

Students extract, study bean DNA at Mayville State

By Tammy Jo A. Taft—December 5, 2015

MAYVILLE, ND - Alex Johnson of Mayville knows exactly how to pull strands of DNA and RNA out of a bean plant. She also knows this ability, and the DNA she has extracted and analyzed, may shape beans of the future. Johnson is one of four students who work in Dr. Khwaja Hossain's lab at Mayville State University. The group is trying to figure out how certain factors affect the nutrition content of beans.

"We are looking at the plant's DNA and RNA and trying to figure out various minerals affect the nutritional value of the plants," senior Cheyenne Durant explained.

The overall idea is that beans have been studied for yields, chemical tolerance and other factors, but maintaining nutrition has not been a key focus of bean research, Hossain said.

During the past year, the group has presented their research at various conferences around the country. Johnson and Durant recently presented their work in Niagra Falls, Canada.

Johnson said more than 200 people attended the conference that focused specifically on beans.

"We got a lot of data questions," Johnson said.

The group collects data in a multi-step process that spans months and starts in the greenhouse.

During the school year they raise about ten varieties of plants. In the summer months, the students have more time and are able to raise more plants, Hossain explained.

There are a few varieties of beans tested and some are exposed to various minerals like iron to see how that affects the bean's nutrition.

To see what DNA and RNA structures are associated with plants that have better, more nutritional beans, the group has to break their sample down into tiny molecules.

"It's cool to see everything that makes up the plant broken down instead of just looking at the leaf or the stem," fellow student and team



Photo by Tammy Jo A. Taft | TRIBUNE
Alex Johnson carefully cuts part of a bean leaf at the Mayville State University Greenhouse. The leaf will be analyzed to see how certain varieties of beans respond to iron and if they retain their nutritional value when exposed to various minerals.

DNA cont'd.

member Kayla Lundon said. "It's just kind of mind-blowing that there are millions of these strands packed into this tiny organism."

To get to the molecules, the group starts by putting dry ice in a small cooler and heading to the greenhouse. They cut a small piece of leaf from multiple plants.

The frozen leaf cuttings are ground up with a mortar and pestle. The dark green frozen mash is put in multiple tiny test tubes and liquid is added to help break cells down, but leave the DNA and RNA in place.

The procedure calls for some chloroform to the cells break down a little bit more.

The small tubes are then put into a machine that spins them at 12,000 RPM for 15 minutes.

The tubes come out of the machine separated and ready to be looked at for the first time. Each sample goes into a gel and the gel is examined using a box with a light source.

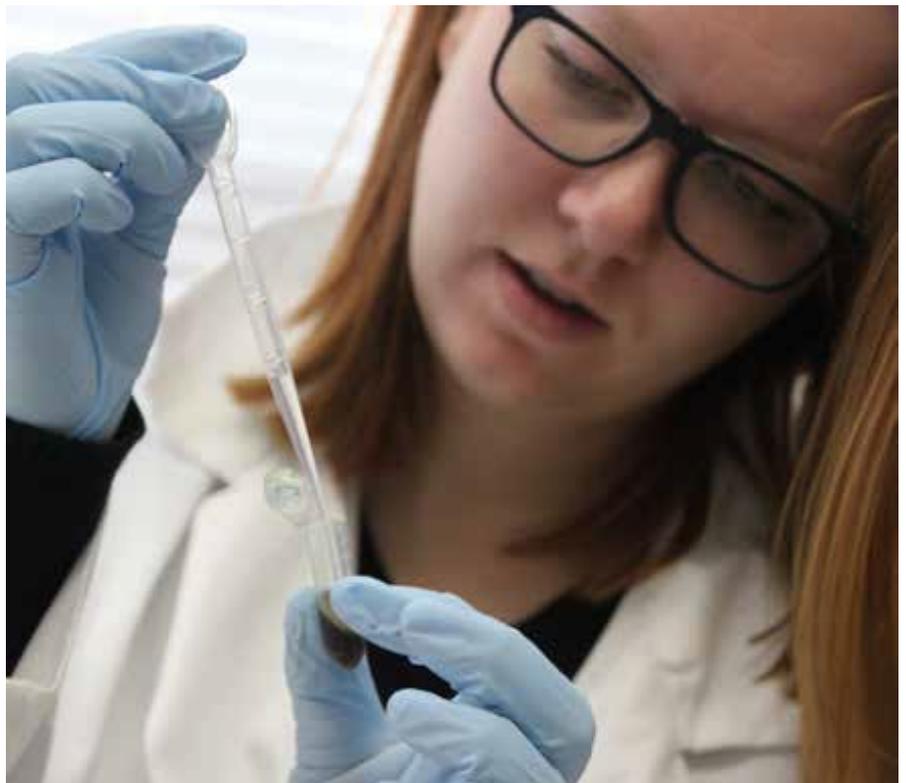
"You can see how good the sample quality is," Durant explained.

On the light box, it's easy to see if there are good samples with non-broken strands of RNA. The samples with the best strands are sent off to another research lab to be sequenced.

Getting the sequencing information back is the root of all data. That is the



Cheyenne Durant adds chloroform to frozen, crushed bean leaf samples. The process she is following helps isolate DNA and RNA molecules so they can be studied.



Alex Johnson works with a sample of plant molecules in the Mayville State lab.

DNA cont'd.

most basic blueprint for cells in the plant.

Although seeing the sequencing is really interesting, Durant said she really enjoys the hands-on lab work. She started working on the project after doing well on a genetics test last year.

She is planning on continuing her education to work in the field of wildlife biology. This type of research work and experience will be important for her to understand different species in various environments.

Her identical twin sister, Cheyenne, is also one of the four team members.

She said she was interested in DNA research because she has an interest in multiples. This interest has flourished since she joined the team last summer. This work will also help her prepare for medical school, Durant said.

Lundon, of Manohmen, Minn., is also a biology major working on the project. She plans on attending veterinary school and is excited to see where DNA and RNA research will go in her lifetime.

“This gives you the ability to really, really know what makes up an animal,” she said.

The science and potential for research is what has drawn all four young women to work on plants under Hossain’s guidance.

So far, they have found there is some impact by exposing the plants to increased levels in iron, but more study is needed to answer more questions about how the plants are affected and why.

The students don’t seem to mind that there are more questions to be answered by scientific research. They are just happy to be in the lab learning about the building blocks of life.

“I always knew I liked working in the lab,” Cherokee Durant said. “I used to work in a lab with blood samples but beans are a whole new thing for me.”

Their work may mean a whole new thing for the world.



Kayla Lundon grinds frozen bean leaf cuttings. The process helps break down the leaves so their DNA and RNA can be extracted.



Four students work in Dr. Khwaja Hossain’s lab studying beans on a molecular level.