New Soybean Inoculant Technology
(2007 Final Report)

Purpose:

Traditional recommendations for soybean production in Ontario have suggested there is little economic benefit to rhyzobial inoculation once a field has grown a well nodulated crop. Therefore an inoculant treatment was not widely recommended and presently only about 40% of Ontario soybeans receive an annual application of inoculants. Research conducted with older inoculant formulations confirmed that yield gains were inconsistent and very small if the field had successfully grown soybeans in the past.

Advances in inoculant technology have provided new soybean inoculant technology called “pre-inoculants”. These products contain highly efficient strains of bacteria and “extenders” that prolong the viability of inoculants. They also allow for a shelf-life of up to 30 days of inoculated seed. The “extenders” enhance the survival of B. japonicum for 30 days on bare seed and 10 to 21 days on seeds treated with a fungicide. These “extenders” also prolong the viability of the inoculants in the soil after planting. Seed can be treated before it is delivered to the farm. Reduced inoculation procedures at planting time and excellent coverage are significant advantages to the grower, compared to traditional drill box application. These high quality inoculants provide between 800 000 and 1 400 000 bacterial cells per seed, much higher concentrations than were previously available.

Researchers from Ohio State found yield gains of 2-7 bu/ac to be common in productive fields with a history of soybeans. The average yield response from 64 Ohio trials was 1.9 bu/acre from all inoculants tested. At a cost of $3.00 - $4.00 per acre (depending on the seeding rate) a ½ bu/ac yield increase could be considered “break even”. Researchers from Ohio suggest a profit of 300 percent compared to the investment when using an inoculant. Other states such as Michigan, Indiana, and North Dakota have also found average gains ranging from 1.0 to 2.7 bu/ac in fields with a history of soybeans. Other regions have found much lower gains.

Sixteen field trials were established in 2007 to assess the efficacy of two pre-inoculants in fields with a history of soybeans. A variety of soil types, yield potentials, crop rotations, and environments were chosen.

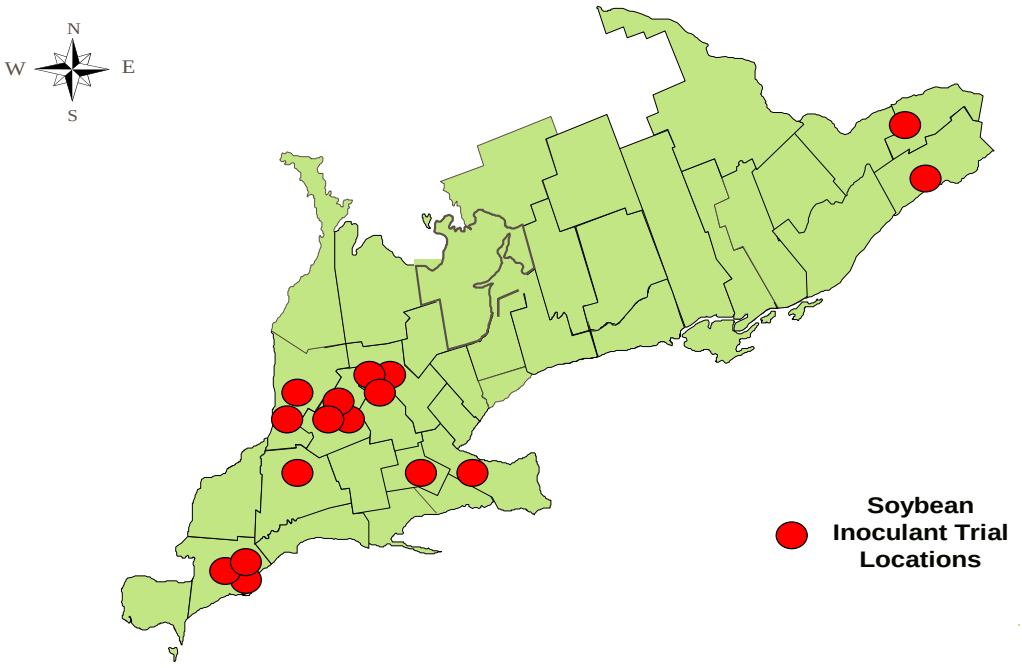
Methods:

Sixteen trials were conducted across a wide geographic area. (See Figure #1) These sites provided a range of soil types, growing conditions and yield potentials. Trials were replicated whenever possible with a minimum length for each treatment of 1000 feet. All trials included the following treatments:

Treatment:
Untreated Check
Cell Tech SCI
HiStick Liquid + Liquid Extender

Fields were treated as a whole when applying herbicides, fertilizers, and tillage practices. Crop inputs were applied perpendicular to the direction of the inoculant treatments.

Figure #1. 2007 Soybean Inoculant Trial Locations



At each field site soil samples were collected at planting time. A standard soil test analysis was conducted as well as a PSNT nitrogen test. Both nitrate and ammonium levels were assessed along with the usual soil test values.

In addition, sufficient topsoil was removed from each site to permit a bioassay of the nodulation potential of the existing Bradyrhizobium japonicum populations indigenous at that field test location. Seed was planted in the soil from each site in pots under greenhouse conditions in replicated trials at the University of Guelph. At the first pod stage, plants were harvested and roots washed to determine the number and dry weight of nodules on each root system.

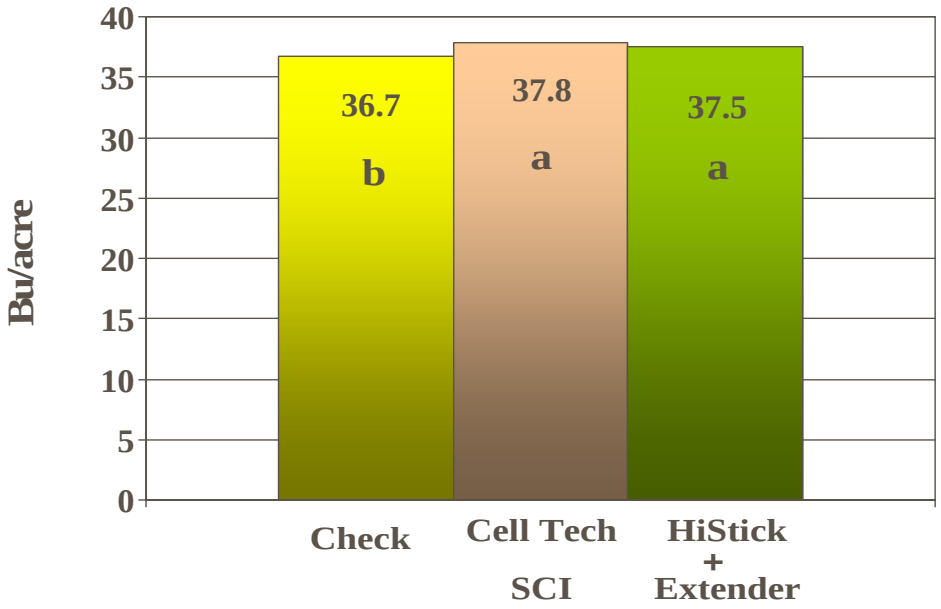
Field trials were weighed with a weigh wagon. Seed samples were collected and assessed for size and grade. Seed samples were also analyzed for oil and protein content by the University of Guelph, using near infrared reflectance (NIR).

Results and Summary:

Statistically significant yield differences were found between the untreated and the inoculant treatments. (See graph #1) No statistical difference was found between the

two inoculants. The average statistical yield gain of the inoculants compared to the untreated control was 0.95 bu/ac. At a selling price of $8.50/bu and a yield gain of 0.95 bu/ac a return of $4.08/acre would be realized when using an inoculant. (Assuming a cost of $4.00/ acre for the inoculant) Table #1 shows the numerical average trial results. 11 of the 16 sites tested showed a numerical yield increase.

Graph #1 2007 Soybean Yield Response to Inoculants



Values followed by the same letter are not significantly different at the 5% confidence level. CV = 5.7%

Table #1: Yield Response to Inoculants (2007)

Trial No.	County	Untreated	Cell Tech	HiStick		Average Inoculant Response
1	Huron	35.36	34.74	33.81		**-1.08**
2	Huron	43.09	44.12	43.55		**0.74**
3	Middlesex	34.14	34.54	34.54		**0.40**
4	Perth	33.96	36.51	35.28		**1.93**
5	Perth	24.02	23.53	24.99		**0.24**
6	Wellington	34.88	33.02	34.88		**-0.93**
7	Niagara	31.66	35.15	33.37		**2.60**
8	Wellington	29.24	29.84	28.44		**-0.10**
9	Dundas	48.85	47.90	47.70		**-1.05**
10	Kent	44.80	47.20	49.50		**3.55**
11	Brant	14.90	15.10	15.00		**0.15**
12	Perth	24.87	28.05	27.06		**2.69**
13	Perth	34.21	41.67	39.91		**6.58**
14	Russell	43.80	43.80	42.40		**-0.70**
15	Kent	57.80	58.60	58.10		**0.55**
16	Kent	51.00	50.70	51.40		**0.05**
	Average	**36.66**	**37.78**	**37.49**		**0.98**

The conclusions from this one year study are:

1) An average yield gain of approximately 1 bu/ac was gained with the use of an inoculant on fields with a history of soybeans.
2) No statistical difference could be detected between the two inoculants.
3) The use of an inoculant was profitable. 69% of trials showed a numerical yield increase.
4) Further research is necessary to evaluate possible yield benefits across multiply sites and years.

Next Steps:

Due to the positive economic response further investigations are warranted.

Acknowledgements:

Special thanks to all those who participated in the project:
The Perth Soil and Crop Improvement Association members that conducted the trials and the Ontario Soil and Crop Improvement Association and OMAFRA for providing the major grant to conduct the trials. Also, thanks to the Ontario Soybean Growers also made this project possible.

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Location of Project Final Report:

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