.4***
3		44.2	33.0	35.5	37.6	***-14.9***
4		57.5	45.4	54.9	52.6	**0.1**
5		56.9	43.2	52.3	50.8	***-1.7***
6		58.8	44.4	56.6	53.3	**0.8**
7		61.1	42.8	56.1	53.3	**0.8**
8		59.7	44.6	56.5	53.6	**1.1**
9		57.6	46.0	57.4	53.6	**1.1**
10		57.3	43.4	53.8	51.5	***-1.0***
11		55.7	42.4	56.2	51.5	***-1.0***
12		57.1	41.5	56.1	51.6	***-0.9***
13		55.4	44.5	48.3	49.4	***-3.1***
14		54.3	43.8	47.6	48.6	***-4.0***
15		59.8	45.3	57.1	54.1	**1.5**
16		57.2	44.9	53.0	51.7	***-0.8***
17		58.1	46.7	56.5	53.8	**1.2**
18		55.1	48.9	55.6	53.2	**0.7**

Negative yield responses of over 10 bu/ac were observed in the stem cutting treatment. Stem cutting was intended to cause the soybean plant to “branch” out adding additional nodes, which in turn would allow for more flowers and therefore more pods. Since the growing season was cool and wet in 2014 the plants were not able to recover quickly enough to add on additional nodes, thus resulting in a yield drag.

Summary:

1) None of the strategies employed above showed any significant yield gains in 2014.

Project Contacts:

Horst Bohner, OMAFRA, horst.bohner@ontario.ca