IHARF

INDIAN HEAD AGRICULTURAL RESEARCH FOUNDATION

2010 Annual Report

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Indian Head Agricultural Research Foundation

The Indian Head Agricultural Research Foundation (IHARF) is a non-profit organization whose mission is to promote profitable and sustainable agriculture by facilitating research and technology transfer activities for the benefit of its members and the agricultural community at large.

Incorporated in 1993, IHARF works in close harmony with Agriculture and Agri-Food Canada at the Indian Head Research Farm. With a nine member Board of Directors providing leadership and making effective decisions, IHARF is widely recognized as an innovative leader in public good research and has an established reputation for the high quality of its research program.

The mandate of IHARF is to:

- Identify new research priorities required to meet the needs of agriculture now and in the future.
- Support public good research – research that has value to the public but is not tied to studying or promoting a specific product or service (eg. Soil conservation).
- Maintain strategic alliances with the agricultural community in order to strengthen the provincial research base.
- Play an active role in the technology transfer process and be involved in public education and awareness activities.
- Maintain a scientific research base at the Indian Head Research Farm.

IHARF Board of Directors

IHARF is lead by a nine member Board of Directors that provide guidance for the organization. Residing all across south eastern Saskatchewan, IHARF Directors are dedicated to the betterment of the agricultural community as a whole. The 2010 IHARF Directors are:

Franck Groeneweg – President – Edgeley
Chad Skinner – Vice President – Indian Head
Terry Rein – Treasurer – Indian Head
Barry Rapp – Regina
Brian Acton – Lemberg
Colin Rosengren – Midale
Jeff Molder – Weyburn
Keith Stephens – Balcarres
Scott Bonnor – Sintaluta

Ex-Officio

IHARF receives additional guidance from an experienced team of AAFC personnel. They include:

David Gehl – Officer in Charge, AAFC Indian Head
Guy Lafond – Research Scientist, AAFC Indian Head
Bill May – Research Scientist, AAFC Indian Head
Chris Omoth – Technician / AAFC Union Rep, AAFC Indian Head

IHARF Staff

The dedicated team of IHARF staff for the 2010 year included:

Judy M^{c}Kell – Executive Manager
Chris Holzapfel – Research Manager
James Runge – Labourer

Extension Events

IHARF Crop Management Field Day

On July 20th, 2010, IHARF hosted its annual Crop Management Field Day. The day brings together farmers and industry personnel from across the prairies. With tours led by IHARF, AAFC and industry specialists, all 127 attendees took home valuable information from the day. Speakers and topics for the day included:

Chris Holzapfel, IHARF
- Harvest Management in Canola
- Reseeding Options for Low-Density Canola Stands
- Yield-Busters Trials
- Pea/Canola Intercropping

Joy Agnew, PAMI Humbolt
- Management Systems for Grain Aeration

Orland Thompson, AAFC Indian Head
- Overview of AAFC Cereal Breeding Program

John O'Donovan, AAFC Lacombe
- Best Management Practices for Malt Barley Production

Hugh Beckie, AAFC Saskatoon
- Dealing with Herbicide Resistance

Bill May, AAFC Indian Head
- Camelina Agronomy
- Are Fungicides Needed in Oats?
- Early Sunflower Hybrids
- Herbicide Tolerant Sunflower Hybrids

Stephen Fox, AAFC Winnipeg
- Midge Tolerant Wheat Varieties
- Improving Fusarium Head Blight Tolerance in Wheat

Guy Lafond, AAFC Indian Head
- Row Spacing
- Canola Recropping

IHARF Winter Seminar

IHARF hosts an annual Winter Seminar, which moves around the south east region of the province to accommodate producers over a wide area. This years Winter Seminar which highlighted the 2010 research program was held at Indian Head on January 28th, 2011, with 65 producers and agronomists in attendance.

IHARF Partners – 2011

Platinum

Agriculture & Agri-Food Canada – Indian Head Research Farm
Agriculture & Agri-Food Canada – Cluster and DIAP Program Funding
Bayer CropScience
Canola Council of Canada
Saskatchewan Canola Development Commission
Saskatchewan Oat Development Commission
Saskatchewan Ministry of Agriculture

Gold

Agriculture Council of Saskatchewan (ACAAF)
BASF
Canaryseed Development Commission of Saskatchewan
Pattison Liquid Systems
Pedde Farms
SeedMaster
Viterra

Silver

Bratrud Ag Advisory Services
Cargill
Donaghys New Zealand
Dow AgroSciences
Grain Millers Canada
International Plant Nutrition Institute / Simplot
Mosaic
Pedde Farms
Raven Industries
Vale Farms

Bronze

Brett Young Seeds
Crop Production Services
Delage Farms
Farm Credit Corporation
Markusson New Holland
Nite Hawk Trucking
Omex Canada
Paterson Grain
Pioneer Hi-Bred
Saskatchewan Institute of Agrologists – Regina Branch
Syngenta
Town of Indian Head
United Agri Products
Westeel

Yield-Busters

The Yield-Busters program was kicked off by the IHARF Board of Directors in February 2010 as a means of initiating new research on products or practices and enhancing stakeholder participation in determining research priorities.

IHARF canvassed farmers and industry alike in support of ideas for Yield-Busters trials. The trial selections were based on what was important to farmers, relatively easy to evaluate with small plot trials and hadn't previously been extensively tested by 3rd party research evaluations.

Two separate trials were initiated in 2010 in cooperation with Agri-ARM sites at Canora (East Central Research Foundation), Scott (Western Applied Research Corporation) and Swift Current (Wheatland Conservation Area). The 2010 Yield-Busters trials looked at: micronutrient seed primers on various crops and fungicide applications on flax.

2010 Yield-Busters - Evaluating the effects of Headline® fungicide application on flax yield

C. Holzapfel[1], A. Severson[2], B. Nybo[3]

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[3]Wheatland Conservation Area, Swift Current, Sk.

Overview

As more products become available to growers to enhance crop yields, it becomes increasingly difficult for producers to sift through all the available inputs and focus on investing in those that will pay a positive return to their operation. The current trial looked at the application of Headline® fungicide on flax as the product manufacturer claimed yield benefits to this practice and an increasing numbers of growers have reported considerable visual responses to Headline on flax and, in most cases, higher seed yields.

As part of the Yield-Busters program initiated by IHARF in 2010, fungicide applications on flax were tested on three sites in Saskatchewan, Indian Head (IHARF), Canora (ECRF) and Swift current (Wheatland). The data collected analyzed disease incidence and severity of the flax before and after application of the fungicide, as well as any responses to yield.

Conclusion

With above average rainfall at all three sites, 2010 was an ideal year to evaluate the effects of fungicide applications on flax. At Indian Head, a visual reduction in disease was observed at 10 days past application and was especially obvious 27 days after the fungicide application. While days to maturity were not recorded, it is estimated that, in the presence of disease, flax maturity could be delayed by at least one week with the application of fungicide; however, flax tends to weather well in the fall and growers should be willing to tolerate this delay provided that it comes with a yield benefit.

Although no yield response was observed in Swift Current, yield increases in Indian Head and Canora were quite substantial, with an average yield increase ~30% at both locations. With well above normal precipitation at Swift Current, the lack of a yield response may have been a result of lower overall levels of inoculum at this site due to the normally drier climate. These trials are going to continue at all three locations in 2011 with the addition of Proline® fungicide to the protocol.

2010 Yield-Busters - Micronutrient seed primer effects on various crops

C. Holzapfel[1], A. Severson[2], B. Nybo[3], S. Phelps[4], B. Davey[5]

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[2]East Central Research Foundation, Canora, Sk.
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[4]Saskatchewan Ministry of Agriculture, North Battleford, Sk.
[5]Western Applied Research Corporation, Scott, Sk.

Overview

Producers in Saskatchewan have access to many products to try and improve the health of their crops and potentially increase grain yields. Many of the products do not have to undergo registration similar to pesticides and do not necessarily have independently verified research results. Indian Head Agricultural Research Foundation heads a project called Yield-Busters to determine the effectiveness of some of the different products and practices available to producers, and micronutrient seed primers were evaluated in 2010.

The seed primer studies began in 2010 and included lentil, canola, wheat, and pea as test crops at Canora, Scott, and Swift Current and lentil, canola, and wheat at Indian Head. The wheat and canola was treated with the commercially available Omex zinc primer (0-22-3.5-0-6.7Zn) while the lentil and pea was treated with the commercially available Omex Pulse primer which contains only calcium (10%). At Indian Head, all three crops were also treated with a second generation zinc primer that is not commercially available at the time. Plant emergence and/or establishment and seed yields were measured and any effects on days to maturity were noted.

Conclusion

Treating the seed with micronutrient seed primers did not impact the rate of plant emergence at Indian Head for any of the test crops and had no positive impact on the total number of plants established for any crops at any of the locations. At three of four sites, wheat plant densities were lower for the treated seed than for the untreated seed; however, the reasons for the observed reduction are unclear and more testing is required to see if this effect is repeated. Maturity also was unaffected when comparing micronutrient treated and untreated seed any of the crops tested. There was no significant difference in yield for any of the crops when comparing yields of micronutrient treated and untreated for any crops at any of the individual sites nor when the results from all sites were combined for each crop. This trial is continuing in 2011 at each of the same four locations.

Evaluating the response of hybrid canola to low plant populations

B. Davey[1], S. Phelps[2], E. Johnson[3], S. Shirtliffe[4], C. Vera[5], C. Holzapfel[6], B. Nybo[7]

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[2]Saskatchewan Ministry of Agriculture, North Battleford, Sk.
[3]Agriculture and Agri-Food Canada, Scott, Sk.
[4]Department of Plant Sciences, University of Saskatchewan, Saskatoon, Sk.
[5]Agriculture and Agri-Food Canada, Melfort, Sk.
[6]Indian Head Agriculture Research Foundation, Indian Head, Sk.
[7]Wheatland Conservation Area, Swift Current, Sk.

Overview

Hybrid canola has become widely grown by producers and information on minimum plant stands required for establishment is important for producers when it comes to reseeding decisions. In terms of minimum plant stands, much of the previous recommendations were based on research conducted using open pollinated canola; indications are that hybrid canola may be able to better compensate at low plant densities, thereby lower minimum plant densities may be acceptable. The purpose of this project was to identify the minimum plant stand required by hybrid canola to achieve 90% of the yield under optimum densities and the density at which maximum yield is achieved. Hybrid canola in this experiment was seeded at 5, 10, 20, 40, 80, 150, and 300 seeds m^{-2} (0.2, 0.4, 0.9, 1.7, 3.5, 6.5 and 13.0 lbs ac^{-1}) at Scott, Melfort, Indian Head, Saskatoon, and Swift Current: Melfort and Scott both had large amounts of volunteer canola grow in the plots.

Conclusion

The analysis of the 2010 results show that more data is needed at the lower plant densities so that more accurate results can be achieved. Uncharacteristic growing conditions in Saskatchewan due to the wet season caused seeding delays at Swift Current. Ideal growing conditions caused volunteer canola to become a problem and increased plant densities. Increasing plant density causes some increase in thousand seed weight. As plant density increases from low values. A sharp decrease in green seed content and flower duration occurs. At higher plant densities there is little effect on green seed content and flower duration.

The project will be repeated in 2011 and may need to be extended into 2012 to obtain enough data points at lower populations to increase the confidence. For 2011 there are some adjustments to be made to the protocol to deal with volunteer canola, such as hand weeding to obtain desired plant populations and ensuring volunteer canola does not alter plant populations, especially at low plant densities.

Evaluating canola type for reseeding timing

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Overview

A canola reseeding experiment was undertaken in 2010. The experiment was designed to mimic a direct seeding situation in a producer's field whereby low populations would potentially justify reseeding. For this project, low plant populations (20 seeds per m^{-2}) and a high plant population check (150 seeds m^{-2}) were seeded in early May. The plots were then terminated with glyphosate prior to reseeding to canola at two different dates (early June and mid-June). The potential reseeding options that were evaluated were a high-yielding, medium-season *napus* hybrid (InVigor 5440), a lower-yielding, early maturing *napus* hybrid (9350 RR) and a *B. rapa* synthetic variety (ACS-C7). Reseeding produced similar yields to the original thin stand for the later reseeding in mid-June. The reseeding in early June produced significantly higher yields than the original thin stand. Later reseeding caused a yield reduction, lower thousand seed weights, and higher green seed contents. The data from 2010 showed that Polish canola produced lower canola seed yields when compared to hybrid argentine canola seeded the same time. Under the earlier reseed timing the Polish yield reduction was significant. This research will continue in 2011 so that improved recommendations on canola reseeding can be made to canola producers in Saskatchewan.

Conclusion

The data indicates that canola can be seeded up to early June with no yield penalty which is not consistent with previous research demonstrating early seeding produces better yields. The abnormal rainfall and conditions in 2010 may have caused the unusual results. What is consistent with other research is that thousand seed weight decreases and green seed content increases as seeding is delayed. Canola lodging did not seem to be related to seeding timing. In general the reseeding to polish canola did not offer any yield advantages even under mid June seeding conditions. Seeding to Polish could offer some advantage to reducing green seed count. The study will continue at all five sites in 2011. Depending on environmental conditions in 2011 it may also need to continue in 2012 in order to obtain data that is applicable to more normal weather conditions for Saskatchewan.

Response of canola to the application of phosphorus fertilizer and Penicillium bilaii (Jumpstart®)

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[3]Indian Head Agricultural Research Foundation, Indian Head, Sk.

Overview

2010 was the first year of a three-year field study initiated to assess the impact of phosphorus fertilizer applied with and without P. bilaii inoculant on the growth, phosphorus uptake, yield and quality of canola (*Brassica napus* L.). Field experiments were conducted at Indian Head and Outlook, Saskatchewan and at two locations near Brandon, Manitoba for a total of four sites. The trials at Indian Head and Brandon were rain-fed while Outlook was irrigated. Treatments were arranged in a randomized complete block design with five replicates and consisted of a factorial combination of two inoculant treatments (no P. bilaii; recommended rate of P. bilaii) and eight P fertilizer treatments (0, 10, 20, 30, 40 kg P2O5 ha^{-1} side-banded; 10, 20 kg P2O5 ha^{-1} seed-placed; 40 kg P2O5 ha^{-1} with 20 kg P2O5 ha^{-1} seed-placed and the remainder side-banded). Preliminary findings from the initial year of the study showed that, in 2010, P fertilizer application increased both early season biomass yield and seed yield in the two Brandon experiments. In one of the two Brandon experiments, the application of P. bilaii inoculant tended to increase seed yield, with inoculated treatments yielding 107% of uninoculated treatments when averaged across all P treatments. Neither P fertilizer treatment nor inoculant application affected seed yield at Indian Head. At Outlook, P fertilizer treatment had no effect on seed yield; however, inoculant application resulted in an approximate 6% decline in seed yield when averaged across all P fertilizer treatments. The reason for this decline is unclear, although it is possible that a trend toward lower plant densities in the inoculated treatments might have limited yield under the very high yield potential conditions at Outlook. Overall, treatments appeared to have little effect on the number of days to the initiation of flowering or crop maturity at swathing in 2010. Treatments had no effect on the percent green seed at any site and inconsistent effects on thousand kernel weight. Laboratory analysis is currently underway for determination of total P concentration in early season biomass and canola seed.

Conclusion

Regardless of treatment, plant density was within recommended levels at all sites, ranging from a mean of 92 to 118 plants m^{-1}. Although statistically significant effects of treatment were observed in some cases, limited effects on yield were expected given the plastic growth response of canola. At all sites, P. bilaii decreased or tended to decrease plant density. Seeding rates had been adjusted to account for the slightly higher seed weight of the inoculant-treated seed. However, a lower germination percent was measured for inoculated seed (~85%) than for un-inoculated seed (~97%) which likely

contributed to lower plant densities. Since seed for all treatments came from the same single bag of seed, possibly the physical process of treating the seed, the inoculant application itself, or other factors may have impacted emergence. Phosphorus fertilizer treatment had no impact on plant density for Saskatchewan sites.

Early season biomass yield was determined at three of the four sites. Slow establishment at the Outlook site precluded collection of this data in 2010. The application of P. bilaii had no effect on early season dry matter yield except at Indian Head, where applying inoculant reduced early season dry matter yield, possibly due in part to lower plant stands.

A positive response to P was evident at both Brandon sites. Contrast analysis showed that treatments receiving P produced a higher biomass yield, on average, than the 0 P control. At both sites, biomass yield increased with increasing rates of banded P then leveled off. Low soil test P levels at Brandon sites likely contributed to the observed increases in biomass yield with P application. Plant tissue analysis of early season biomass is currently underway.

Crop maturity at swathing was estimated in select treatments (0, 20, 40 kg P2O5 ha^{-1}, with and without P. bilaii) by determining the percent colour change and seed moisture content for about 45 pods per plot. The assessment method used indicated that neither P treatment nor inoculant affected seed maturity or moisture content.

Effects of inoculant application and P fertilizer on seed yield varied among sites. At Indian Head, neither inoculant application nor P fertilizer treatment affected seed yield. As seen for all other sites, the lack of a significant inoculant × P fertilizer effect suggests that impacts of inoculant application are similar regardless of P fertilizer treatment. Seed weight was influenced by P. bilaii at three of four sites in 2010. The application of P. bilaii tended to result in a statistically significant decline in thousand seed weight at Indian Head when averaged across all P treatments. These treatment differences were considerably smaller in magnitude than the differences observed among sites. Phosphorus treatment did not have a significant effect on thousand seed weight at any site. Contrast analysis showed that treatments receiving P produced a higher thousand seed weight, on average, than the 0 P control. Neither inoculant application nor P fertilizer treatment had a significant effect on the percent green seed which was less than 1% at all experimental sites.

Evaluating the effectiveness of pod-sealants for reducing shattering losses in several cultivars of direct-combined canola

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[2]Northeast Agricultural Research Foundation, Melfort, Sk.
[3]Western Applied Research Corporation, Scott, Sk.
[4]Wheatland Conservation Area, Swift Current, Sk.

Overview

While the recommended and preferred harvest practice in western Canada is to swath canola (*Brassica napus L.*), there is appreciable interest in straight-combining this crop. In a recent study, five cultivars were harvested according to one of four harvest treatments and evaluated for seed yield, yield loss due to shattering, percent green seed and seed size. The cultivars included four *B. napus* hybrids and an open-pollinated canola quality *B. juncea* variety. Harvest strategies were swathed, straight-combined without a pod sealant, straight-combined with Pod Ceal DC® and straight-combined with Pod-Stik®. While average yields ranged from 894-3066 kg ha^{-1}, cultivar rankings for yield were generally consistent across sites. Seed yields were equal when averaged across harvest treatments and sites, but swathed yields differed from straight-combined yields 50% of the time for individual sites. At two sites, straight-combining produced 142-370 kg ha^{-1} higher yields than swathing while, when harvest was delayed due to un-favourable weather, swathed yields were 276-413 kg ha^{-1} higher. A 217 kg ha^{-1} yield increase occurred with pod sealants at one site, but there were no differences amongst the two products and pod sealants did not affect yields of straight-combined canola at the remaining seven sites. Pod sealants did not have a measurable effect on shattering losses, even under high shattering conditions. In contrast, cultivar effects on seed loss were generally significant with losses from one of the *B. napus* cultivars being particular and consistently low, especially when overall shattering losses were high. On average, losses for all cultivars were 4% of the total yield when harvest was completed reasonably close to the optimal stage. Swathed canola tended to have slightly higher percentages of green seed; however, straight-combining resulted in a small but highly significant increase in percent green seed and seed size. Pod sealants did not affect seed quality in any cases.

Conclusion

Overall, this study supports previous findings that straight-combining canola can be a viable alternative to swathing in western Canada; however, doing so comes with considerable risk, especially when harvest cannot be completed close the optimal growth stage. In the two cases where harvest was delayed due to unfavourable weather, yields were reduced by 18% relative to swathing. However, this was balanced out overall by two locations where yields were higher with straight-combining, presumably due to larger seed size and allowing the pods to fill for a longer period of time. Pod sealants increased seed yields by 16% over untreated, straight-combined canola at one site but did

not affect seed yields at all the other sites, which is probably not sufficient to justify a generalized recommendation of applying pod sealants when straight-combining canola considering their cost. Another factor to consider when using a field sprayer to apply pod sealants or desiccants to canola fields destined to be straight-combined is the effect of wheel tracks on seed yield. While wheel tracks were not a factor in the current study, it should be acknowledged that driving over the crop at this late stage causes irreversible damage and could reduce yields by 2-5%, depending on the width of the sprayer. While pod sealants did not affect the observed shattering losses, important cultivar differences in resistance to shattering were observed and variability in shattering resistance amongst *B. napus* hybrid varieties should be explored further. Pod sealants did not affect seed quality in any cases; however straight-combining resulted in slightly higher incidence of green seed and consistently larger seeds compared to swathing. Our results suggest that choosing a cultivar that is high yielding and relatively resistant to shattering is likely a factor of greater importance for canola growers considering straight-combining than deciding whether or not to apply a pod sealant.

Comparing specialty phosphorus fertilizer products to mono-ammonium phosphate with and without ammonium sulphate in lentil

C. Holzapfel[1]

[1]Indian Head Agricultural Research Foundation, Indian Head, Sk.

Overview

This trial investigated the effects of using Mosaic's MES10 (12-40-0-10), MES15 (13-33-0-15) and MESZ (12-40-0-10-1Zn) phosphate fertilizers relative to mono-ammonium phosphate (MAP; 11-52-0) with and without ammonium sulfate (AS; 21-0-0-24) on test weight and seed yield of lentil (*Lens culinaris*). The treatments included a factorial combination of four forms of P fertilizer (MAP, MES10, MES15 and MESZ) and two rates (15 and 22 kg P2O5 ha^{-1}). An unfertilized treatment and a treatment where MAP and AS were combined to match P and S rates supplied by MES15 at 22 kg P2O5 ha^{-1} were included as checks.

Conclusion

The 2010 growing season at Indian Head was slightly cooler and unusually wetter than normal. April was warm with close to normal precipitation; however heavy rainfall at the end of the month brought precipitation levels up to nearly 190% of normal and postponed the onset of seeding in the area. Mean temperatures in May and June were 1.2 ºC cooler than normal and 138% of the normal precipitation was received. Nearly 100 mm of rainfall was recorded in the last two weeks of June and resulted in widespread crop injury; during this period replicates 1 and 2 of the current study were severely damaged and the plots in these replicated were terminated. July was the driest month of the 2010 growing season and the remaining lentils recovered well overall during this period. While August was wetter than normal and rain slowed harvest progress in September, the

remaining plots were harvested relatively early with minimal losses and in good overall condition. Overall, there was not response to P fertilizer observed in terms of either crop establishment, seed yield or test weight. No statistically significant differences between treatments were observed for any of the parameters measured. Crop establishment was considered excellent with an overall average of 142 plants m^{-2} established. The overall average yield on the plots that were harvested was 2417 kg ha^{-1} while the mean test weight was 399 g $0.5L^{-1}$.

Canola / pea intercropping study

C. Holzapfel[1]

[1]Indian Head Agricultural Research Foundation, Indian Head, Sk.

Overview

While suitable land areas for growing crops in western Canada are fixed or diminishing, agronomists and farmers are challenged with increasing production to meet larger demands while, at the same time, keeping farms profitable and globally competitive. Intercropping, where more than one crop is grown on the same field at the same time, shows good potential for increasing the productivity of prairie farmers on a per acre basis. While numerous combinations of cereal, oilseed and pulse crops have been grown together in western Canada, the most common and consistently successful mix has been field pea and canola. The predominant reasons for growing interest in canola-field pea intercrops in the Prairies have been reports of significantly higher yields and larger profits relative to monocrops, often with lower fertilizer and pesticide inputs. At the same time, enhanced weed control with Clearfield canola systems and improvements in seeding technology have made intercropping more practical for a growing number of producers.

Colin Rosengren, who farms near Midale, Saskatchewan, has been experimenting with intercropping on a commercial scale for more than half a decade, and after consistently increasing yields and profits over his pure stand fields, now grows more than one crop on over half his acres. While relatively few growers have adopted intercropping to this extent, a growing number are paying attention and starting to experiment with this practice on their own farms. In addition, researchers on the Prairies have been able to demonstrate the potential benefits of intercropping. With minimal or no declines in canola yields relative to pure stands and field pea yields well over half of the monocrop yields, recent work in Manitoba has resulted in total pea-canola intercrop yields as high as 177% of the monocrop yields along with reduced incidence of field pea seed disease and reduced shattering in canola. Furthermore, it is possible that the peas would provide an N benefit to the subsequent crop that would not occur with pure canola stubble. The most immediate benefit of adoption of this practice to canola growers would appear to be increased profits resulting from higher overall yields, but longer-term benefits could arise from improved soil health and reduced pesticide and fertilizer use. Research on canola-

field pea intercrops is required to assess the repeatability of the benefits reported elsewhere and to improve our ability to intercrop successfully and profitably.

Conclusion

Overall at Indian Head in 2010, peas and canola were successfully grown together; however there was no apparent advantage or disadvantage to doing so relative to growing these crops in pure stands. The observed land equivalent ratio for the intercropped canola and field peas was not significantly different from 1.0, indicating that on average, the yields of the two crops in an intercropped situation were half of that in the monocrop checks. At Indian Head in 2010, intercropping resulted in grain yields and net profits that were intermediate between the two crops grown in a pure stand with canola being the most profitable and field pea being the least profitable. With the yields observed at Indian Head in 2010, if a given area of land were divided equally into pure stands of field pea and canola, similar net profits would have been achieved as if the entire area were seeded to a pea-canola intercrop This is somewhat inconsistent with the findings of many similar studies, including those completed in western Canada, who have reported over-yielding when canola and field peas were grown together. In any case, the relative performance of intercropping pea and canola relative to monocultures of the same crops can be expected to vary somewhat from one year to the next and further research is required to evaluate this practice in the thin-black soil zone of Saskatchewan. This research is being expanded in 2011 to include more soil types (heavy clay versus loamy texture) and a new study is being initiated to evaluate the effects of row-species configuration (alternating rows of pea and canola versus mixed-row plantings) and interactions with N fertility levels. The new study will be completed at both Indian Head and at Melita, Manitoba in cooperation with the Westman Agricultural Diversification Organization.

An agronomic assessment of the long-term impact of no-till on soil improvement and crop productivity on the Canadian prairies: a case study

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[2]Indian Head Agricultural Research Foundation, Indian Head, Sk.

Overview

Meeting the food requirements of an increasing human population requires that we both protect our current arable land base and improve its overall productivity. The objectives of this study were to compare soil quality characteristics and crop yield and quality response to nitrogen (N) fertilizer in two adjacent fields with contrasting management histories; one field was managed using no-till for 31 years by the end of the study period while the other had been in no-till for 9 years. In the spring of 2003, the two fields along with an adjacent piece of native prairie were sampled extensively to evaluate soil bulk density, potentially mineralizable-N, residual ammonium-N and nitrate-N and soil organic carbon across two landscape positions. A small plot study involving five rates of urea N (0, 30, 60 90 and 120 kg N ha^{-1}) and two phosphorus fertilizer placement methods (seed-placed and side-banded with the N fertilizer) was conducted on the two adjacent fields for the period 2002-2009. The rates of N were superimposed on the same plots each year and the plots alternated between spring wheat and canola across years. Plant densities, grain yield, grain protein, grain N uptake and soil residual nitrate-N were measured each year, and flag leaf N and phosphorus in the years seeded to spring wheat. An N balance was conducted after eight years to account for inputs and outputs of N.

Conclusion

The native prairie showed the highest levels of soil organic carbon (SOC) and potentially mineralizable-N, followed by long-term no-till (LTNT) then short-term no-till (STNT), and these differences reflect the changes that have occurred with cultivation. Phosphorus fertilizer placed in the side-band with the N fertilizer yielded 3.5% more than seed-placed phosphorus in spring wheat. The N response for grain yield, grain N uptake and grain protein was greater on LTNT than STNT and overall LTNT yields were 14% and 16% higher than STNT yields for spring wheat and canola, respectively. The results of this study support the view that no-till combined with continuous cropping and proper fertility management are essential to sustaining the global soil resource.

Development of a web-based real time weather decision support system for managing aeration and drying in grain bins to ensure safe storage and high quality grain

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Overview

The success of the Canadian value-added agriculture industry in accessing foreign and domestic markets is dependent on the availability of high quality farm-gate products. One of the greatest sources of concern for producers is the ability to consistently produce high-quality grain for the value added industry. The dilemma for producers is to balance the necessity of harvesting higher moisture content grain with a need to preserve grain quality by avoiding in-field weathering with the risks of spoilage in storage. Currently, all the necessary information and equations exist to determine how much time is required to aerate grain in storage for safe-keeping based on air flow in the bin from the aeration fan which is a function of crop type and height of grain column, grain moisture content, ambient relative humidity and temperature. However, it is based on static values (i.e. constant temperature and relative humidity). The opportunity exists to develop improved methods for producers to manage natural air aeration systems using knowledge of temperatures, relative humidity levels and fan capacity in order to reduce energy consumption and associated costs while safeguarding their crops against spoilage due to storing grain at high moisture levels and / or temperatures.

The initial objective of this project was to develop a web-based real-time system for managing aeration and drying that has been validated at the farm level and that producers can easily access at a low cost to assist them in their decision making process with regards to the safe storage of grain on their farm. Although we were not able to come up with a practical method on how to develop a web-based application, we noted some important observations which in turn provide some very important clues in how to design a real-time control system for operating bin aeration fans. The research has provided us with a much better and simpler approach with regards to the development of an automatic control system for managing aeration fans on the farm.

Results

Some key findings are noted. When we consider the 13 runs conducted during the last four years, the estimated reduction in grain moisture content was 3.6% + 1.6% using the mass balance approach developed in our study (compares the amount of water entering the bin to the amount leaving the bin) while the actual measured reduction in grain moisture content was 3.7% + 1.5% using a grain moisture tester. This means that the method developed in this study provides an accurate way of quantifying water removal from the bin and provides reliable estimates of the average grain moisture content of the

overall bin, provided that the average starting moisture content is known. The other main finding is that if we only operate the fan when the water being removed from the bin is >10 lbs/hour, we estimated a 41.8% (range 9.8 -63.3 %) reduction in the number of hours of fan operation time. We also observed greater overall water removal with less fan operation time when we used a threshold cutoff of <10 lbs of water per hour being recorded. The average increase in water removal was 1.32 (range 0.99 – 2.8) times the values observed when the fans were run continuously. Therefore it would appear that more drying can occur with less fan operation time when we can choose the correct combination of temperature and relative humidity under which to operate the fans.

This study also allowed us to make some very important observations regarding the overall management of aeration fans. In most cases, there was a strong diurnal pattern of water removal and addition to the bin. The period of highest water removal tended to occur during the coolest period of the day (i.e night time) and the addition of water tended to occur during the warmest part of the day. The water removed from the grain occurs almost entirely as the grain is cooling. In situations where a power outage occurred (<10 hours), we observed large water removals following the resumption of the fans indicating that the cycling of fans can increase water removal. Any future automatic control system needs to consider the actual amount of water in the air which is a function of both temperature and relative humidity and constitutes the criterion for this decision-making process. The use of supplemental heat needs to be approached with caution as the costs of the extra heat may not warrant the benefits obtained when using aeration systems based on only ambient conditions. Significant reductions in electrical energy use are possible using a control system that would be based on the net amount of water leaving the bin as proposed in this study. The data clearly showed that the most drying occurred when the grain was much warmer than the ambient temperature of the air entering the bin (i.e. grain is dried as it is being cooled), thus such a control system would have added benefit of cooling the grain, making it less susceptible to mold and insect infestations.

Conclusion

Based on the information collected from this study, it is possible to build a very low cost automatic control system to operate the aeration fans that will save producers energy and money. The principle would be to compare the water content of the air entering and leaving the bin. If the rate at which water is leaving the bin is greater than a certain pre-determined threshold, the fan will continue operation while if the rate falls below a critical value, then the fan ceases operation until the conditions are conducive to water removal at which time the fan will resume. Taking air flow into consideration would allow for estimates of grain moisture content in the overall bin by providing an estimate of the actual mass of water leaving the bin. The controller does not have to measure CFM and no information about bin size, depth of grain, amount of grain in the bin or the type of crop is required. By simply following the procedure that was developed in this study, a very inexpensive control system can be built. All that is required is two sensors, one to measure the temperature and RH of the air going into the bin and the other to measure the temperature and RH of the air going out of the bin and an interface with a controller that will determine the amount of water in the air for any given temperature and relative humidity, compare the water content of the air going in or going out and make a decision as to whether the fan should be on or off based on pre-determined set of thresholds.

Optimum camelina seeding dates

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Overview

Camelina is a new crop to Saskatchewan with little known about its crop husbandry. Seeding date is one of the agronomic factors that effects crop establishment and yield potential of camelina, as camelina is a small seeded crop with poor weed competition early in its lifecycle, seeding date plays a large role in producing a competitive crop early in the season. Fall seeding and very early spring seeding may produce a healthy competitive crop. This project will demonstrate the most suitable fall and spring seeding dates for camelina. Fall seeding dates will be used to show over winter survival of emerged plants and effects of dormant seeding. Spring seeding dates will show the spring frost tolerance and competitiveness of early emerged crops.

The project has three locations (Scott, Indian Head and Swift Current) and eight seeding dates: five seeding dates in the fall, and three seeding dates in the spring. Measurements taken include germination, emergence counts, flowering and maturity dates, height, grain yield, and kernel weight. Data also includes a previous project at Indian Head that this project was based on.

With the bad weather in October there were some limitations to fall seeding dates. With the extended harvest in 2009 there were no producers interested in doing a fall seeding date on their fields. At Scott, germination and plant establishment occurred in the fall for the first fall seeding date. For the remaining seeding dates there was no plant emergence and the ground froze after November 5, preventing germination counts to be completed. At Indian head in both years all seeds planted in the fall germinated. In 2009, the October 2 treatment fully emerged and partial emergence was observed for the October 8 seeding date. In 2010, just the October 14 seeding date emerged. The October 14 seeding date emerged November 2. For Indian Head in 2010, wet conditions delayed the start of the experiment until October 14 instead of October 1. Therefore on November 2 an extra treatment was added which used a Valmar® applicator instead of a seed drill to distribute the seed onto the plot.

Conclusion

At Indian Head in 2009 the fall seeding dates produced lower yields and lower plant populations than the spring seeding dates. In 2010 the Indian Head project had reduced yields overall due to wet conditions during the 2010 growing season. November 2 was the seeding date with the highest grain yield with November 2 and May 12 having similar

yields to all seeding dates. All treatments exceeded the crucial threshold of 70 plants m^{-2}, and as seeding was delayed into the spring, plant density increased with the best emergence occurring with the June 2 seeding date. Flowering date was also affected by seeding date as the earlier the seeding date produced earlier flowering.

At Scott in 2010 the treatments that germinated and emerged in the fall did not produce as much yield as the fall non-emerged plants or spring seeded camelina. Height was also affected by seeding date with the shortest plants being the fall seeded, and increasing in height to the dormant seeded and again increasing in height to the spring seeded.

At Swift Current, plant density was dramatically affected by seeding date with only the spring seeded plots showing good plant populations. Yields were also affected by seeding date and the highest yields were obtained with the April 6th seeding date. There were no differences between the Nov 7, Nov 17, May 12 and June 1 seeding dates.

Fall seeding camelina does show some promise but yield response was variable across the province. Fall seeding late enough to prevent emergence appeared to be more consistent with spring seeding dates. Another year of data at more locations is needed to really demonstrate the suitability of camelina to different seeding date options.

Response of camelina to nitrogen fertilizer application

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In 2009 and 2010, a study to determine the fertility requirements of camelina was carried out at Indian Head. This trial is lead by Eric Johnson with AAFC and took place at Scott, Melfort, Indian Head, Lethbridge and Beaverlodge, and looked at the nitrogen requirements of camelina as well as plant height, days to flower, lodging, maturity, harvest index, straw yield, seed yield, and thousand kernel weight. The trials found that camelina is as responsive to nitrogen as canola. The appropriate rate is about 75 kg ha^{-1} for first time growers in western Canada and 100 – 125 kg ha^{-1} in higher yielding environments.

Camelina seeding depth

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Overview

Camelina is a crop that offers several benefits for producers, especially in drier areas of the province. It is a frost-tolerant, short-season oilseed that is suitable for straight combining. If it can be seeded in the fall, it offers the additional benefits of spreading the farm workload and reducing herbicide applications. This work will help producers to refine their camelina production system and will be quickly adopted if it shows improved stands and yields of the crop. There are currently several thousand acres of camelina being grown in the province and improved agronomics will help increase the acres where growers see a fit for the crop in their farming operation.

Conclusion

The study found that camelina appears to be able to emerge from 2.5 cm but the recommended seeding depth is .5cm. Seeding depth results are very preliminary. At Indian Head, there were no significant differences in plant density among seeding depths used (surface to 2.5cm), on either the fall or spring seeded camelina. However, in Indian Head, the fall 2009 seeded plots yielded lower than the spring 2010 seeded plots.

Tolerance of Niger to pre and post emergence herbicides

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The objectives of this trial were to test currently registered herbicides to determine their ability to be applied to niger. Ethalfluralin, flucarbazone, 2,4-D and sulfentrazone were some of the products to be tested. Unfortunately, the plots were lost due to wet conditions in 2010. A factsheet is being developed for niger which will include herbicide information from previous years.

GR tolerance of Niger to pre and post emergence herbicides

W. May[1]

[1]Agriculture and Agri-Food Canada, Indian Head, Sk.

The objectives of this trial were to test currently registered herbicides to determine their ability to be applied to niger. Ethalfluralin, flucarbazone, 2,4-D, clethodim, and quizalofop-P-ethyl were the products to be tested. Unfortunately, the plots were lost due to wet conditions in 2010. A factsheet is being developed for niger which will include herbicide information from previous years.

Development of niger

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The objective of the trial was to follow the development of niger through the growing season at several locations across Saskatchewan. Factors such as plant height, percent ground cover, uniformity of stand, lodging, and disease level were assessed at all sites. The niger plot at Indian Head was not harvested as most of it was lost to wet conditions. One of the co-operators, Les Williams, Glenavon, harvested his highest yielding crop of niger yet. The crop yielded 900 lbs ac^{-1} net. Les uses the niger as part of a business he has developed selling birdseed mixes. There is potential for a new niger market in Canada due to the demand for live niger seed (not heat-treated) for use in bird breeding operations as the birds perform better with the live seed. All niger used in the US must be heat-treated.

Post-Emergent N application algorithms for the GreenSeeker® optical sensor in cereals and canola using small plot studies and UAN solution: a summary

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Overview

Nitrogen (N) fertility management encompasses four major components, source, placement, timing and rate. Research has demonstrated that there is very little difference between fertilizer forms, providing they are managed appropriately. Placing the fertilizer in the soil, as opposed to on the surface, greatly minimizes losses from volatilization and immobilization and enhances overall N fertilizer recovery. The timing of N application should be such that it is available close to the time of maximum crop uptake which in cereal grains extends from the start of elongation until heading with peak uptake during flag leaf extension and in canola from the start of flowering to the end of pod formation.

The current N fertilizer rate recommendations on the Canadian prairies generally consider factors such as soil texture, residual soil nitrate levels, soil moisture at seeding, average growing season precipitation, previous crop grown, crop to be grown, target grain yield, expected commodity prices and N fertilizer; however there is uncertainty with all of these factors. Furthermore, nitrogen release during the growing season and the major pathways of N losses (immobilization, volatilization, denitrification and leaching) are greatly influenced by climatic conditions, making their amounts very difficult to estimate. Consequently, much uncertainty exists in determining crop N requirements and the rate of application can easily be under or overestimated with important economic and/or environmental consequences in either case.

There is interest in exploring post-emergent N applications in annual crops to refine our ability to arrive at more optimal N fertilizer rates. Delaying a portion of the N fertilizer until after crop emerges may allow for a better sense of crops yield potential and the actual growing conditions for a given year / field. Previous research with spring wheat and canola using post-emergent N applications as an N management tool compared applying all fertilizer at time of seeding in the soil with in-crop surface banded applications of liquid urea-ammonium nitrate (UAN) at different times after seeding and concluded that postponing the crops entire N recommendation into the growing season was too risky. Later research showed that applying 50% or more of the recommended N at seeding enhances the opportunity for in-crop applications of nitrogen in spring wheat and canola to better match the soil and climatic conditions while reducing the risk of deferring N applications into the growing season.

With the recent introduction of commercial optical sensors (i.e. GreenSeeker®) as a nitrogen management tool, it is now possible to estimate crop yield potential early in the growing season in cereals (5-6 leaf stage) and canola (mid-bolting stage) allowing enough time to adjust the rates of N to realize that potential. The objectives of this

research were to develop sensor-based N application algorithms for the Canadian Prairies and to test the algorithms developed to date for spring and winter wheat, durum, oat, malting barley and canola using small plots. The validation consisted of applying specific amounts of UAN at the 6-7 leaf stage in cereals and the mid-bolting stage of canola using rates determined by the algorithms and comparing this to the standard practice of putting all the fertilizer down in the spring at seeding.

Conclusion

The study has established that arriving at the correct rate of N, which accounts for both spatial and temporal variability, is very difficult. When comparing the farmer practice (FP) grain yields to the nitrogen rich (NR) grain yields and the reduced rate of nitrogen at seeding (RR) grain yields, the correct N rate for FP was only obtained 24% of the time. In 26% of the trials, the N rate used for FP did not maximize grain yield while in 66% of the time, the N rate used was too high based on the yield comparison between FP and RR. The study also established that post-emergent split N applications are feasible for all crops tested providing that 66% of the target N rate is used at time of seeding. This makes the use of the GreenSeeker® for fine-tuning N applications feasible given that it relies on the concept of post-emergent N applications. When the GreenSeeker® was used, it was successful in arriving at a more optimum rate given the year and field history in 74% of the trials. However, in 26% of the trials, the grain yields with GreenSeeker® were lower than FP. The question of interest is how do we improve the performance of the GreenSeeker® such that its success is greater than 74% of the time? It should be noted that in spring wheat, equivalent grain yields between FP and GreenSeeker® were observed in all years. The spring wheat algorithm is complete while the ones for barley, durum and winter wheat are still under development. However the canola algorithm is also complete and yet grain yields between FP and GreenSeeker® were only equivalent in 2 of 3 years, providing that 66% of the target N rate was applied at seeding.

Demonstration of the suitability of new mid-oleic and high-oleic hybrid sunflower across Saskatchewan in 2010

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[5]Saskatchewan Ministry of Agriculture, Weyburn, Sk.

Overview

Sunflower is an oilseed crop used as whole seed for human consumption, as oil for human consumption and as a feed for caged birds. The oil profile of sunflowers demanded by the market place has changed to mid-oleic and high-oleic sunflowers. New hybrids bred in Europe and the United States have been released, however, the seed companies have not been testing these new hybrids in Saskatchewan due to the small acreage of sunflowers (approximately 10,000 acres) spread across the wide geographic area of Saskatchewan. Growers are unable to evaluate the wide range of hybrids that have been released. Growers need to see these hybrids grown locally to evaluate their relative maturity and rate of dry down after they have reached physiological maturity. This differs among hybrids but these differences are not known for Saskatchewan growing conditions. Therefore this project was developed by the Saskatchewan Sunflower Committee to evaluate these new hybrids based on yield, relative maturity and rate of dry down after they have reached physiological maturity at six locations across the province. Ten hybrids and one cultivar were compared using a randomized complete block design. While two hybrids were identified that were close to the yield of our current earliest hybrid, 63A21, some caution must be taken in using this information until more data can be collected in the coming years as the 2010 available moisture was above average through the growing season.

Conclusion

Excess moisture reduced plant stands at Tribune and delayed seeding at Canora until very late into the spring. Bird damage occurred to the earliest lines at Tribune: AC Sierra and 63A21. Therefore the yield data from these two lines was not included. In addition the AC Sierra had a much lower vigour and germination than expected and its grain yield was not included since it would be misleading of the cultivars potential.

Hybrid 63A21 consistently ranked near the top for grain yield except at Outlook. This hybrid consistently reached maturity in a shorter number of days than most of the other lines except for AC Sierra, and had a low kernel moisture at harvest. The Hybrid 63A21 is a traditional oil sunflower that has been tested in Saskatchewan since 1998. Most of the market is moving to a Nusun oil profile and new hybrids with this profile are required. In 2010 two of the new hybrids tested 803 and 2930 look to be close in maturity and kernel

moisture at harvest to 63A21. The yield of 803 and 2930 was close to 63A21 except at Indian Head. These hybrids had elevated levels of lodging at Indian Head which reduced grain yield. These hybrids are the most promising new hybrids for production across most of Saskatchewan. The other hybrids appear to be limited to the warmer regions of the province. It is interesting to note that 7120 was rated as having a late maturity but its kernel moisture at harvest was below other earlier maturing hybrids indicating that this hybrid has a fast dry down after physiological maturity has been reached In addition the higher seeding density in 63A21 tended to increase yield and shortened maturity. In 2010 available moisture was above average through the growing season

Nitrogen Response of Hybrid Sunflowers across Saskatchewan

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Overview

Sunflower is an oilseed crop used as whole seed for human consumption, as oil for human consumption and as a feed for caged birds. In recent research led by William May with AAFC, the nitrogen response of sunflowers was studied. The research found that sunflowers do not require large amounts of N fertilizer to maximize grain yield. This project had two objectives. The first was to demonstrate the response of sunflowers to N and the second is to further refine the N response of sunflower.

Conclusion

The study found that seed yield increased by 300 kg ha^{-1} as the N rate was increased from 10 to 70 kg ha^{-1} when averaged over 4 locations and 3 years; however, the responsiveness of seed yield to N rate varied depending on the location and year. Therefore, the data suggests a moderate rate of nitrogen (50 to 70 kg ha^{-1}) is recommended in Saskatchewan. However, there can be large differences in response between individual fields.

There was a strong linear increase in grain yield at Indian Head and Swift Current, however there was a moderate decrease in grain yield as the rate of nitrogen increased at Outlook. The residual N in the soil from 0 to 24 inches was 14 kg ha^{-1} at Indian Head, 23 kg ha^{-1} at Swift Current and 325 kg ha^{-1} at Outlook. There was a strong increase in kernel weight and test weight as the nitrogen rate increased. The damage to the plots at Tribune from birds and excess moisture make it difficult to determine if N did not affect grain yield or was overwhelmed by the stress the plot received from water and birds. In 2010 sunflowers appeared to be more responsive to N than in most previous studies unless the residual N before seeding was quite high.

Field Scale Fungicide Trials

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Objective

Each year, IHARF manages the land at the AAFC Indian Head Research Farm that is not being utilized for small plot research in addition to another 120 ha farm located east of Indian Head. Wherever possible, large-scale field trials are established on these 'fill-in' acres that utilize commercial field equipment and yield monitor data. A good example of these field-scale trials are fungicide trials that IHARF has been completing over the past several years. The objective of these trials was simply to test various fungicides on several crops on a field scale and also demonstrate to producers that scientifically sound, on-farm research is possible with commercial equipment. These trials have been ongoing since 2004 on peas, spring wheat, barley, oats, canaryseed and canola. The products tested varied with crop and year. Yield data was collected using New Holland yield monitoring equipment and GPS, processed using GIS software and statistically analyzed using SAS. All field experiments were completed in the Indian Head area and a summary of the different fungicide trials completed over the years follows:

- 2004 – 2 trials (pea, barley)
- 2005 – 1 trial (pea – no data)
- 2006 – 3 trials (pea, barley, wheat)
- 2007 – 5 trials (canola, pea, wheat, oat, barley)
- 2008 – 5 trials (canary, canola, barley, pea, wheat)
- 2009 – 5 trials (canary, canola, barley, pea, wheat)
- 2010 – 3 trials (canary, oat, wheat) pea & canola cancelled due to wet weather

Results

Malt Barley (Headline®, Stratego®, Tilt®) – There was a yield response to fungicide 50% of the time. There was an overall yield response of 6.6 bu ac^{-1} averaged over 4 years. There was no significant difference amongst products detected.

Peas (Headline®) – A yield response to fungicide was observed 20% of the time and an overall yield increase of 3.3 bu ac^{-1} averaged over 5 years.

Spring Wheat (Headline®, Stratego®, Quilt®, Tilt®) – A yield response to fungicide was observed 20% of the time and an overall yield increase of 2.2 bu ac^{-1} averaged over 5 years. There were no significant differences amongst products.

Canola (Lance®, Proline®, Rovral Flo®) – A yield response to fungicide was observed 33% of the time and an overall yield increase of 1.0 bu ac^{-1} averaged over 3 years. There were no significant differences amongst products.

Canaryseed (Headline®, Quilt®, Tilt®) – A yield response to fungicide was observed 100% of the time and an overall yield response of 8.8 bu ac^{-1} averaged over 3 years. There were no significant differences amongst products.

Oats (Headline®, Stratego®, Tilt®, Quilt®) – There was no significant yield response to fungicide over 2 years and no significant differences amongst products.

Harvest Management – Field Scale

A new harvest management trial was established in the fall 2010 by sculpting stubble with a mower to various height for snow trapping. Future work will be looking at wider row spacing, between row seeding and the use of a stripper header.

Contract Research

IHARF does partake in a small amount of contract research for private industry but generally prefers to work with industry on a more cooperative basis whereby ownership of data is equally retained between IHARF and the industry partners who provide compensation in the form of in-kind contributions and financial support.

IHARF carried out the following contract trials for various companies. It is likely that most of the research information from these trials will be available for inclusion in reports on our website but we must first seek permission after all the reports have been completed.

Nutri-sphere research for the Canadian market – canola, wheat

The Objective of the trial was to evaluate the Nutri-sphere technology for urea under western Canadian conditions using canola and wheat as test-crops.

2010 Nexera advancement demonstration trial

The objective of the trial was to evaluate the agronomic performance and quality of Stage 3A RR and CL Omega-9 lines under commercial management practices compared to commercial elite and internal check varieties.

Donaghys N-Boost study on CWRS wheat (heading) and canola (bolting)

The objective of the trial was to test the effect of foliar nitrogen and N-Boost on wheat and canola crops treated at the appropriate stage. Moderately low N rates are used to reduce the impact of leaf scorch and increase the chance of seeing an N-Boost response.