EDIBLE BEAN

AGRONOMY
AND
PEST MANAGEMENT
RESEARCH RESULTS

2019

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Agronomy and Pest Management Research Results for Dry Edible Beans 2019

This report is a compilation of agronomy and pest management research results in dry edible beans at Ridgetown College and the Huron Research Station. It has been produced as a reference for growers and industry personnel.

A number of the pesticides that are included in this report are not currently registered for use in dry edible beans in Ontario. Always follow label directions when applying pesticides.

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2019 Heat Unit and Precipitation Summary for Exeter and Ridgetown.

Ontario Corn Heat Units (OCHU)

	Huron Research (Exeter)		Ridgetown Campus	
Month	2019	Norm (38 yr)	2019	Norm (43 yr)
May	360	365	387	379
June	652	659	636	682
July	839	779	813	794
August	765	750	742	765
September	629	563	627	674
October	57	47	257	218
Total	3302	3163	3462	3513

Precipitation (mm)

	Huron Research (Exeter)		Ridgetown Campus	
Month	2019	Norm (38 yr)	2019	Norm (43 yr)
May	96	84	102	82
June	74	81	82	69
July	32	80	170	84
August	73	70	103	86
September	66	104	30	86
October	170	96	127	66
Total	511	515	614	474

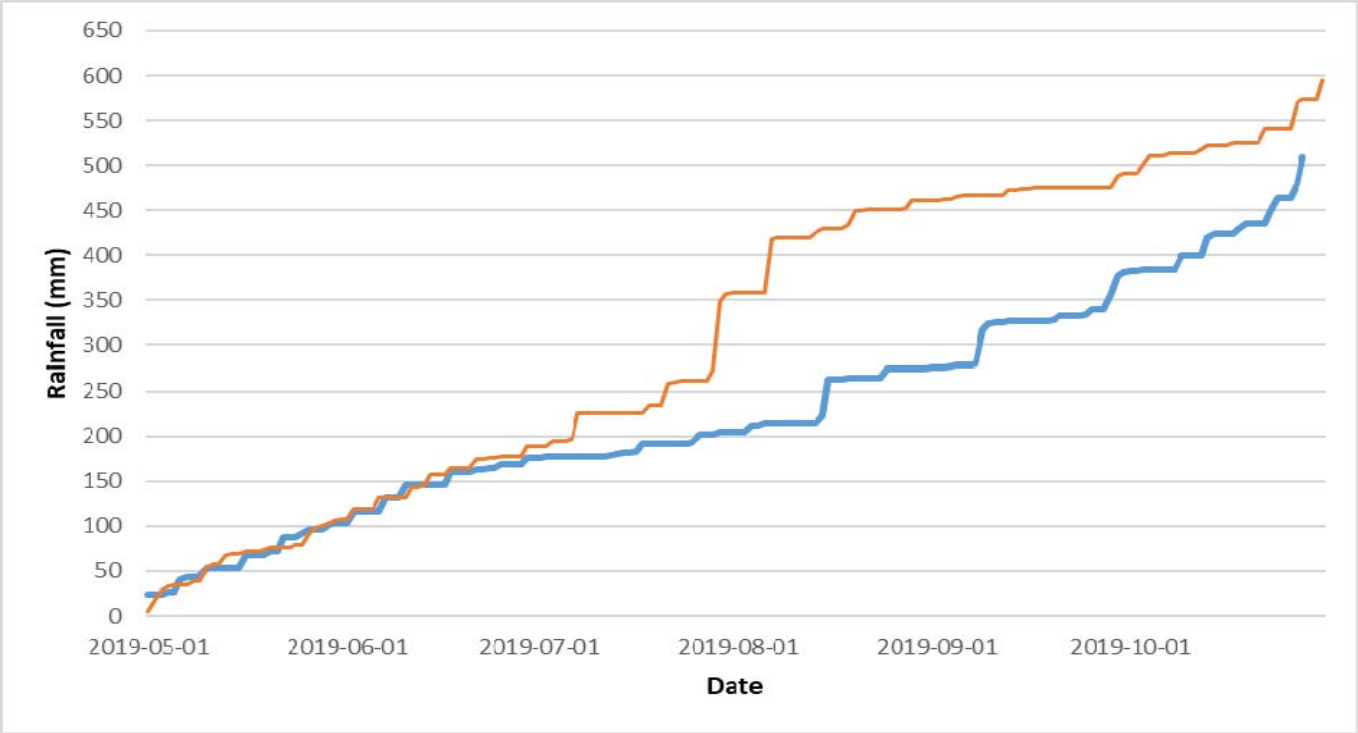
20% or more below average

20% or more above average

2019 Weather

Heat unit accumulation was near normal. Across Ontario, most crops were planted much later than normal, with some of the latest planted crops struggling to mature in the fall. May had average heat but excessive rainfall, and there was very little field activity throughout the province. Our planting commenced at Ridgetown on June 8, and at Exeter on June 9. Planting progress was slow, as soils were slow to dry. Planting was completed on June 26 at Exeter. Rainfall was below average at Exeter through July and August, and some later planted experiments on heavier soil produced high CVs. Temperatures were average in July and August, with very few really hot/humid days. A large rain event on August 3-4 eliminated any drought conditions at Ridgetown. Blyth had more reasonable rainfall throughout the summer. A killing frost was observed on October 18 and 26, at Ridgetown and Exeter, respectively. Rainfall was well above average in October and November, and some late planted commercial dry bean fields

in the region were not harvested, due to wet soil conditions, deteriorating plants and poor bean seed quality.



EXECUTIVE SUMMARY

Variety Registration and Performance Trials (ongoing)

Seeding was later than normal at the Huron Research Station (June 23) and Blyth (June 19). Four studies were seeded in 2019 (see table below). The 2019 Blyth site was a new location, at the farm of Peter Heindrich. The site had good emergence, average rainfall and above average yield. The three trials for the Exeter location were planted at the Huron Research Station. A combination of late planting and dry weather resulted in some variability, particularly for the cranberry/kidney bean trials, which had some large differences in yield between cultivars.

Summary of Registration/Performance Trials, Huron Research Station, 2019

Location	Market Class	Average Yield	C.V.	Notes
Blyth	Navy	3403	9.4	Above average yield, nice site
Huron RS	Navy	3363	7.7	Above average yield, loam soil, low rainfall
Huron RS	Cran/Kidney	2150	15.2	Below average yield, loam soil, low rainfall
Huron RS	Small seed	3586	8.8	Above average yield, loam soil, low rainfall

Preliminary Yield Trials (ongoing)

Four studies were seeded in 2019 at Blyth, Exeter and Woodstock (see table below). A preliminary site was seeded at New Liskeard (see table below) and Emo (not harvested) in northern Ontario. The New Liskeard site produced a quality trial with very good yields. The Emo site had good stands, but severe rains later in the season caused plants to deteriorate, which prevented harvest.

Summary of Preliminary Yield Trials, Huron Research Station, 2019

Location	Market Class	Average Yield	C.V.	Notes
Blyth	Navy/Black/Misc	3482	9.5	Above average yield, nice site
Huron RS	Navy/Black/Misc	2670	10.7	Average yield, clay soil, low rainfall
Huron RS	Cran/Kidney/Misc	2984	13.6	Average yield, loam soil, low rainfall
Woodstock	Cran/Kidney/Misc	2996	12.0	Average yield
New Liskeard	Misc	3035	9.1	Good yield, planted May 30
Total Entries				47 distinct entries at 4 sites

A number of public and private breeding programs took part in the trials, including ADM, Ag. Canada, U of Guelph, AmeriSeed (Co-op), Hensall Co-op, Michigan State University , Trinity Genetics, Treasure Valley and Seminis. The primary site was at the Huron Research Station, and these trials were repeated at Blyth (narrow row) and Woodstock (wide row).

There were 47 entries tested as follows: navy (10 entries), DRK (6 entries), LRK (4 entries), WK (3 entries), Cran (8 entries), Black (5 entries), Otebo (1), Pinto (1), Small Red (3) and food-type soybean (1).
Black – Top yielding lines include Zenith and OAC Vortex
Navy – Top yielding lines include NA 14068, and Rexeter.
ACUG 17-W1 (WK) AAC Cranford (Cran), Dynasty (DRK), Samerai (Otebo), Viper (small red) La Paz (pinto) and T9905 (navy) did well at both locations.

White Mold Foliar Fungicide in Dry Beans (ongoing)

This is an ongoing study to develop a long term data set on white mold fungicide efficacy and economic returns. Two trials were planted in 2019. Disease pressure was much below average in the both studies, due to very dry weather. There were no meaningful differences between treatments for disease severity. There were no differences between the untreated check and the fungicide treatments for yield.

White Mold Fungicide x Fertilizer in Dry Beans (Year 1 of 3)

This study investigated a tank mix of foliar fertilizers + white mold fungicides to determine if the fertilizers antagonized the fungicide efficacy. The experiment was a factorial design with five fungicide (Control, Allegro, Propulse, Cotegra and Acapela) and four foliar fertilizer (Control, Crop Booster, Releaf Mn and Phi 42K) treatments. One trial was planted in 2019. Disease pressure was much below average, due to very dry weather. There were no differences between treatments for disease severity or yield.

White Mold in Dry Bean Cultivar x Row Width x Population (Year 2 of 3)

This research was conducted to determine the impact of plant population and row width on white mold disease development in dry beans. Two cultivars (Beryl and Merlot) were chosen – both are very susceptible to white mold, but differ in plant architecture. Each cultivar was planted in two row widths (38 and 76 cm) and four populations (100, 80, 60 and 40%) using 200,000 and 175,000 plants/ha for a 100% plant population in narrow and wide rows, respectively. There were no meaningful differences between treatments for disease severity. There were no differences between the untreated check and the fungicide treatments for yield.

White Mold in Dry Bean Fungicide Application Time of Day (Year 2 of 3)

This research was conducted to determine the impact of the time of day application (6:00, 12:00, 18:00 and 0:00) for the fungicide Allegro on white mold development in dry beans. Two studies were conducted in 2019. Disease pressure was very low, and there were no differences between treatments for disease severity or yield.

White Mold Foliar Fungicide in Soybean (ongoing)

This is an ongoing study to develop a long term data set on white mold fungicide efficacy in soybeans. This study has been conducted for 7 years, but good treatment separation has been achieved for only in 2016 and 2017. Two trials were planted in 2019. Disease pressure was very low in both studies. There were few meaningful differences in disease severity and yield between the untreated control and the fungicide treatments.

Anthracnose Foliar Fungicide in Dry Beans (ongoing)

This is an ongoing study to develop a long term data set on fungicide efficacy for anthracnose control and calculate the economic returns of fungicide use. A paper was published in 2019, summarizing past work (see end of this report). A spore suspension was used as an inoculum

source on disease free plants, and irrigation was used to promote disease development. The concentration of the spore suspension was low, which likely influenced disease development. Two studies were seeded about 4 weeks apart, and were inoculated at first flower. Disease pressure following inoculation was very low in both studies. There were no differences between the untreated control and the fungicide treatments for disease severity, pick or yield.

Anthracnose Fungicide x Foliar Fertilizer in Dry Beans (Year 2 of 3)

This study investigated a tank mix of foliar fertilizers + anthracnose fungicides to determine if the fungicides efficacy was affected. The experiment was organized as a factorial design with five fungicide (Control, Headline, Quadris, Allegro and Propulse) and four foliar fertilizer (Control, Crop Booster, Releaf Mn and Phi 42K) treatments.

A spore suspension was used as an inoculum source on disease free plants, and irrigation was used to promote disease development. The concentration of the spore suspension was low, which influenced disease development. Two studies were seeded about 4 weeks apart, and were inoculated at first flower. Weather conditions following inoculation were very dry, and disease pressure was very low in both studies. There were no differences between the untreated control and the fungicide treatments for disease severity, pick or yield.

Anthracnose Seed Treatment in Dry Beans (Year 1)

This research was restarted in 2018, as several new seed treatment compounds were recently registered for dry bean in Canada. Seed harvested from previous anthracnose studies were used for all treatments except the non-inoculated control, which used Idaho grown seed of the same cultivar. Two studies were planted about four weeks apart, to provide different environmental conditions for disease development. All treatments received Cruiser insecticide to manage soil insect populations. Differences between treatments were measured for emergence at 8-9 days, but disappeared by 15 days. Pod severity was moderately high in the first study, and high in the 2nd study, but the disease developed very late in the season, and there was no impact on seed yield in either study. Cruiser + Rancona Summit + Maxim + Sedaxane + Dynasty had the lowest pod severity and pick scores of any treatment.

Sulphur Fertilizer in Dry Bean (Year 1)

Sulphur Fertilizer Rate

Sulphur is an important secondary nutrient for plants. It is a key component in photosynthesis, nitrogen fixation and methionine and cysteine, which are essential amino acids. Deposition of S from atmospheric pollution had been decreasing over the last 20 years. The response of alfalfa, canola, corn and soybean crops to S fertilizer is currently being evaluated, but there is no work being conducted on dry beans.

The response of dry beans to S fertilizer were measured using five potassium sulphate fertilizer rates (0, 10, 20, 30, 40 kg S/ha) were applied to four dry bean cultivars (Line 37, Morden 003, Mist and Dynasty). KCl was used to balance potassium rates between treatments. The experiment was conducted on a clay loam soil at the Huron Research Station and a sandy soil at Ridgetown. Line 37 contains high levels of methionine cysteine, and it is a near isogenic line of Morden 003.

S fertilizer did not impact plant height, plant development (BBCH), plant dry weight or greenseeker score at 40 and 60 days after planting. As the rate of S fertilizer increased, there was a measureable increase in crop seed S content at Ridgetown. This did not result in a consistent yield response, as only the 20 kg S treatment provided a yield increase over any other rate. At the Huron Research Station, crop seed S content increased as S fertilizer rate increased, but the response was not significant. There was no seed yield response to S fertilizer.

On-Farm Response to Sulphur Fertilizer
S fertilizer was applied at two rates (0 and 20 kg S/ha) at six farm locations across Ontario. One site had otebo beans, and the remainder were navy beans. Plant height, plant development (BBCH), plant dry weight and greenseeker score were measured twice at approximately 40 and 60 days after planting. There were few meaningful differences at any site. S fertilizer did not impact seed weight, seed quality or yield at any site.

Dry Bean Cultivar x Row Width x Population (Year 3 of 4)
Large Seed – Four cultivars (Hime otebo, Inferno LRK, Red Hawk DRK and Etna cran) were seeded in two row widths (38 and 76 cm) and four populations (100%, 80%, 60%, and 40%) at two sites (Exeter and Ridgetown), using 175,000 and 200,000 plants/ha for 100% population in wide and narrow rows, respectively. Small differences were observed between plant populations for plant height, plant dry weight and canopy cover. Narrow row width had higher yield. At 40% plant stand, a yield loss of 20% was measured, compared to higher plant populations.
Small Seed – Four cultivars (T9905 navy, Nautica navy, Rexeter navy and Zorro black) were seeded at four populations (100%, 80%, 60%, and 40%) at two sites (Exeter and Ridgetown), using 300,000 plants/ha for 100% population. Small differences were observed between plant populations for plant height, plant dry weight, harvestability and lodging. Seed yield trended lower as populations decreased, but the effect was not significant.

Root Rot Seed Treatment (ongoing)
This is an ongoing study to seed treatment combinations on early season plant emergence and vigour, and yield at harvest. The experiment starts with two base compounds: Cruiser Maxx Bean and Rancona Summit, with Dynasty and Sedaxane layered on top, either alone and in combination, to measure the additive effect of each compound. Two other recently registered seed treatment products (Evergol Energy and Insure Pulse) were also compared. All plots received Cruiser to minimize any confounding effects from soil insects. Two studies were conducted for each root rot species using two different rates of inoculant. The experiments were planted later than normal in 2019. Dry weather conditions following planting limited the expression of root rot in the experiments.
Fusarium - disease pressure was low, with the root rot inoculum impacting plant emergence and vigour for the first 16 days. There were few meaningful treatment differences for plant emergence and vigour. There were no differences between treatments for yield.
Rhizoctonia - disease pressure was low, with differences between the inoculated and non-inoculated control treatment measured for plant emergence and vigour for 16 days after planting. Seed treatments had higher plant emergence and vigour than the inoculated control for only a few days after planting. There were no differences between treatments for yield.

Soybean Cultivar Performance (ongoing)
A summary of the Ontario Soybean and Canola Committee (OSACC) 2800 CHU soybean cultivar performance trials conducted near Exeter ON in 2019 is provided. There are separate studies for Roundup ready cultivars and conventional (food-type) cultivars. The conventional study had low variability and high yields (63.5 bu/ac). The Roundup ready study was slightly less variable, and yields were lower (57.3 bu/ac).