Saskatchewan AgriARM Applied Research Management

Wheatland Conservation Area Inc.
Swift Current, SK.

Soybean Agronomy, where to Start?

Project #20140459

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ADOPT 2015

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Final Report

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Soybean Agronomy, where to Start?

2015 Report

Project Objectives

The objective is to demonstrate the effect of seeding rate, seeding date, and inoculant placement on soybean production, giving Saskatchewan producers a solid starting point for growing dryland soybean.

Project Rationale

Traditionally soybean has not been considered a reliable grain crop for production in SW Saskatchewan because varieties available mature too late and often suffer from frost damage. Recently, earlier maturing varieties have been developed that have at least partially overcome that limitation. Experiences from producers in the area who have grown the crop on a limited number of acres have prompted increased interest in this crop. The intended benefit of this demonstration is to provide information about appropriate production practices for growers interested in growing soybean in the area. The project emphasizes the importance of inoculation, delaying seeding until after the soil has warmed to 10 degrees Celsius, good weed control (since the crop does not compete well with weeds), and having the optimum plant population to ensure they can optimize yield potential. At this point we are not encouraging growers to make soybean a regular part of their rotations, however we feel that it is essential that those who try the crop on a limited basis do so using the most appropriate production practices. This is necessary to provide a valid evaluation of the potential of this crop. This project will also help to determine the viability of soybean production in the Brown soil zone using on currently recommended practices for soybean production in Saskatchewan.

Methods

The treatments were arranged as a two replicate demonstration. The treatments were as follows:

1) Early May seeding at 5 degrees Celsius, with inoculant on seed plus in-furrow, 180,000 seeds/ac seed rate, at 9" row spacing.
2) Early May seeding at 5 degrees Celsius, with inoculant on seed plus in-furrow, 220,000 seeds/ac seed rate, at 9" row spacing.
3) Early May seeding at 5 degrees Celsius, with inoculant on seed plus in-furrow, 260,000 seeds/ac seed rate, at 9" row spacing.
4) Early May seeding at 5 degrees Celsius, with inoculant in-furrow only, 180,000 seeds/ac seed rate, at 9" row spacing.

5) Early May seeding at 5 degrees Celsius, with inoculant in-furrow only, 220,000 seeds/ac seed rate, at 9" row spacing.
6) Early May seeding at 5 degrees Celsius, with inoculant in-furrow only, 260,000 seeds/ac seed rate, at 9" row spacing.
7) Early May seeding at 5 degrees Celsius, no inoculant, 260,000 seeds/ac seed rate, at 9" row spacing.
8) Delayed seeding at 10 degrees Celsius, with inoculant on seed plus in-furrow, 180,000 seeds/ac seed rate, at 9" row spacing.
9) Delayed seeding at 10 degrees Celsius, with inoculant on seed plus in-furrow, 220,000 seeds/ac seed rate, at 9" row spacing.
10) Delayed seeding at 10 degrees Celsius, with inoculant on seed plus in- furrow, 260,000 seeds/ac seed rate, at 9" row spacing.
11) Delayed seeding at 10 degrees Celsius, with inoculant in-furrow only, 180,000 seeds/ac seed rate, at 9" row spacing.
12) Delayed seeding at 10 degrees Celsius, with inoculant in-furrow only, 220,000 seeds/ac seed rate, at 9" row spacing.
13) Delayed seeding at 10 degrees Celsius, with inoculant in-furrow only, 260,000 seeds/ac seed rate, at 9" row spacing.
14) Delayed seeding at 10 degrees Celsius, no inoculant, 260,000 seeds/ac seed rate, at 9" row spacing.

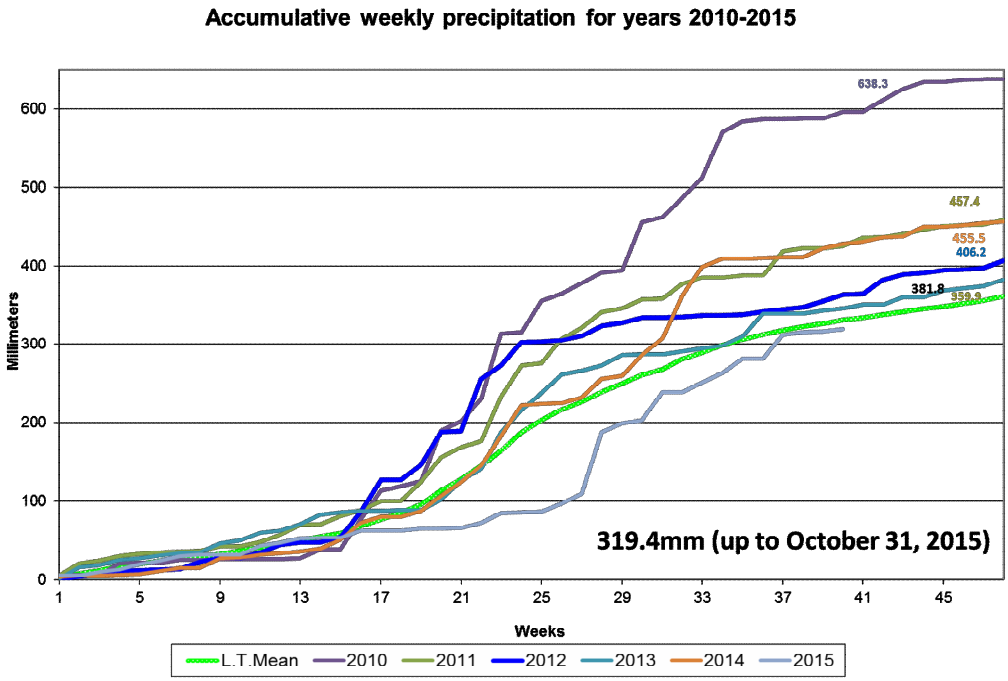
Each treatment received 60 lbs of 11-51-0 side banded and full weed control as needed. Inoculant was a combination of the recommended rates of granular and liquid formulations. Data collected was seed date, soil temperature at seeding, emergence date, plant density at 10 days after rows are visible, days to mature or growth stage at first killing frost, and grain yield.

Other field notes as follows:

Plot Size:		18' long x 7' wide.
Previous Crop:		Spring Wheat
Burnoff:	**07-May**	CleanStart (Credit @ 1 l/ac + Aim @ 30 ml/ac)
Seeding:	**11-May**	Seeded first date
Variety 2310RY	**28-May**	Delayed seeding date
Seeding Rates:		180,000; 220,000; & 260,000 seeds/ac
		All seed treated with Apron Maxx RTA @ 325 ml/100 kg of seed
		Seeded with Fabro plot drill; atomjet knife opener; 9 inch row spacing
Inoculant:	Granular Cell-Tech	4.7 lb/ac in furrow on Treatments 1 to 6 and Trts 8 to 13
	Liquid Cell-Tech	75 ml/27 kg of seed on Treatments 1, 2, 3, 8, 9, and 10.
Fertility:	60 lbs/ac of 11-51-0 sidebanded	
Incrop Spray:	**24-Jun**	Odyssey @ 17.3 g/ac + Poast Ultra @ 190 ml/ac + Merge
	14-Jul	RT 540 @ .67 l/ac
Plant Density:	**16-Jun**	Early May plant density counts done
	24-Jun	Delayed Seeding density counts done
Harvest:	**30-Sep**	Combined first seed date
	07-Oct	Combined delayed seeding date
Other:	**16-Jun**	Early Seed Counted

24-Jun	Delayed Seeding Counted
24-Jun	Incrop Odyssey @ 17.3 g/ac + Post Ultra @ 190 ml/ac +Merge
14-Jul	Sprayed RT540 @ 0.67 L/ac
30-Sep	Combined First Seed Date
07-Oct	Combined Second Seed Date - Slight deer damage (lots of tracks)

General Site Conditions



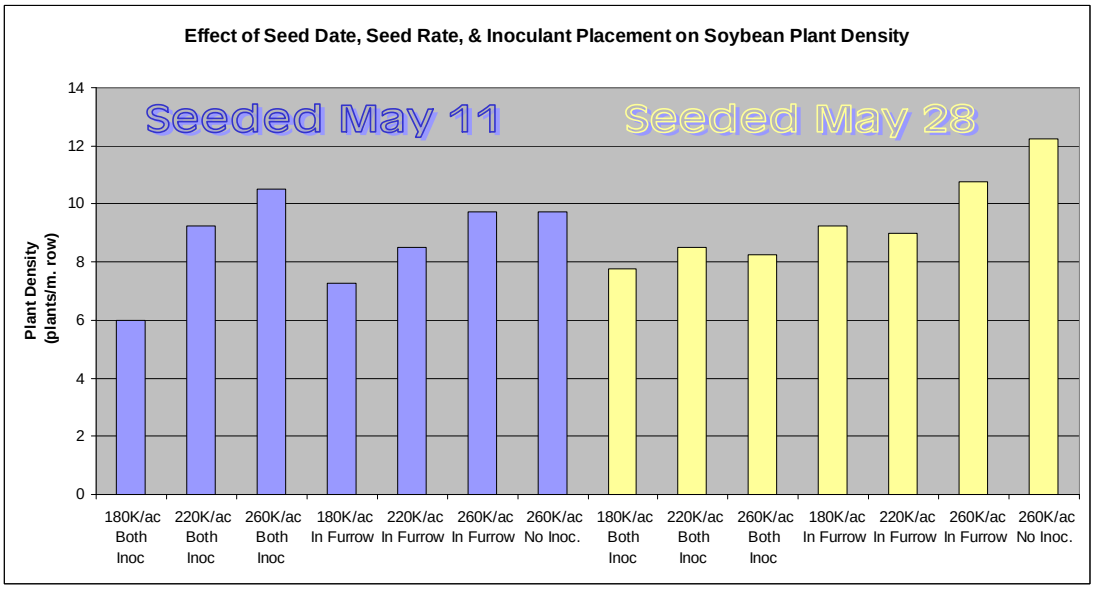
Graph 1. Accumulative weekly precipitation for years 2010-2015.

The site is situated 1 mile south of Swift Current. The soil is classified as a Swinton silty loam. For the most part in 2015, lower than average precipitation in the early growing season had a negative impact for shallow seeded crops. Severe drought like conditions continued through May, June, and July having a negative effect on yield potential and made it difficult to show treatment responses in certain trials. Overall yields for oilseed crops were lower than average due to lack of rain fall. Deeper seeded cereal crops had close to average yields. This was generally the case for area producers who experienced similar conditions resulting in similar yields. This trial was not affected by frost, either in spring or later in the growing season.

Results

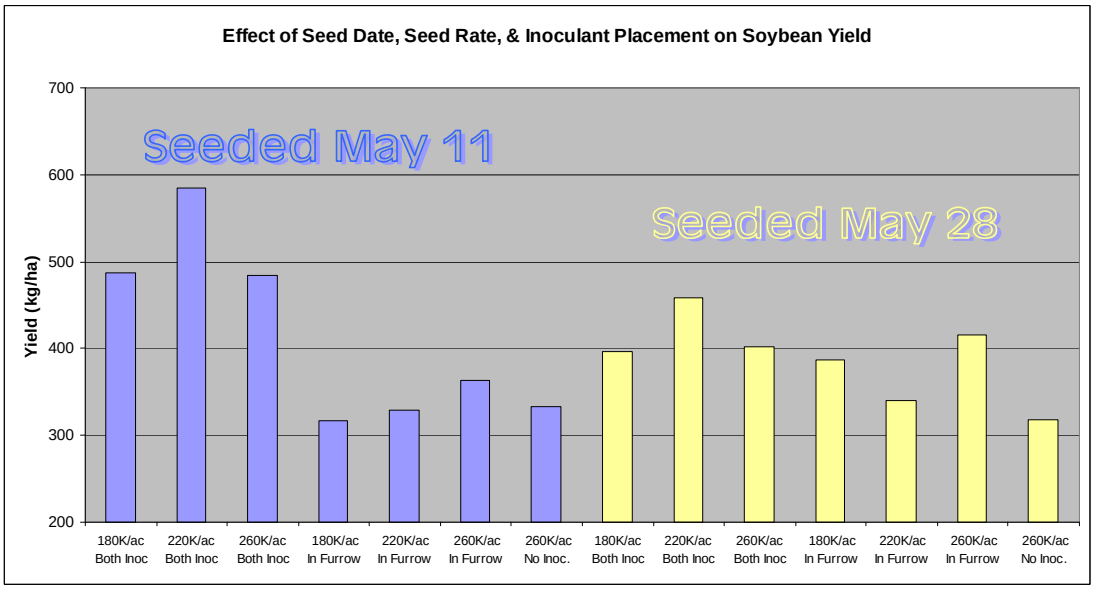
As expected, plant density increased with increased seeding rates, however, it appeared that seeding date had no effect on establishment. In 2015, we had no late spring frost that could potentially limit establishment (Graph 2.).

Graph 2.

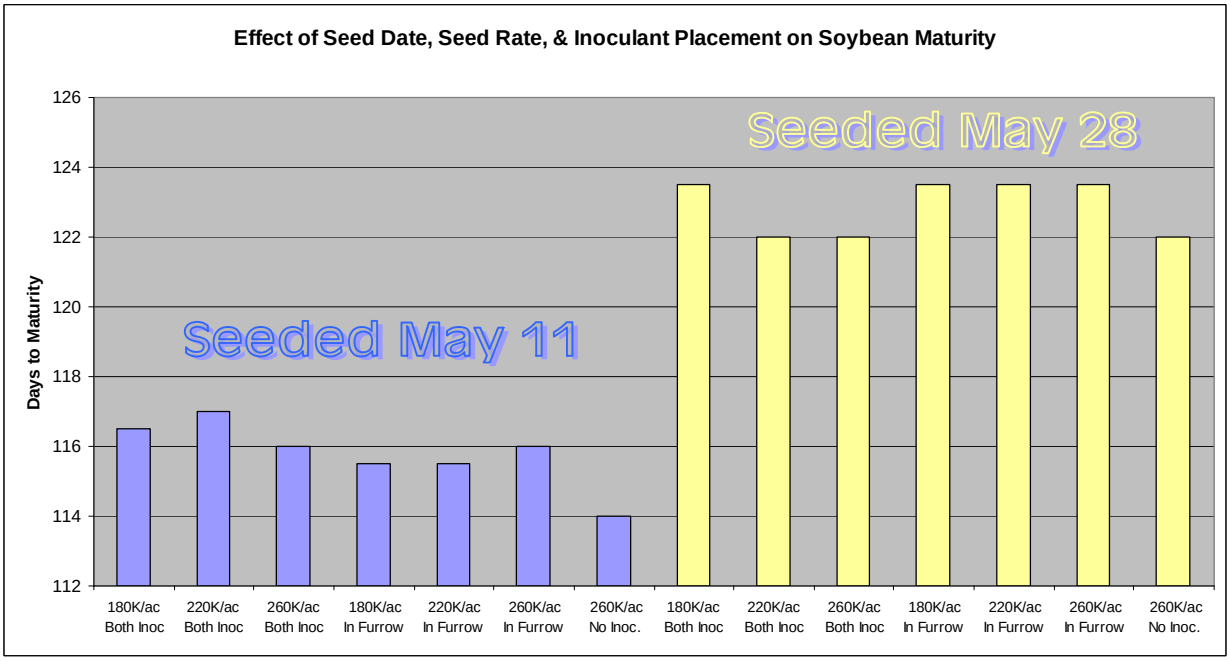


In 2015, this trial showed yield benefits from double inoculating, which included both an in furrow granular application and a seed applies liquid application. This was the case for both seeding dates. We saw similar results in other soybean trials we ran on our site in 2015. When a double inoculation was not used, yields were not much better than the un-inoculated check. Seeding rates had an affect on yields at both seeding dates, which can best be seen when we look at the data from the double inoculated treatments. At both seeding dates the 220,000 seeds/ac treatment resulted in the highest yield. Again, when an in-furrow only inoculation was used, yields were not much better than the un-inoculated check making results difficult to interpret, making this a non recommended practice. In 2015, seeding date had an affect on yield, which again can best be seen when we look at the data from the double inoculated treatments. Since there was no late spring frost events to limit establishment and yield, the early seeding date took advantage of early spring soil moisture and showed a yield benefit (Graph 3

Graph 3.



Days to maturity was also influenced by seeding date. The early seeded treatments took on average eight days less to reach physiologic maturity than the late seeded treatments. The late precipitation received towards the end of the growing season likely prolonged maturity in the late seeded plots, whereas the early seeded plots were likely too far advanced to be effected by the late season rainfall.



Conclusions

More work needs to be done before soybeans become a commonly used rotational crop in Saskatchewan, however, producers wanting to grow the crop on a small scale have some good initial background information to utilize. One factor that jumps out time and time again are the benefits gained by of double inoculating. We see from this trial, and other trials we have run recently, that inoculating both the seed and the furrow improved nodulation and yield.

The soil temperature in Swift Current on the early seeding date was 8 degrees Celsius, which is bordering the current 10 degree recommended minimum temperature for seeding soybeans. Even though we avoided any catastrophes that can be encountered by seeding early, we currently stand by the recommendation of delaying seeding until the soil temperature is 10 degrees Celsius.

This trial also supports the current seeding rate recommendation for solid seeded soybeans production in Saskatchewan to target about 180,000 to 230,000 plants per acre. This trials indicated an optimum seeding rate of 220,000 seeds per acre, which in turn averaged about 190,000 plants per acre. More detailed analysis over more years and locations will need to done in this area.

Acknowledgements

We thank the Ministry of Agriculture for all our ADOPT projects including plot signage and verbal acknowledgement at field days and on PowerPoint slides during presentations. This will continue at each venue where an extension activity occurs. We also thank Shannon Chant (Saskatchewan Ministry of Agriculture) for her help.

Summary

The objective is to demonstrate the effect of seeding rate, seeding date, and inoculant placement on soybean production, giving Saskatchewan producers a solid starting point for growing dryland soybean.

Traditionally soybean has not been considered a reliable grain crop for production in SW Saskatchewan because varieties available mature too late and often suffer from frost damage. Recently, earlier maturing varieties have been developed that have at least partially overcome that limitation. The intended benefit of this demonstration is to provide information about appropriate production practices for growers interested in growing soybean in the area. The project emphasizes the importance of inoculation, delaying seeding until after the soil has warmed to 10 degrees Celsius, good weed control (since the crop does not compete well with weeds), and having the optimum plant population to ensure they can optimize yield potential. At this point we are not encouraging growers to make soybean a regular part of their rotations, however we feel that it is essential that those who try the crop on a limited basis do so using the most appropriate production practices. This is necessary to provide a valid evaluation of the potential of this crop. This project will also help to determine the viability of soybean production in the Brown soil zone using on currently recommended practices for soybean production in Saskatchewan.

The treatments were arranged as a two replicate demonstration and set up looking at the following three factors in combination with each other:
Seeding rate (180,000, 220,000, and 260,000 seed/ac)
Seeding date (Early seeding May 11, and delayed seeding date May 28)
Inoculant (Single application in furrow vs. double inoculation in furrow and on seed)

More work needs to be done before soybeans become a commonly used rotational crop in Saskatchewan, however, producers wanting to grow the crop on a small scale have some good initial background information to utilize. One factor that jumps out time and time again are the benefits gained by of double inoculating. We see from this trial, and other trials we have run recently, that inoculating both the seed and the furrow improved nodulation and yield. When a double inoculation was not used, yields were not much better than the un-inoculated check.

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This project will be promoted during Crop Production Week in Saskatoon in January and locally at Cropportunities 2016 on March 3 in Swift Current (200+ expected participants). This project was promoted on a CKSW radio program called "Walk the Plots" which we broadcast in the summer on a weekly basis. As well this topic was brought to the attention of the group on the Annual Field Day on July 16th (100 participants) as well as a number of smaller individual tours. This topic will also be posted on our website.