SPECIALTY CROP BLOCK GRANT PROGRAM

FISCAL YEAR 2023 AWARDED PROJECTS

Agriculture Commissioner
Doug Goehring

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A Letter from the Commissioner

Greetings,

Agriculture Commissioner DOUG GOEHRING

The North Dakota Department of Agriculture is pleased to support the specialty crop industry in the state through specialty crop block grants.

The USDA defines specialty crops as "fruits and vegetables, tree nuts, dried fruits, horticulture and nursery crops." Specialty crops grown commercially in North Dakota include dry beans, dry peas, lentils, potatoes, confection sunflowers, grapes, honey and various vegetables.

Projects that enhance the competitiveness of specialty crops in ND are eligible for these grants.

Eligible applications include enhancing food safety; pest and disease control; developing new and improved seed varieties and specialty crops; and increasing child and adult nutrition knowledge and consumption of specialty crops. Projects that directly benefit specific, commercial products or profit a single organization, institution or individual are not eligible.

North Dakota receives funds based on a grant allocation formula that is based on the average of specialty crop cash receipts and specialty crop acreage in the state.

The North Dakota Department of Agriculture has been administering the Specialty Crop Block Grant Program since 2007. Since then, we have administered a total of 277 grants and have received more than $33 million in funding through the past 19 annual funding opportunities; and an additional 28 grants and $4.3 million in additional one-time funding through H.R. 133, the Consolidated Appropriations Act of 2020.

We encourage organizations, institutions and individuals to submit proposals on their own or in partnerships during open application periods. Questions may be directed to Jonathan Leonard at 701-328-2191 or scbg@nd.gov.

Thank you for your interest in specialty crop block grants.

Sincerely,

Doug Goehring
Agriculture Commissioner

ABOUT PROGRAM

The purpose of the Specialty Crop Block Grant Program (SCBGP) is to enhance the competitiveness of specialty crops. Specialty crops are defined as "fruits, vegetables, tree nuts, dried fruits, horticulture, and nursery crops (including floriculture)."

The Food, Conservation, and Energy Act of 2008 (Farm Bill) amended the Specialty Crops Competitiveness Act of 2004. Under the amended Act, the Secretary of Agriculture is directed to make grants to states for each of the fiscal years 2008 through 2012 to be used by state departments of agriculture to enhance the competitiveness of specialty crops. The American Taxpayer Relief Act of 2012 provided funding for fiscal year 2013, section 10010 of the Agricultural Act of 2014 provided funding for fiscal years 2014 through 2018 and section 10107 of the Agriculture Improvement Act of 2018 will provide funding for fiscal years 2019 through 2023.

To be eligible for a grant, the project(s) must "enhance the competitiveness of U.S. or U.S. territory grown specialty crops in either domestic or foreign markets." Projects must also benefit more than one commercial product (e.g., ABC Company brand), organization, or individual.

Examples of enhancing the competitiveness of specialty crops include, but are not limited to: research, promotion, marketing, nutrition, trade enhancement, food safety, food security, plant health programs, education, increased consumption, increased innovation, improved efficiency and reduced costs of distribution systems and environmental concerns and conservation.

Grant funds are not awarded to projects that solely benefit a specific commercial product. It will not benefit products that provide a profit to a single organization, institution, or individual. Grant funds cannot be put toward capital expenditures (equipment, buildings, land). They also may not be used to make improvements to capital assets that materially increase their value or useful life. Each project funded through the Specialty Crop Block Grant Program will be carried out over a two-year timeframe. The Specialty Crop Block Grant Program is funded through the United States Department of Agriculture's Agricultural Marketing Service.

Number of Grants Awarded to the North Dakota Department of Agriculture: 2
Number of Sub-Awarded Projects: 19
Amount of Funds Awarded: $3,358,290.40

These following funding breakdowns are for annual funding:

2023 funding from the Farm Bill (fiscal year 23-26):

21 Projects	$3,105,652.84
Direct	$174,561.69
Indirect	$78,075.87
Total	$3,358,290.40

For more information, please visit the program's website at https://www.ndda.nd.gov/scbgp.

SCBGP STAFF

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PROJECTS FUNDED IN 2023

Research field of confectionary sunflowers

PURSUIT AND DEVELOPMENT OF A DURABLE RUST-RESISTANT CONFECTIONARY SUNFLOWER

North Dakota State University (NDSU)
Samuel Markell, Fargo

Project Budget: $180,859

North Dakota State University plant pathologists and breeders located in North Dakota will pursue the development of durable rust resistance in confection sunflower hybrids by identifying, mapping and incorporating potential gene(s) conferring adult plant resistance into a confectionary sunflower hybrid.

TOWARD A COMPREHENSIVE UNDERSTANDING OF PULSE PROTEINS AND THEIR FRACTIONS AS AFFECTED BY SIMPLE FOOD PROCESSING

NDSU
Jiajia Rao, Fargo

Project Budget: $170,123

North Dakota State University will address the critical needs of pulse proteins to be utilized as "Alt protein" in the food industry, which can directly help increase the market of pulse production in North Dakota (ND). The utilization of pulse proteins is highly dependent on functional properties. The functionality of isolated pulse proteins is highly influenced by protein compositions (e.g., globulin to albumin ratio). Additionally, protein purification processing result in ingredients suitable for industrial use. However, it may not have ideal functional properties. Previously, a number of post-extraction techniques such as chemical or enzymatic modification methods were applied to improving their techno-functional properties. Nonetheless, up to date, majority of modification methods either required the harsh reaction conditions or high cost, which limited the use of these technique in the food industry. The overall objectives of this study are to comprehensively understand how the structural, functional properties, flavor profile of isolated individual pulse protein fractions (globulin, legumin, vicilin and albumin) are affected by a number of moderate and simple processing conditions by (e.g., thermal treatment, pH shift, ultrasound,

high pressure treatment). To accomplish the goal, the following tasks will be completed at NDSU laboratories: i) isolation and fractionation of pulse proteins ii) Impact of physiochemical treatments on structural, functional, nutritional properties and flavor profile of pulse protein isolates and their fractions.; iii) Application of selected pulse protein isolates and/or their fractions in semi-solid and solid food; and iv) dissemination of technical data through conferences, social media, workshops, webpages and publications.

DEVELOPING A COMPREHENSIVE MOLECULAR DIAGNOSTIC PANEL AND SAMPLING TECHNIQUES TO QUANTIFY ROOT PATHOGENS IN PULSE CROP HOSTS AND THE ENVIRONMENT

National Agricultural Genotyping Center
Zachary Bateson, Fargo

Project Budget: $321,804

The National Agricultural Genotyping Center (NAGC) and North Dakota State University

A National Agricultural Genotyping Center testing panel

Williston Research Extension Center (WREC) will create a comprehensive molecular panel and optimize field collection methods to quantify pathogens causing root rot disease in pulse crops. The outcomes of this project will be: 1) identify the pathogens driving root rot disease in North Dakota pulse crops, 2) discover how pathogen quantities in soils before planting are correlated to in-season root rot ratings and crop yield, and 3) provide farmers with a tool to diagnose and predict root disease in pulse crops from plant and soil samples. Collectively, this project will improve root disease management in pulse crops by increasing the availability of DNA-based tests for root pathogens and demonstrate that these tests can help growers make decisions on field selection for growing pulses.

TOWARDS VISUALIZING IMPROVEMENTS IN MANAGEMENT OF THE EARLY DIE COMPLEX

NDSU
Julie Pasche, Fargo

Project Budget: $142,975

Plant pathologists from North Dakota State University will improve outcomes from the early die disease complex for growers. Specifically, we will work directly with growers and an industry partner to validate the use of imaging for detection of potato early die disease. Data on pathogen/ pest populations and disease severity will be used to train the artificial intelligence crop monitoring technology to recognize the disease prior to visual recognition is possible by the human eye. While qPCR is a wonderful tool for quantifying pathogen populations, the cost in many cases is too high to justify its' use across entire commercial potato production farms. Sensors attached to irrigation systems are currently utilizing thousands of images collected while the irrigator is running to assess plant population, ground cover, and weeds. Identifying diseases is one of the next steps in maximizing

the value of these imaging systems for growers. With early detection of early die disease, growers can amend management practices to minimize the losses incurred by this disease complex. Additionally, they can make planting decisions for future crops on a field-by-field basis. Growers and other stakeholders have been involved in the development of this project. Results will be shared with growers, scientists, and other industry stakeholders at field days, grower winter meetings, trade journal articles, and scientific publications.

INVASIVE HORTICULTURE PEST TRAPPING AND OUTREACH PROJECT

North Dakota Department of Agriculture
Charles Elhard, Fargo

Project Budget: $135,565.80

The North Dakota Department of Agriculture (NDDA) will document the presence or absence of specific pests that affect trees and shrubs of North Dakota and are not established here. The main pests that will be monitored for are Japanese beetle, emerald ash borer and exotic wood borer/bark beetles. The status of these pests will be documented by conducting a trapping survey throughout the state. Additionally, NDDA intends to conduct outreach to stakeholders during the year at garden shows, trade shows and other events to educate the public on potential invasive horticultural pests, including Japanese beetle, emerald ash borer, spongy moth, spotted lanternfly and Asian longhorned beetle. NDDA will partner with the North Dakota State University (NDSU) master gardeners' program, NDSU entomology, North Dakota Forest Service (NDFS) and city foresters to fulfill the trapping portion of this project. NDSU Entomology will assist with sample sorting and identification.

INCREASE THE AVAILABILITY OF A DIAGNOSTIC PANEL TO SURVEY FOR HERBICIDE RESISTANCE IN KOCHIA POPULATIONS.

National Agricultural Genotyping Center
Zachary Bateson, Fargo

Project Budget: $271,945

The National Agricultural Genotyping Center (NAGC) will build a diagnostic panel to determine the herbicide resistance (HR) potential of kochia in North Dakota. This project will: 1) provide wider availability of genetic tests to rapidly screen for HR in research programs and grower fields, and 2) deliver the first state map of HR genotypes in kochia collected for an upcoming sampling program. At the local level, results from the diagnostic panel will help specialty crop growers with decisions on what particular herbicides to use or avoid. At the state level, the project result will increase the awareness of HR kochia, find where HR kochia exists, and identify hotspots of HR activity in North Dakota.

DEVELOPMENT OF DRY BEAN-BASED BAKERY PRODUCTS FROM STONE MILLED FLOURS

NDSU
Fatemeh Zare, Fargo

Project Budget: $22,330

The Northern Crops Institute, tasked with growing markets for crops in the Northern Plains, will develop a stone milling process and formulate new bakery products using the most important dry bean classes in North Dakota, promoting the dry beans market both nationally and internationally.

PROJECT SPOTLIGHT: HAIL

Application of simulated pea-size hail through prototype hail machine

After a hail storm, some of the most common questions that specialty crop growers ask are "will a fungicide application help my crop recover, prevent diseases from occurring and/or prevent yield loss?"

North Dakota State University plant pathologists set out to answer those questions with their project titled "Impacts of Fungicide Applications and Plant Diseases on Specialty Crop Yields After Hail." The project set out to: 1) determine the severity and yield impact of diseases that occur on pinto bean, navy bean, chickpea, dry edible pea and confectionary sunflower following hail, 2) determine the disease severity and yield impact of foliar fungicide and cupric hydroxide applied after hail events, 3) determine the impacts of fungicide applications on plant health, and 4) develop and disseminate management recommendations to growers at meetings, field days and through media.

In response to these questions and a lack of management recommendations, research was started and a hail machine to simulate pea-sized hail was developed. Trials were conducted with confectionary sunflower but yield differences were not observed. More research and larger studies were needed and a refinement of the hail machine occurred in order to consistently deliver known amounts of hail to crops of all architectures and sizes.

These questions are still being answered as research is still underway.

PROJECT SPOTLIGHT: BEAN RUST

Gathering rust pathogens from a bean leaf

Dry bean rust is one of the most important disease threats that impact dry edible bean production. Without effective management strategies, rust can escalate from local infections to widespread epidemics, causing significant economic losses to dry beans growers. Application of fungicides also add additional economic burden in the management of this diseases. To address the threat of economic loss to dry bean growers, North Dakota State University researchers are improving rust management using rust surveillance, evaluating bean lines for genetic resistance, and assessing the economic impact of growing rust-resistant varieties.

IThe most cost- and environmentally-friendly way to manage rust is to plant rust-resistant varieties. To develop varieties, pathologists and breeders need to first understand the pathogen races, then select and incorporate the best resistance genes to protect the plants, and finally, produce a bean variety with excellent yield and quality that growers are proud to plant. Each year, surveillance of bean rust pathogen is done to monitor for the emergence of new races. Recent surveys demonstrate that the predominant race in the region is 20-3, which is able to infect the majority of dry bean varieties grown in our region. However, effective genes, like *Ur-5* and *Ur-11* are known, and others are likely to exist. This information is used to screen and identify rust-resistant lines with the potential to become new varieties. Simultaneously, new sources of rust resistance are also being identified and characterized using genetic and genomic approaches that expedite their development into future varieties.

To give the dry bean growers the best information about rust resistant varieties, this project is also evaluating economic return for growers when they use rust-resistant varieties. Field experiments at two locations in North Dakota are in progress, and compare yields of several common bean varieties and breeding lines with and without the application of fungicide, and under rust pressure. Outcomes of this project will help dry bean growers protect their yield and maximize their economic return by improving varieties resistant to the races of rust in our region and providing the economic information to growers they need to make the best decisions for their farms.

BUILDING A BETTER INOCULANT AND INOCULATION DECISION FRAMEWORK FOR NORTH DAKOTA PULSE CROPS

NDSU
Barney Geddes, Fargo

Project Budget: $189,903

Researchers from North Dakota State University are working to improve the profitability of pulse farming by maximizing the potential of rhizobium inoculants to provide nitrogen to pulse crops and boost yields. There are a myriad of formulation options available to farmers when it comes to applying inoculants to their pulse crops. The inoculants contain rhizobia bacteria which form the root nodules that fix atmospheric nitrogen to meet crop needs, as opposed to applying nitrogen fertilizer. In this project, NDSU researchers will generate data on which inoculant formulation result in the highest yield when considering field history of pulse production. Concurrently they are working to overcome challenges with inoculant technology, specifically an issue called the `rhizobium competition problem' wherein natural rhizobia from the soil that are less efficient outcompete the more efficient rhizobia in inoculant products for formation of root nodules. Their work will lead to a better decision framework for farmers when it comes to choosing inoculant products for their operation and even take the first steps to developing new and improved versions that overcome the rhizobium competition problem.

DEVELOPMENT OF PILOT MILLING OPERATIONS AND PRODUCT APPLICATION FOR LENTILS

NDSU
Amrita Ray, Fargo

Project Budget: $20,912

The Northern Crops Institute will promote the purchase of lentils in global markets by developing low-cost stone milling operations and utilization of lentil flour in foods important to the world's most significant lentil customers.

UTILIZE MESSAGING AND MARKETING TO INCREASE AWARENESS AND SALES OF NORTH DAKOTA-GROWN POTATOES

Northland Potato Growers Association
Jacey Kuersteiner, East Grand Forks

Project Budget: $150,000

This grant will utilize a common identity, marketing, communications and education plan to showcase, promote and increase sales of North Dakota-grown potatoes across the US and international countries. Northland Potato Growers Association (NPGA) will coordinate these plans and efforts to promote the potato growers and specialty crop potato industry. NPGA's marketing efforts will promote the potato production of 200 potato growers, many of whom are 4th- and 5th-generation families. North Dakota is

Potato research plot

the 4th largest potato production state, growing potatoes for the chip, fresh, seed and processing sectors. The growers believe they can produce and sell more potatoes with proper messaging and marketing. To continue building momentum of new messaging, this grant will help fund the creative, development, placement and purchase of media and marketing campaigns; tradeshow fees and participation; and supporting program developments to promote the value, quality, taste and nutrition of North Dakota-grown potatoes to consumers, wholesale buyers, educators, chefs and processors with the intent to increase demand, sales and market share. NPGA will contract with an ag-based marketing agency to develop a paid media placement program, strategic targeted ad placement and ensure messaging and creative components reach the intended audience. NPGA also plans to continue working with Molly Yeh, a local resident chef, restaurateur, Food Network show host, author and influencer to develop tools to endorse Northland Potatoes. Finally, this grant will connect fresh potato growers/shippers at US produce tradeshows to wholesale buyers, grocery chains and foodservice providers. These shows are well attended by ND shipper's competitors, so a vibrant booth and messaging is vital.

North Dakota field peas

LENTIL ROOT ROT PREDICTION AND MITIGATION

NDSU
Audrey Kalil, Williston

Project Budget: $36,930

Lentil production has been an economic boon to northwest North Dakota, but recently, root rot disease has become a threat to their continued production. Current recommendations for lentil production are to maintain a four- to five-year rotation to avoid the build-up of root rot pathogens in the soil. This is a challenge for growers who rely on the revenue generated from this high-value crop. The North Dakota State University Williston Research Extension Center will compare one-, two-, three- and four-year intervals in between lentil crops to determine the effect of these rotation lengths on root rot disease severity and yield in a no-till, dryland cropping system. Intercropping lentils with canola will be evaluated for suppression of root rot in lentils in a short rotation. Finally, a soil root rot potential seedling bioassay will be evaluated for its usefulness in predicting field root rot severity. This effort will improve root rot management and help generate more specific rotation recommendations for lentils grown in North Dakota.

BREEDING BY DESIGN TO DEVELOP THE NEXT GENERATION ULTRA-HIGH PROTEIN PEA VARIETIES

NDSU
Nonoy Bandillo, Fargo

Project Budget: $272,228

Gulfood 2024 in Dubai, United Arab Emirates

The NDSU Pulse Crops Breeding Team, in collaboration with NDSU geneticists, agronomists and food scientists, will aim to develop the next generation, ultra-high protein pea cultivars for sustainable protein production with a minimal carbon footprint. Yellow and green peas are frontrunners in plant-based non-GMO protein markets due to healthy perceptions by customers, limited environmental impacts and more economical production costs. The pea protein market is currently valued at $9 billion due to increasing demand for products like Beyond Burger and Ripptein. Increasing total protein content while concomitantly adapting pea genotypes to highly variable and stressful environments is key for sustainably meeting the growing demand. However, increasing total protein content in pea is challenged by the limited genetic diversity available within public breeding programs. Current cultivars of field pea average 22% total protein content in regional trials, and there is a need to increase total protein content of existing pea cultivars to 24%. We aim to systematically increase total protein content of peas while expanding genetic diversity through breeding by design of 16 high protein cultivars.

FACILITATING INTERNATIONAL GROWTH FOR ND SPECIALTY CROP PRODUCERS AND PROCESSORS

North Dakota Trade Office
Amanda Nordick, Fargo

Project Budget: $382,321

The North Dakota Trade Office (NDTO) seeks to increase the market share of North Dakota specialty crops by strategically expanding opportunities and partnerships internationally. We plan to do this by:

a. Providing up to seven (7) ND companies the opportunity to exhibit at SIAL Paris, France, in October 2024. Companies will increase the European market's knowledge of the high-quality pulse crops available in ND. This is a premiere tradeshow highlighting cutting-edge food products.
b. Increasing the exposure of pulse crops for up to seven (7) ND companies to the Middle East and North African Regions by exhibiting at Gulfood 2024 in Dubai, United Arab Emirates, in February 2024. More than 120 countries attend this show across 5000 food and

beverage exhibitors.

c. Executing an NDTO lead trade mission to Spain for up to six (6) ND companies. Data will drive the specific mission destination and meeting agenda; however, Spain is a promising market and location for lasting impact.

Smooth hydrangeas

EVALUATING HYDRANGEAS FOR THE NORTH DAKOTA NURSERY AND LANDSCAPING INDUSTRY

NDSU
Todd West, Fargo

Project Budget: $67,112

In partnership with North Dakota State University, hydrangeas are in the top 10 most used and popular landscaping shrubs. In recent years, there have been many new releases of hydrangeas to the green industry. Unfortunately, with the volume of new plants that have been released to the ornamental nursery trade, most plants are never formally evaluated and this burden is put on the consumer. This project proposes to evaluate six different species/hybrids and multiple new cultivars of hydrangea including: *Hydrangea anomala* (climbing hydrangea), *Hydrangea arborescens* (smooth hydrangea), *H. macrophylla* (bigleaf hydrangea), *H. paniculata* (panicle hydrangea), *H. serrata* (mountain hydrangea) and hydrangea hybrids. These new cultivars will be compared to the industry standards for adaptation and usability in North Dakota.

MITIGATING POTATO SEED DECAY AND ASSOCIATED ECONOMIC LOSSES USING ENHANCED SUBERIZATION STRATEGY

USDA-ARS Sugarbeet and Potato Research Unit
Munevver Dogramaci, Fargo

Project Budget: $118,000

Potato Research Program of USDA-ARS, Fargo, North Dakota will establish an agreement with the North Dakota Department of Agriculture to advance research strategies for mitigating potato tuber seed decay and associated crop production losses. In 2022, the Northland Potato Growers faced significant economic losses due to seed decay after planting when an extreme wet spring was experienced. Seed decay can be induced by various physical (e.g., wet soil conditions) and/or biological (e.g., diseases) factors. The common agronomic practices adopted in the region include cutting seed tubers in several pieces, often followed by a fungicide treatment, and planting them in the field immediately. While this method has its advantages, the open-cut surfaces of the seed pieces are susceptible to both abiotic (high soil moisture, cold temperature) and biological stresses (pathogens). Therefore, to reduce seed decay, it is essential to find alternative practices that can be applied for varying environmental conditions during planting (e.g., dry or wet spring). The scientific rationale of the proposed research is that the formation of the

A high tunnel used to extend the growing season

suberin layer, which is the natural wound-healing response of wounded potato tubers will provide protection against seed decay ensuring optimum crop stand and higher yield. The major goal is to determine the ideal conditions (temperature, humidity, and seed treatments) to enhance suberization of cut potato seed tubers. The results regarding seed treatment optimization and role of suberization on seed decay will be disseminated to the scientific community, and best practice guidelines will be developed for the potato growers and stakeholders.

METIGROWSHE EDUCATIONAL GARDEN AND ORCHARD AT CAMP METIGOSHE

Metigoshe Ministries
Laura Holvorson, Bottineau

Project Budget: $53,532.24

The MetiGROWshe Garden and Orchard at Camp Metigoshe will educate participants, staff, and volunteers on the production of and nutritional value of vegetable, herb, and fruit crops through interactive learning sessions. Camp participants, staff, and Food Pantry customers will increase their consumption of fresh produce grown in the garden and orchard. The garden and orchard will be able to produce more crops by improving the fencing, high tunnel, drainage and irrigation systems and the educational sessions will continue to operate through quality staffing and curriculum materials.

INTEGRATED ROOT ROT MANAGEMENT IN FIELD PEAS WITH CROP ROTATION, PLANTING DATE, AND SEED TREATMENT

NDSU
Michael Wunsch, Carrington

Project Budget: $97,502

Fusarium and Aphanomyces root rots have emerged as serious constraints on field pea production in North Dakota, causing severe losses that have resulted in many producers abandoning field peas on all or part of their acreage. Previous research conducted on fields with severe root rot pressure has shown that field pea yields can be increased by an average

4-10 bushels/acre with each of three different management practices: early planting, seed treatment, and crop rotation (minimum 6-year rotation). None of these strategies provides satisfactory root rot management on its own, but preliminary findings suggest that commercially acceptable field pea agronomic performance under root rot pressure can be achieved by combining all three practices. In this project, the North Dakota State University Carrington and Williston Research Extension Centers seek to evaluate the integrated use of crop rotation, planting date, and fungicide seed treatment for management of field pea root rot. Testing will be conducted in 12 fields in Carrington and 3 fields in Williston with a history of pea and lentil production (lentils are also highly susceptible) and problems with these diseases. Fields will differ in the number of years since the last pea or lentil crop: 2-3 years (four fields), 4-5 years (four fields), or 6-10 years (seven fields). In each field, peas will be planted in replicated studies with and without seed treatment at three dates corresponding to different soil temperatures. Field pea establishment, root rot severity, and yield will be assessed. Results will be disseminated to stakeholders.

POST-HARVESTING PROCESSING AND QUALITY EFFECTS ON VALUE-ADDED COLD-HARDY BERRY AND STONE FRUITS

NDSU
David Boehm, Fargo

Project Budget: $121,520

North Dakota State University (NDSU), if awarded this grant, will establish an agreement relationship with the State Department of Agriculture to lead and execute the project to increase consumption and access to cold-hardy berries and stone fruits. NDSU's Northern Crops Institute (NCI) will identify fresh and frozen harvest and post-harvest conditions' that

Aronia berry bush

impacts their optimization for processing and fruit qualities- acidity, phenolic profile, colorimetric, and sensory characteristics of North Dakota indigenous or introduced cold-hardy berry and stone fruits (Aronia, grape, chokecherry, currant, gooseberry, honeyberry, and juneberry) of value-added commercial use or interest. The outcomes of this work will increase the utilization of these fruits in beverages and foods by characterizing post-harvest storage and processing effects, identifying preferable treatments and chemistry profiles leading to better shelf stability of end-use processed fruit products. The results of this work will be shared and discussed with grower and processor stakeholders through industry and association meetings, field days, electronic summaries, and subsequent publications.

DIAGNOSTICS OF NOSEMA INFECTION IN HONEY BEES

NDDA
Samantha Brunner, Bismarck

Project Budget: $151,008.80

Apiary inspection programs from the North Dakota Department of Agriculture, South Dakota Department of Agriculture and Natural Resources, Massachusetts Department of Agricultural Resources, Montana Department of Agriculture, Maine Department of Agriculture, Conservation and Forestry and Vermont Agency of Agriculture, Food and Markets will collect information on hive health from a total of 1200 colonies (over 2 years) and look for correlations of hive health, Nosema spore counts, and molecular results. Molecular diagnostics, while helpful, currently don't relate to ditional spore counts that have been used for gnosing Nosema infection levels. This study will work to correlate spore counts with molecular test results. Hive strength assessments and varroa mite levels taken along with the Nosema results will aim to help provide some guidance on what levels of Nosema relate to impacts on hive health. Molecular tests will also show other viruses, pests and pathogens that may be present in the samples.

DETERMINING INTERACTIONS OF NEMATODE AND FUNGAL PATHOGENS FOR CONTROL OF POTATO EARLY DIE DISEASE COMPLEX

NDSU
Guiping Yan, Fargo

Project Budget: $139,600

The Department of Plant Pathology at North Dakota State University will determine the effects of co-inoculation of the root-lesion nematode species Pratylenchus scribneri and fungal pathogen Verticillium dahliae on disease symptoms of potato early die and growth and yield of selected potato cultivars, and determine the nematode and fungal interactions by comparing the effects of co-infection of nematode and fungal pathogens to the infection of nematode or fungal pathogen alone in outdoor microplot field experiments. Results of the proposed research will help understand whether

North Dakota bees

North Dakota nursery trees

the interactions between nematode and fungal pathogen cause more severe disease symptoms and more negative impact on growth and yield of potato and whether the P. scribneri nematode plays an important role in the potato early die complex. This information is important to help growers preform risk assessment and make proper management decisions for controlling the early die disease and nematodes to increase potato yield and quality to improve the production of potatoes.

EVALUATING WOODY PLANT SPECIES FOR CLONAL PROPAGATION METHODS

NDSU
Todd West, Fargo

Project Budget: $59,482

The North Dakota State University Woody Plant Improvement Program will evaluate suitable propagation methods for five different woody plant species including: Acer trifloum (threeflower maple), Alnus hirsuta, Manchurian alder, Cercis canadensis (Eastern redbud), Prunus triloba `Multiplex' (double flowering plum) and Tilia cordata (littleleaf linden). This project will focus on best management practices for developing propagation methods utilizing plant tissue culture (micropropagation). Currently, there are no micropropagation protocols for each of these species which greatly limits their use with commercial nursery production. Developing efficient, cost-effective, environmentally sustainable micropropagation protocols for each of these species, will increase production numbers of the current cultivars and any other cultivars developed in the near future. Results will be disseminated to specialty crop beneficiaries through conference presentations, website publications and field days. Results will also be published in peer-reviewed journals.