

MCDC

2023

MHPEC Inc. acts as the industry partner in managing the Manitoba Crop Diversification Centre (MCDC).

 MCDC's programs are broadly classified as water and irrigation management, applied potato research, environmental, and crop diversification. This partnership between MHPEC and Manitoba Agriculture provides a unique opportunity for a collaborative site which amplifies the scale and significance of research that can be done.

Keystone Potato Producers Association, McCain Foods Canada, and Simplot Canada II constitute the members of the Manitoba Horticulture Productivity Enhancement Centre (MHPEC Inc.)



OUR GOAL

to provide leadership and vision through cooperation, coordination and strategic collaborations between industry members and the scientific community, resulting in the development of a research program that will ensure the long term sustainability of the potato industry in Manitoba.

Thank you for taking the time to read and review our 2023 report. This year marked thirty years of research at this site. The site has benefited both agriculture and industry and has helped to broaden the picture of farming in the province.

The Manitoba Crop Diversification Centre (MCDC) was established in 1993 between the Government of Canada, the Government of Manitoba, and Manitoba Horticulture Productivity Enhancement Centre Inc. (MHPEC). We are located at the north-east corner of the junction of highway number 1 and number 5 at Carberry Manitoba.

The Centre's mission, in brief, is to facilitate the development and adoption of science-based solutions for agricultural crop production. This is accomplished through the design, development, and adaptation of best management practices with a focus on water management, crop diversification and environmental stewardship. Its strategic areas include sustainable irrigation, sustainable potato production, improving the environmental sustainability of intensive crop production, and crop diversification.

Here at the MHPEC site we are fortunate to have the support of our three industry partners Keystone Potato Producers Association, Simplot Canada II Ltd., and McCain Foods Canada that allows us to operate and conduct research for the potato industry, as well as other trials on crops. The results of this collected data are then entered and published for distribution to all interested stakeholders in potato production. These reports and full reports are also available online at www.mbpotatoresearch.ca and diversification trials are available online at <https://mbdiversificationcentres.ca>



The year 2023 saw us welcome Amy Unger to our team as an applied research technician. Amy's background in small plot research is a huge asset to our team. Also, in May we received notice from Zack Frederick, our applied research agronomist, that he would be leaving MHPEC to pursue other interests. We wish him success in his future career. I would like to pass along my appreciation to the entire team for their contribution to make this a very successful season.

In closing I would like to thank you for taking the time to read and review this publication. We welcome, any and all researchers, commodity groups and interested industry parties to bring forward your research projects for discussion. We are always open to the possibility of new research and trials at our site. Call us at 204-834-2007

FROM THE SITE MANAGER

Garth Christison

Site Manager for MHPEC Inc, MCDC Carberry



BENEFITS OF CONDUCTING RESEARCH AT MDC CARBERRY

- Soil types that match light and heavy soils used in Manitoba crop production
- Irrigated or dry land available
- Ability for the site to provide other services – tillage, sprays, specialized crop research and precision agricultural equipment
- Low overhead costs
- Soil optix available for nutrient mapping
- Drone imaging available for canopy reflectance measurements
- Decades of historical data, maps, soil horizons, and surveys onsite
- Access to dedicated research staff onsite with experience conducting trials with potatoes, grains, brassica crops, legumes, forages, and specialty crops
- Proximity to Environment Canada and Agriculture and Agri-Food Canada weather stations
- Easy access at the junction of highways #5 and Trans-Canada highway #1
- Proximity to Carberry growers and central placement in Manitoba’s processing potato region

On site events and extension

- Annual field day
- Extension workshops
- Presence at major provincial extension events including Manitoba Potato Production Days, Manitoba Ag Days, Manitoba Agronomists Conference, Crop Connect Conference, etc.
- Demonstrations
- Boardroom, classroom, and laboratory space also available to rent



WELCOME

MOHAMED ELSHETEHY

**New Applied
Research
Agronomist
Hired!**



Mohamed graduated from the Faculty of Science at Tanta University, Egypt, in 2003. He joined the University of Kentucky as a PhD student in 2011. After five years, he received his PhD degree in August 2016 from the University of Kentucky, USA. Then, he was appointed as a lecturer of microbiology at the Department of Botany, Faculty of Science, Tanta University, Egypt, from October 2016 until August 2018.

From September 2018 to April 2020, he worked in Prof. Mauch's lab as a postdoctoral researcher at the Department of Biology, College of Science, University of Fribourg, Switzerland. Then returned to work as a lecturer of microbiology at the Department of Botany, Faculty of Science, Tanta University, Egypt, from April 2020 to December 2020.

Currently, Mohamed is working in Prof. Daayf's lab as a research associate at the Plant Science Department, College of Agriculture, University of Manitoba.

His research interests are molecular and biochemical analyses of host-pathogen interactions, plant defense signaling, and systemic acquired resistance. His goal is to pursue and strengthen his career in the field of life sciences by doing meaningful scientific research using advanced techniques and developing innovative strategies and methods to help solve biological problems.

Potato Program

Mohamed ElShetehy, PhD

Applied Research Agronomist

MHPEC Inc.

MCDC Carberry



Crop Diversification Program

Haider Abbas, M.Sc. P.Ag.
Applied Research Specialist
Manitoba Crop Diversification Centre
Manitoba Agriculture

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Haider Abbas is the Applied Research Specialist with Manitoba Agriculture and provides scientific and technical support to the Manitoba Crop Diversification Centre's crop diversification program. He holds a B.Sc. degree in Agricultural Engineering with a specialization in Irrigation and drainage Engineering and an M.Sc. degree in Agricultural and Biosystems Engineering with a focus on Soil and Water Engineering, attained from the University of Manitoba.

Haider has over 14 years of professional experience in agricultural research and extension. His areas of expertise include water management, agronomy, regenerative agriculture, crop production systems (including sustainable potato production), field crop scouting, agricultural machine design, and soil fertility management. The primary focus of the Crop Diversification program lies in meeting the demand for localized applied research. This involves testing and evaluation of crop varieties and novel technologies tailored to the region. The findings of this research are disseminated through various channels such as field days, producers' meetings, workshops, and online platforms, ensuring widespread accessibility and applicability.

Haider also provides the Secretariat support to the Manitoba Potato Research and Advancement Committee and assists the committee in implementing the Manitoba Potato Science Strategy.



Small Plot Studies

4.5 acres of potato studies
113 plots planted

SCAP Funded Project

- Nitrogen product and timing in potatoes

MHPEC Funded Projects

- Humic Acid
- Wind Erosion in Small Plots
- Available Soil Water Tracking

Plot Hosting for Collaborators

- Herbicide Injury Demo for Manitoba Agriculture
- Sulphur Plots for University of Manitoba



Grower Field Studies

10 grower fields
8 grower partners

SCAP Funded Projects

- Mustard biofumigation for Verticillium wilt control in potatoes
- Mustard biofumigation for erosion reduction
- Sulphur nutrition for potato yield improvement

FVGC Funded Project

- Comparing regenerative to conventional practices for improvements in soil health, crop quality



Project: Mustard Biofumigation Ahead of Potatoes for *Verticillium dahliae* Control

Research questions:

- Does mustard biofumigation reduce levels of *Verticillium dahliae* sclerotia in the soil in the MB context?
- Does mustard biofumigation improve potato yield or tuber quality in the year following biofumigation?
- Does mustard variety or plant stand quality relate to biofumigation effectiveness?

Overview:

Growing brown mustard as biofumigant in the season prior to potatoes has been shown to reduce losses to *Verticillium* wilt during the potato crop year. This season MHPEC studied four grower fields to measure the impacts of mustard biofumigation on soil *V. dahliae* levels.

Three grower fields were planted to mustard (variety Rojo Caliente or AAC Brown 18) and paired plots were identified to follow throughout the project. A fourth field had received mustard biofumigation in the fall of 2022 and was planted to potatoes in 2023. Each field in the project is examined for two back-to-back growing seasons to follow a field from the mustard to the potato crop. The MHPEC crew geolocated plots to follow throughout this year and next. In the fields in mustard rotation, each mustard plot was paired with a no-mustard control plot nearby in the same field. Soil *V. dahliae* sclerotia counts were taken in the early season before biofumigation, as well as two weeks after the crop was flailed and turned under as a biofumigant. Plant stands were measured for plant height, density, above ground wet and dry biomass immediately before biofumigation. In the field planted to potatoes, the same plot locations were used as those established last year when the field was in mustard. Ten metre strips were harvested from each plot to assess total yield, size profiles, defects, and specific gravity. Next year we will follow the three mustard biofumigated fields into their potato rotation to assess how biofumigation versus no biofumigation impacts the next season *V. dahliae* levels, potato yield and quality. Check out the website at mbpotatoresearch.ca for full reports and results.

This project is funded in part by the Governments of Canada and Manitoba under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative.

Project Staff: M. Bowley, A. Manns, B. Mitchell, Y. Sidler, A. Unger



Project: Enhanced Efficiency Nitrogen Management for Potatoes

Research question:

-How does rate, product, and timing of Nitrogen application impact yield, size, and quality of Russet Burbank potatoes?

Overview:

Potato yields, set number, size profile, specific gravity, and defects can all be impacted by too much or too little Nitrogen at different points in the growing season. Past research at MHPEC has suggested that even with consistent rates applied over the whole season, a soil test below 120lb/ac N at row closure is related to lower specific gravities, more undersize tubers, and fewer tubers in the 6-12oz category at harvest time. This study takes a closer look at how different N products applied before and after row closure impact the tubers.

Treatment	% N applied - Planting	% N applied - Topdress	% N applied - UAN Fertigation	Total N Applied (lb N/ac)
1 - Control	0	0	0	0
2- ESN	15%	35%	50%	200
3- ESN	25%	50%	25%	200
4- ESN	33%	66%	0	280
5- SuperU	15%	35%	50%	200
6- SuperU	25%	50%	25%	200
7- SuperU	33%	66%	0	280

Small plots were set up in RCBD design to compare seven Nitrogen scenarios with different splits of the products ESN or SuperU at plant and as a topdress at hilling, and UAN as fertigation after row closure. Both high-rate plots and plots without Nitrogen were included in the study. Plots were monitored throughout the season with a focus on soil and petiole N analysis at row closure and pre-harvest stages. Harvested tubers were graded for total yield, size category distribution, specific gravity, and defect counts. Check out the website at mbpotatoresearch.ca for full reports and results.

Funded in part by the Governments of Canada and Manitoba under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative.

Project Staff: M. Bowley, A. Manns, B. Mitchell, A. Unger



Project: Sulphur for Potato Nutrition

Research question:

-Does application of elemental sulphur versus ammonium sulphate result in different soil test Sulphur levels in season, or different yield and quality of harvested tubers?

Overview:

Past research at MHPEC has suggested a connection between higher yields and adequate soil test S levels at the row closure stage. This study tracked the impact of different formulations of S on soil test levels and on harvest data to explore the topic further.

MHPEC partnered with two Manitoba growers interested in comparing the same rates of Elemental Sulphur and Ammonium Sulphate on the field scale. Each field was split into two treatment zones where all management was the same except for formulation of Sulphur. Fields were scanned with SoilOptix before planting to aid in plot location selection. Eight plots were established per field, with four plot locations in each treatment identified and returned to throughout the season. Soil testing included pre-season, row closure, and pre-harvest soil test NPKS at 0-15cm and 15-30cm. Petiole samples were also pulled at the row closure stage to make a connection between soil test S levels and S uptake by growing plants.

At the end of season, 10 metre strips of tubers were harvested from each sampling location and assessed for total harvested weight, size category distribution, specific gravity, and defects. These will be compared to the treatments to explore how elemental sulphur and ammonium sulphate impact raw quality. Check out the website at mbpotatoresearch.ca for full reports and results.

Funded in part by the Governments of Canada and Manitoba under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative.

Project Staff: M. Bowley, A. Manns, B. Mitchell, Y. Sidler, A. Unger



Project: Cover Crops and Wind Erosion in Grower Fields

Research question:

-Does including green manure in rotation with potatoes decrease soil loss by wind erosion?

Overview:

Growers had observed that including a green manure cover crop in rotation with potatoes seemed to reduce the amount of soil blowing around. This study set out to put numbers to that observation by measuring wind transported sediment directly.

Two similar fields were included in the study, one which had received a green manure previously, and one which had not. Custom built sediment traps were constructed that allow wind to move through while keeping any wind transported particles inside. These traps had openings at three heights pointing toward the field, and sets of traps were placed at up to four locations around the edges of each field. Traps were placed before planting and left in position until after harvest.

All the solids left behind in the traps after the growing season were collected and weighed. Further analysis of these samples will help answer the question of whether or not including a green manure in the rotation reduced soil loss by blowing during the growing season.

Check out the website at mbpotatoresearch.ca for full reports and results.

Funded in part by the Governments of Canada and Manitoba under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative.

Project Staff: M. Bowley, A. Manns, B. Mitchell, A. Unger



Project: Wind Erosion in Small Plot Potatoes

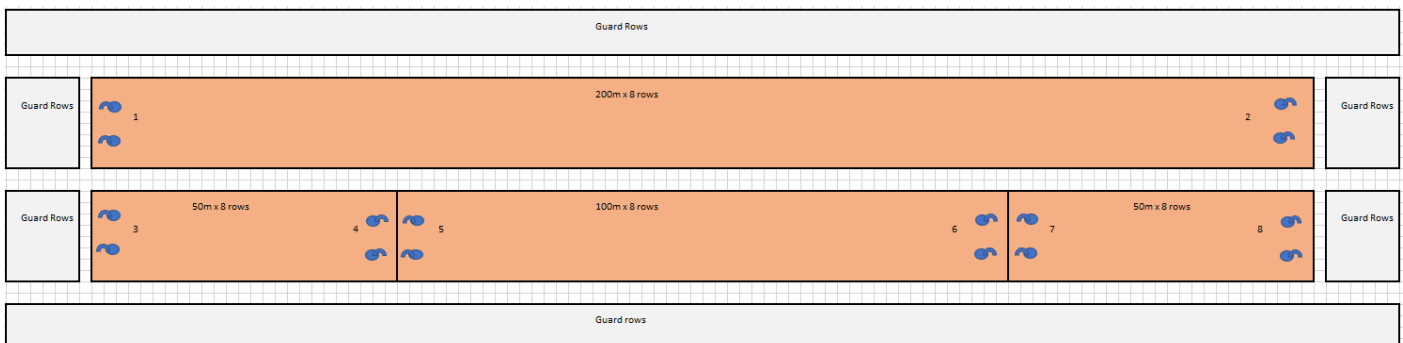
Research questions:

- How does wind erosion move soil across a potato field?
- How much soil is lost from a field due to wind erosion?

Overview:

MHPEC is conducting research into wind erosion on a field scale with growers, and we wanted to get a more detailed picture of how and how much soil moves by wind in potato systems through a smaller and more intensive experiment. When wind erosion occurs, some soil particles are moved along the field but ultimately stay on the same field. Some particles move off the field altogether. This study will help us understand how these dynamics act in potatoes specifically.

To get this detailed view, plots were planted 200 metres long and 8 rows wide with custom built sediment traps placed in strategic places along the plots. These sediment traps are placed in sets of two with a higher opening on one bucket and a lower opening on the other. The traps are designed to allow the wind to enter and continue to move through the trap while particles fall and are collected in the bucket to be measured and analyzed at the end of the growing season.



Check out the website at mbpotatoresearch.ca for full reports and results.

Project Staff: M. Bowley, A. Manns, B. Mitchell, A. Unger



Project: Humic Acid Applied at Planting in Russet Burbank

Research questions:

- How does humic acid application at planting impact plant growth, nutrient uptake, and tuber quality?
- How does humic acid application interact with full or reduced Nitrogen rates?

Overview:

With movement toward regenerative farming and reduced fertilizer inputs in potato systems in Canada, growers may consider applying products like humic acid which are advertised with the ability to improve or maintain tuber yield and quality with reduced Nitrogen rates. This study takes a closer look at humic acid application in irrigated Russet Burbank potatoes in a Manitoba context.

Four replications of small plots in RCBD design compared humic acid application or not, at either a full rate or reduced rate of Nitrogen. Soils were tested for NPKS levels pre-plant and at row closure stage at two depths. Stem counts were collected and full nutrient analysis of petioles was done at row closure stage. Plots were harvested and data collected on total harvested weight, size category distribution, specific gravity, and defects.

Treatment	Humic Acid	Nitrogen Rate
1	No	100%
2	Yes	100%
3	No	75%
4	Yes	75%

This study will allow us to explore how liquid humic acid at planting on plots with either full or reduced nitrogen impacts the plant growth, nutrient uptake, potato yield or tuber quality. Will plots that received less Nitrogen and humic acid perform as well as the plots with full nitrogen but no humic acid? Check out the website at mbpotatoresearch.ca for full reports and results.

Project Staff: M. Bowley, A. Manns, B. Mitchell, A. Unger



Project: Regenerative Agriculture, Rebuilding Soil Health and Increasing Crop Productivity of Canadian Potato Production Systems

Research question:

-How do regenerative practices versus conventional practices impact soil and crop health over time?

Overview:

This project, led by Dr. Claudia Goyer at Agriculture and Agri-Food Canada in Fredericton explores regenerative practices that growers are trying on farm compared to conventional practices. Growers from across Canada are participating in this project along with the three Manitoba potato growers. Every field in the project is split into a conventional and regenerative area within the same field so that the impacts of the regenerative practice can be isolated and better understood. The Manitoba growers will be exploring practices of manure application, cover cropping, reduced tillage coupled and extended time with living roots in potato systems.

Throughout this five-year project, fields will be closely monitored for changes in soil and crop health in both the conventional and regenerative areas of the field, with three plots per treatment (six per field) to be followed year after year.

Soils will be assessed for physical properties and nutrient levels every year. Microbial community analysis of the soil in regen and conventional areas will be assessed every second year. At the start and end of the project bulk density and soil organic carbon be measured to look for shifts. Crop data collected includes biomass and ground cover measured for every rotation crop. In potato years the yield, size profile, specific gravity, and quality of tubers will be collected. Each field in the project will have at least two crops of potatoes to help us gain a clearer picture of how regenerative practices change a potato system and bottom line over time.

This project is generously funded through the Canadian Agri-Science Cluster for Horticulture 4, in cooperation with Agriculture and Agri-Food Canada's AgriScience Program, a Sustainable Canadian Agricultural Partnership initiative, the Fruit and Vegetable Growers of Canada, and industry contributors.

Project Staff: M. Bowley, B. Mitchell, A. Unger



Controlling and Measuring Available Soil Water:

MHPEC installed a new Variable Rate Irrigation system at the small plot site. This system will make it possible to run studies that include high and low moisture scenarios at specific points in the growing season.

The goal of this system isn't to make recommendations to growers about how to use a VRI system, but rather to mimic the different kinds of growing seasons that Manitoba faces, and to ask research questions about how management practices and moisture levels interact.

This year, MHPEC planted plots and outfitted them with two types of soil moisture sensors at multiple depths in the soil profile. Soil samples, tissue samples, and harvest data from plots were collected. Unfortunately the Variable Rate Irrigation system was not working throughout season, so all treatments received full irrigation regime. The goal was to explore the precision and potential of applying specific amounts of irrigation water with new system, and to gather information on impact of water applications on potato yield and quality while training the team to use make full use of the moisture sensing equipment available on site. We look forward to getting the VRI up and running to better serve Manitoba potato growers in our research.

Pest and Disease Network:

MHPEC participated in Manitoba Agriculture's Potato Pest and Disease Reporting Network with a Spornado for Early and Late Blight reporting, Aphid trap, and European Corn Borer lure and trap at the small plot field.



Amy Unger, P.Ag. joined the team as the Applied Potato Research Technician in January 2023. She received her Bachelor of Science in Agronomy from the University of Manitoba and brings potato experience from both industry and research perspectives. Having been in the Manitoba potato industry since 2019, Amy has enjoyed working closely with growers to monitor their potato systems and tuber quality through the growing and storage seasons and down the processing line at McCain Foods. She also valued the strategy and design behind research and connecting with scientists across Canada as potato biologist with AAFC. These experiences led her to the world of applied potato research and extension here at MHPEC Inc. Local research paired with ag extension puts science into the hands of growers and consultants as they sustainably provide high quality food to our wider community, and this is what Amy loves about her role.

thank you

We want to thank our industry and commodity partners, government, and grower cooperators for their support as we build our
Manitoba Potato Centre of Excellence

Faryal Yousaf is the Applied Research Technician at the Manitoba Crop Diversification Centre. She provides field operations and technical support for the Crop Diversification research program. Faryal completed her undergraduate education in Soil Science from the University of Alberta and earned her Master's degree in Business Administration with a focus on agribusiness. To enhance her agronomic skills, Faryal obtained a Diploma in Agronomy from the Olds College of Agriculture and Technology in Alberta. Born and raised on a family farm and working with the ag industry in the Canadian prairies, Faryal has significant experience in applied research, nutrient management, field scouting, and statistical analysis. She also obtained a certification in Website Development and Administration and manages the Manitoba Crop Diversification Centres' website.





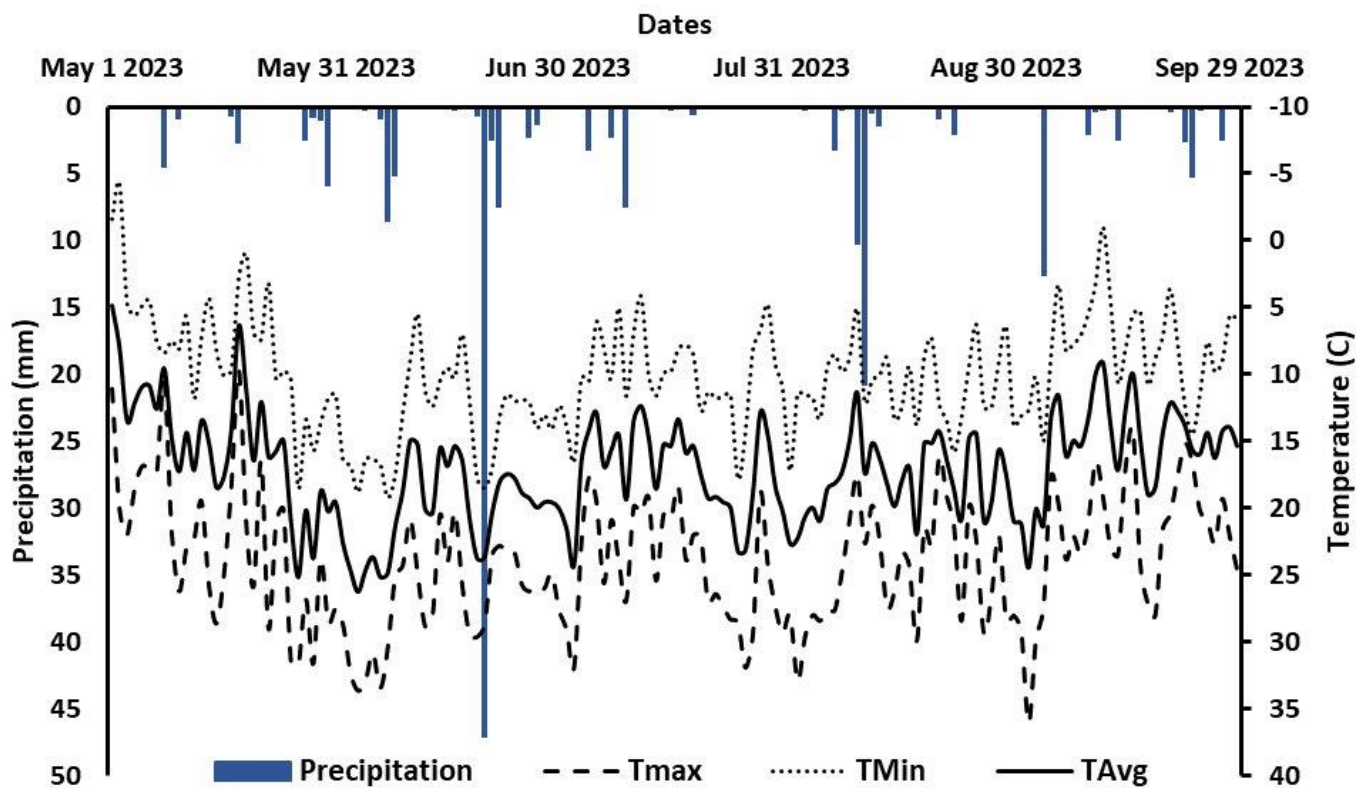
MANITOBA CROP DIVERSIFICATION PROGRAM

The long-term health of regional agriculture-based communities and Manitoba, in general, is strongly dependent on the inclusive sector's ability to consistently improve competitiveness while maintaining the sustainability of production practices. Crop Diversification program of Manitoba Crop Diversification Centre (MCDC) supports key agriculture sector growth and sustainability through applied research for accelerated adoption of innovation. MCDC's activities include testing and demonstrating current technologies and crop performance field tests with and without irrigation, extreme moisture and drought management, crop variety evaluation, greenhouse gas (GHG) emissions, nutrient management and regenerative agriculture projects. MCDC partners on a variety of projects with numerous public and private organizations.

During the 2023-24 growing season, the Manitoba Crop Diversification Centre (MCDC) conducted 44 research and demonstration projects in the applied research program on cereals, forages, oilseeds, pulses, special crops, and potatoes in collaboration with Manitoba Agriculture, AAFC, producer groups and industry partners. Over 3,000 research and demonstration plots were maintained during the crop season.

The region experienced inadequate rainfall during the growing season, with below-average precipitation. Temperatures were above normal for most of the season, contributing to hot and dry conditions. The rainfall events at the end of August boosted longer-season crops like soybeans, corn, and sunflower. The rainfall during September delayed harvest progress. However, some timely rains and post-harvest management practices contributed to better-than-expected yields. The figure shows MCDC's weather conditions throughout the growing season.

MCDC Weather Conditions - 2023 Growing Season



MCDC is one of many sites that are part of the Manitoba Crop Variety Evaluation Team (MCVET) trials, which facilitates variety evaluations of many different crop types in the province. MCDC conducted winter wheat, fall rye, spring wheat, oats, corn, flax, field peas, sunflowers, and annual forage trials for MCVET, focusing on varietal evaluations. These results have been published in the SEED MANITOBA guide.



MCDC partnered with AAFC Alberta to study the effect of drought stress on soybean seed yield and seed protein. In collaboration with AAFC Ottawa, Manitoba Crop Alliance, and Maizex Seeds Canada, the MCDC conducted projects with a focus on climate change resilience to develop and release early maturing cold-tolerant corn inbreds, corn variety evaluation, and Goss's Wilt disease evaluation.



MCDC conducted protein-focused research to support Manitoba's protein strategy. In this category, a number of trials were conducted on field peas, soybeans, teff, peas-cereals intercropping, hemp-cereals intercropping, spring wheat, winter wheat, annual forages, and corn silage, with a focus on the quantification of protein contents and yield benefits of intensive management practices.



To contribute towards reducing greenhouse gas (GHG) emissions, MCDC conducted two experiments in collaboration with Ducks Unlimited Canada and the University of Manitoba. These projects aim to contribute insights into the relationship between N application strategies and GHG emissions in a multi-crop system and winter wheat production.

Other crop research activities included variety evaluation and yield testing of mustard, hemp, teff, barley, oats, wheat, corn, alfalfa, hops, canola, sunflowers, flax, soybean, field peas, lupins, beans, quinoa, fruits, and vegetables.



Project descriptions and results for all 44 research projects have been published in the MCDC's Annual Report. All experiments' annual and individual reports are available on the Diversification Centres' website (mbdiversificationcentres.ca). Some featured results have been shared through social media channels (Twitter, YouTube, etc.) for timely public access.

MCDC organized in-field and virtual extension events to disseminate research findings with local producers, industry, and universities. In collaboration with provincial crop specialists, MCDC also prepared two extension videos to brief about the annual forage varieties test and herbicide injury in the potato production system for knowledge transfer.



For your questions and feedback on the crop diversification program, contact **Haider Abbas** at haider.abbas@gov.mb.ca



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Contact Us:

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mhpec_manager@outlook.com

Shawna Derksen – Office Administrator
mhpec1@outlook.com



Support Staff:

MHPEC's research program is supported by a research technician and seasonal staff: Garth Christison, Amy Unger, Sherree Strain, Beverly Mitchell, Alan Manns, and Shawna Derksen along with summer students, are critical team members whose efforts are essential for work at the research site.

In Memory:

August 26, 2023 we lost our longtime administrator Sherree Strain. Sherree was our co-worker but more importantly our friend. Sherree started at MCDC with MHPEC in the 90's then became an AAFC employee working on behalf of all partners at the site. With her retirement from AAFC Sherree continued to handle the administration for MHPEC and MCDC projects until her passing.



Extension



August 2023 Field Day



ACC visit



Manitoba Potato Production Days 2024

For project findings and recommendations, please visit the following websites for our Annual Reports or scan the QR code

mbpotatoresearch.ca

mbdiversificationcentres.ca QR code

