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# GOOD THINGS GROWING

**SUSTAINABLE GREENHOUSE**  
REPORT TO DONORS, SUMMER 2018

# Strawberries in the snow?

## *Assiniboine research could help grow fruits and vegetables in North*

Strawberries, tomatoes, sweet potatoes and other warm-weather crops could be grown in northern Manitoba, thanks to research being carried out at Assiniboine's Sustainable Greenhouse.

Dr. Sajjad Rao, agriculture instructor and researcher, is coordinating with organizations in northern Manitoba that would like to build sustainable greenhouses to grow fresh vegetables and fruit.

"Research at Assiniboine's Sustainable Greenhouse will provide information on what is the best sustainable greenhouse for growing up North," Dr. Rao said.

Assiniboine's Sustainable Greenhouse was opened in 2013 at a cost of \$1.3 million. The funding came from donors to the Assiniboine Community College Foundation and other sources, including the federal and provincial governments.

Dr. Rao was attracted to Assiniboine from the private sector because of the opportunity to conduct research in the state-of-the-art greenhouse that was already under construction.

"This greenhouse was a big learning experience for me. It was built in front of me, so I have seen all the steps as it was built," he said.

Dr. Rao has published two articles in scholarly journals from the greenhouse research project.

The article in the *Canadian Journal of Plant Science* was co-authored by Dr. Lord Abbey, a former instructor at Assiniboine, now a professor at Dalhousie University.

The article in *Acta Horticulturae*, published by the International Society for Horticultural Science, was co-authored by Dr. Abbey and Dr. Mohammad Khakbazan of the Brandon Research and Development Centre of Agriculture and Agri-food Canada.

Dr. Rao's first scholarly article evaluates the effects of the "micro-climates" created in each pod on the growth of collards, carrots and tomatoes. The second article examines the difference in the growth and yield of tomatoes between the low-tech and the medium-tech greenhouses.

Dr. Rao is recommending the low-tech or medium-tech models as the template for greenhouses in northern Manitoba, because the requirements for the high-tech model would be difficult to support in remote areas.

The medium-tech model is the best for growing tomatoes in winter, because of the heated floor, he said in his second scholarly article.

The college's greenhouse has three pods, each more technologically sophisticated than the last.

In the low-tech greenhouse, a black wall heats up with the passive solar heat coming through the roof. The floor is made of gravel. Temperature and humidity can be controlled by the operator.

The medium-technology greenhouse uses solar panels beside the building to heat a mixture of glycol and water that is pumped through pipes in the concrete floor.

The high-tech greenhouse has many features that are standard in the industry, including computer control

of temperature, humidity, irrigation and ventilation.

"There are a lot of visitors to the greenhouse. They ask, 'If we're going to have a greenhouse like this, what do we need to do?' We have a prototype here with three or four years data," Dr. Rao said.

Part of his research is focused on the cost of using the three different technology levels.

"Does the heat coming from the floor in the medium-tech greenhouse make a significant difference in crop production? How much electricity and propane do we need to use to reach a certain temperature? I am trying to calculate the cost of the energy in terms of dollars."

Now in the fourth year of his five-year research plan, Dr. Rao said his research shows residents of northern Manitoba could grow a variety of crops in a low-tech or medium-tech greenhouse.

"They can grow baby carrots and all kinds of greens. They can produce planting material like sweet potato slips in April and May and in June they can plant them outside in their grow plot. From there, they can produce their sweet potatoes. They can start tomatoes in the greenhouse and plant them outside in the summer months."

Dr. Rao is also researching the best strains of strawberries and sweet potatoes to grow in Manitoba's climate.

Part of his research has been funded by Growing Forward 2, a federal-provincial program recently renamed the Canadian Agricultural Partnership. ❁





## Aim of research: A better strawberry

Dr. Sajjad Rao is identifying a better strawberry for Western growers at the college's Sustainable Greenhouse.

"When you have one variety, after 10 to 15 years, you need to replace that variety with a new one, because of disease, pressure, reduced yield, all of those attributes. After 15 years, its potential is not as good as the first year," Dr. Rao said.

"Now you need to replace it with a good variety that is better than Kent (the most popular current variety.) If nothing is better than Kent, the growers will still use that."

Dr. Rao is working with the Prairie Fruit Growers Association on the project and conducting research at Assiniboine's Sustainable Greenhouse.

Assiniboine is a testing location. "We are working closely with breeding stations to bring in new lines for testing," Dr. Rao said.

"We test new varieties for winter hardiness. We are measuring quality – skin, firmness, taste, shelf life, size, all these attributes. Yield is third. If those three things match, growers want that variety."

No variety has a significant advantage over the Kent so far. Some varieties rate well for hardiness, but not for quality or yield.

Dr. Rao's tests will continue this year and next, comparing new strains with commercial ones.

"This fall, next winter and next spring, we will do the second year's data. In 2019, we will analyze the yield data. Then we'll be able to say, 'This variety is better than the others.' " ❀



*Pictured, this page: Strawberries being harvested at the Sustainable Greenhouse as part of Dr. Sajjad Rao's research.*



*Dr. Sajjad Rao helps to harvest sweet potatoes from the grow plot near the Sustainable Greenhouse on the college's North Hill campus.*

# Would you like (sweet potato) fries with that?

Manitoba is a large producer of potatoes in Canada. Sweet potatoes? Not so much.

Dr. Sajjad Rao is on a mission to change that, by conducting research at Assiniboine to identify a sweet potato that could grow easily in Manitoba and just as easily be processed into french fries.

Why does Manitoba need sweet potatoes, when it has all the potatoes it needs?

"First, we need crop diversification. Continuing to grow the same crop on the same land is not the best agricultural practice," Dr. Rao said.

"Second, we are importing a huge amount of food from the south. We need to produce locally to replace imports," he said.

"Number three, from the Manitoba perspective, we have two big industries: Simplot and McCain. Because they have plants here, they are processing potatoes. But McCain has one plant in the southern U.S. and all they process there are sweet potatoes."

If Manitoba growers could guarantee a steady supply of sweet potatoes, Dr. Rao thinks Simplot and McCain would use some of their capacity to process them into sweet potato french fries.

A representative of McCain has already visited Dr. Rao two or three times.

Dr. Rao is working with the Vineland Research & Innovation Centre, located in Lincoln, Ontario and funded by the federal and Ontario governments.

"They're working on sweet potato breeding. There are challenges in growing a subtropical crop in a temperate region, which is a colder region. They are trying to develop a strain with early maturity," because of the high number of days with frost in Manitoba.

Vineland is going ahead with a promising variety. They will be producing planting material this year and next.

Dr. Rao's next goal is to test that variety with growers.

"Growers are interested in a variety that can be grown commercially in Manitoba."

To make it work, it's essential that the process for the growers is simple.

"We are making sure that whatever research we do, it is feasible at a grower's level. You don't need the high technology of a laboratory or tissue culture or something that is not easy or approachable for the growers. We are trying to develop a protocol or design a technology that a grower can easily adopt at their farm level." ❁

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## Bug research gets media attention for Greenhouse

*Assiniboine instructor uses \$25,000 NSERC grant to reduce pesticide use*

Bugs that eat bugs fascinate Dr. Poonam Singh... and journalists.

The instructor and researcher at Assiniboine Community College is studying the effectiveness of using "good bugs" to control pests that injure and sometimes kill plants.

Dr. Singh is the first instructor at Assiniboine to receive a grant from the Natural Sciences and Engineering Research Council of Canada - \$25,000 from the NSERC Engage program.

When journalists heard about her approach, they invited her to share the information with their viewers.

CBC Winnipeg News interviewed Dr. Singh inside the college's Sustainable Greenhouse, where she conducted key parts of her research. CTV Morning Live invited her into the studio for an interview about how homeowners could reduce pesticide use. CTV News at Six interviewed her at the Shelmerdine Garden Centre in Headingley, focusing on the partnership she formed with the private sector.

Using "biological control agents" can reduce and even eliminate the need for spraying chemical pesticides on the plants, said Dr. Singh.

"Resistance is developed so fast in this pest world. Then you have to go to an even stronger pesticide. This is a pesticide treadmill.

"Once you are on it, you can never get off it. You are just paving the way for having stronger, more resistant pests," she said.

"These biologicals, they are safe and economical. They provide a long-term solution. They're very good for the

customers, who don't want pesticides on their plants. They're good for the environment and they work really well."

The bugs that are used to control the pests are either predators or parasitoids. Predators eat the pests. Parasitoids lay their eggs in the pests, killing them in the process.

"Eventually, when there are no more pests, the good bugs just die as part of their natural cycle."

The practice of using biological control agents is already widespread in greenhouses used to grow vegetables. But many flower and shrub nurseries still use chemicals to kill pests as the cheapest way to protect plants from damage.

One of the requirements of the NSERC Engage grant is recruiting an industry partner who will benefit from the research.

Dr. Singh contacted Shelmerdine Garden Centre in Headingley, just west of Winnipeg, after hearing from a source in the industry that it was starting to use biological control agents in its greenhouses.

"They were very keen on getting this started, but they hadn't been as successful as they had hoped," Dr. Singh said.

"We are developing a customized integrated pest management program for them, using biological control agents. They told me they get almost 20 per cent economic loss because of the pests in their nursery. If we can somehow reduce plant damage using bio-control agents, it's going to reduce their economic loss and increase their sales."



Even though it was not required to, Shelmerdine committed \$1,000 to the project. More importantly, it made in-kind contributions of plants and staff time. Dr. Singh has visited the garden centre many times, training greenhouse staff to run the program, while helping the marketing staff sell it to pesticide-wary consumers.

Shelmerdine vice-president Chad Labbe said his team has “really enjoyed working with Poonam and her students for this project. We have learned a tremendous amount during this process and look forward to learning more as the season continues.”

If the program at Shelmerdine is successful, Dr. Singh will make presentations to the Manitoba Landscape and Nursery Association, hoping to spread the practice throughout the industry.

The project is a great opportunity for students to “learn by doing,” Assiniboine’s motto.

One student, Tiffany Nykolyshyn, works on the project as a research intern, funded by the NSERC grant. Two other students work on the project as part of their course practicum. Dr. Singh has also taken the whole class from both her Sustainable Food Systems program and her Horticultural Production program twice to Shelmerdine to help identify and monitor the pests.

“The students will help us make decisions about implementing this program. They will be able to see the live implementation of this program. And they will learn from this real-world situation.”

Dr. Singh first piloted her program by pitting good bugs against bad ones inside the Sustainable Greenhouse at the college’s North Hill campus in Brandon, with students helping to initiate the program.

That part of her research was funded by Growing Forward 2, a federal-provincial program recently renamed the Canadian Agricultural Partnership.

Thrips, a common pest, lay their eggs inside leaves, hatch as larvae and eat the leaves, pupate in the growing media and emerge as adults to lay more eggs. A mite known as *Amblyseius cucumeris* “is a very effective predator. She will eat both adults and larvae, although her preferred stage is larvae.”

When the thrips pupate inside the growing media, they can be attacked with small worms, known as entomopathic nematodes or *Steinernema feltiae*.

“They get inside and reproduce and eat everything inside the pupae. The pupae will be dissolved and these nematodes will be released and increase in number,” Dr. Singh said.

When the mites had so many larvae available that they didn’t want to eat the adult thrips, Dr. Singh introduced the Minute Pirate bug, *Orius insidiosus*.

“This bug specifically goes after thrip adults. When the thrips are not there, she feeds on pollen and survives on that.”

Dr. Singh began rearing her own beneficial insects inside the college’s Sustainable Greenhouse, which provides the perfect environment for her research, she said. Her future research projects may include study of “biofertilizer” – using the waste products from organic materials to enhance plant health. 🌱

*Pictured, below: Assiniboine agriculture instructor Dr. Poonam Singh, right, discusses how good bugs can fight bad bugs with, from left, Assiniboine student Gopin Patel, Shelmerdine employee Stephanie Walker and Assiniboine research intern Tiffany Nykolyshyn.*





# Weed ID conference held at Assiniboine

*Garden provides hands-on practice in identifying weeds*

The Weed Identification Garden, growing right beside the college's Sustainable Greenhouse, was the site this spring of the province's second annual Weed Seedling Identification Day.

About 85 participants were given numbered specimens of 75 weed species to identify at their own pace.

They also heard a presentation by Ingrid Kristjanson of Manitoba Agriculture on the basics of weed identification and the unique characteristics of the common weed species found in Manitoba.

The garden "provides live weed specimens that people can use to hone their observation skills. They are able to see characteristics that are often difficult to see in pictures. They are also able to touch and smell the plants which can be really useful when identifying certain species. Some weed species can look very different from one growing location to another," said agriculture instructor Danielle Tichit.

Students from Agribusiness, Land & Water, Geographic Information Systems (GIS), Horticulture and

Sustainable Foods use the garden as part of their programs.

"Students often have limited or no previous experience with weed identification and management. This garden provides an opportunity to work with a wide variety of weed species in one location. Many of these weeds are found in very specific areas of the province or may have completed their life cycle by the time students begin their studies in the fall. The garden allows us to expose the students to species that they may not see otherwise," she said.

The garden was established with a grant from the Manitoba Zero Tillage Research Association.

Tichit said she hopes to continue to develop the garden as a learning resource for students and the public.

"This will include educational signage on such topics as Integrated Weed Management, control measures for the various species in the garden, tips for identification of grassy vs broadleaf weeds and information about weed resistance and weed abundance in the province," she said. ❁



**New garden is growing like... weeds!**

*MZTRA-ACC Weed Identification Garden open to public*

Most people don't want weeds in their gardens.

But at Assiniboine Community College, there is a whole garden dedicated to nothing but weeds, growing right beside the Sustainable Greenhouse.

Homeowners, gardeners, farmers and anyone else having trouble figuring out what weeds are growing where they're not supposed to can bring them to the weed garden to figure out for themselves what they've got. All the weeds have signs identifying their species.

"We are developing the garden as a learning resource, both for students and the public. Gardening clubs, lawn and garden companies, anyone looking for a fun and informative activity can come to the weed garden. You can even have a picnic there!" said agriculture instructor Danielle Tichit.

The Weed Identification Garden is open for self-guided tours Monday to Friday, 8:30 a.m. to 4:30 p.m., at the college's North Hill campus. Enter from Lori Road and follow the signs to the Sustainable Greenhouse. ❁

*Pictured, left: About 85 participants were given numbered specimens of 75 weed species to identify at their own pace. Assiniboine students in agriculture and environment programs also use the outdoor learning space as part of their curriculum.*





## Thank you for helping us Grow the Greenhouse.

*Our vision of a Sustainable Greenhouse at Assiniboine Community College has become reality. We would like to acknowledge those who have supported us. Thank you.*

### *Funding Partners*

- Government of Canada (through Agriculture and Agri-Food Canada)
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