



AWARD YEARS 2022 AND FORWARD

This annual Performance Progress Report (PPR) must illustrate the progress made toward the completion of your project. If this project is completed at the time of the annual PPR submission, the project report should be marked as final. Please note character limits (abbreviated "char.") throughout.

PROJECT INFORMATION

Project Title (250 char.)	Mitigating freezing damage in emerging wine and seedless table grapes during fall acclimation and spring deacclimation
Organization Name (250 char.)	South Dakota State University
Project Start Date	09/30/2022
Project End Date	09/29/2025

ORGANIZATION POINT OF CONTACT

Full Name	Anne Fennell
Phone Number	605-688-6373
Email Address	anne.fennell@sdstate.edu

BACKGROUND INFORMATION

PROJECT PROGRESS

Please provide the total percentage of work completed on the project.	100
Is this a final report? Please select the box to the right if the answer is "yes".	☐

PROJECT BACKGROUND (REQUIRED FOR FINAL REPORTS)

Provide enough information for the reader to understand the importance or context of the project and any key findings. This section may draw from the background and justification contained in the accepted project plan. As the project has been completed, write this section in past tense. If this is an annual report, please skip this section. (1200 char.)

The timing of early-spring warming and early-fall related freeze events are fluctuating more widely in South Dakota resulting in an increased frequency of freeze damage in grapevines. The objectives were to evaluate six emerging grape selections (University of Minnesota (UMN) seedless table (2) and two wine grapes each from UMN and North Dakota State University (NDSU). The seedless table grape selections were advanced to field trials to be evaluated for ongoing studies. The seedless selection MN1369 was used to assess chemical its ability to modify acclimation in the fall periods. There was no difference in freezing tolerance in Protone or Ethephon treated plants as compared to water control. In addition the highest level of Protone resulted in a lower freezing tolerance than the control. The wine grape evaluation indicated ND213 was suitable for SD whereas ND054 had only 25% survival in 3rd year. New selection cuttings were obtained from UMN, NDSU and Cornell University and rooted for field evaluation trials to maintain a steady test process emerging selections. The seedless grapes (MN1369

and MN1325) and the wine grape ND213 have good potential for South Dakota production.

OBJECTIVE(S) (REQUIRED)

Please provide the approved project's objectives from the accepted project plan. Use the boxes to indicate if the objective is in progress, has been completed, or is not (and will not be) completed. At the final report, if "no" is selected for any of the listed objectives, you must expand upon this in the Challenges and Developments Section. Additional objectives may be added as needed.

+	#	Objective (2,000 char.)	Objective Completed?
-	1	Determine the acclimation and deacclimation profiles of six emerging grapes (two MN seedless table and two wine grapes and two North Dakota State University (NDSU wine grapes) to determine their suitability for use in SD.	Yes
-	2	Test the potential for protone or ethephon modification of to delay timing of bud break (deacclimation) or enhance/accelerate acclimation to mitigate potential freeze damage.	Yes
-	3	Provide information on new grapes and mitigation treatments by engaging growers and market gardeners in annual grower meetings or field days. Update grape recommendation for SD using extension digital publications to aid growers in making informed decisions in selecting new cultivar releases.	Yes

OUTCOMES

Please only report on the outcomes and indicators that are selected and approved for this project. Use the check boxes to indicate which outcomes and indicators are selected. Select the "N/A" box for any indicators that are not applicable.

1. INCREASING CONSUMPTION AND CONSUMER PURCHASING OF SPECIALTY CROPS ☐

2. INCREASING ACCESS TO SPECIALTY CROPS AND EXPANDING SPECIALTY CROP PRODUCTION AND DISTRIBUTION ☐

3. INCREASE FOOD SAFETY KNOWLEDGE AND PROCESSES ☐

4. IMPROVE PEST AND DISEASE CONTROL PROCESSES ☐

5. DEVELOP NEW SEED VARIETIES AND SPECIALTY CROPS ☐

6. EXPAND SPECIALTY CROP RESEARCH AND DEVELOPMENT ☒

Indicators	Value	N/A
6.1 Number of research goals accomplished	2	☐
6.2 For research conclusions, the number that:		☒
6.2a Yielded findings that supported continued research	1	☐
6.2b Yielded findings that led to completion of study	1	☐
6.2c Yielded findings that allow for implementation of new practice, process or technology	0	☐
6.3 Number of industry representatives and other stakeholders who engaged with research results	70	☐
6.4 Total number of research outputs published to industry publications and/or academic journals, and for each published research output, the:	0	☒

Indicators	Value	N/A
6.4a Number of views/reads of published research/data	0	☒
6.4b Number of citations counted	0	☒

7. IMPROVE ENVIRONMENTAL SUSTAINABILITY OF SPECIALTY CROPS



Indicators	Value	N/A
7.1 Number of stakeholders that gained knowledge about environmental sustainability best practices, tools, or technologies	70	☐
7.2 Number of stakeholders reported with an intent to adopt environmental sustainability best practices, tools, or technologies	6	☐
7.3 Number of producers that adopted environmental best practices or tools		☒
7.4 Number of new tools/technologies developed or enhanced to improve sustainability/conservation or other environmental outcomes		☒
7.5 Number of additional acres managed with sustainable practices, tools, or technologies that focused on:		☒
7.5a Water quality/ conservation		☒
7.5b Soil health		☒
7.5c Biodiversity		☒
7.5d Reduction in energy use		☒
7.5e Other positive environmental outcomes (optional)		☒
7.6 Number of additional acres established and maintained for the mutual benefit of pollinators/specialty crops		☒

ADDITIONAL APPROVED OUTCOME (IF APPLICABLE)



OUTCOME REMARKS (REQUIRED)

Please explain any quantifiable results, along with an update on their progress and data collection efforts for each of the outcomes and indicators selected in the accepted project plan. It is understood that the results may not yet be final at the time that this report is submitted; however, please provide an update on progress to date. If you do not have any data on the indicator(s) listed above, you must explain why in this section. (2,000 char.)

Objective 1. Determine the acclimation and deacclimation profiles of six emerging grapes (two MN seedless table and two wine grapes and two North Dakota State University (NDSU wine grapes) to determine their suitability for use in SD.

6.1 Accomplished research goals = 2

6.2a Yielded findings that supported continued research: New seedless selections MN1296, MN1325 and MN1369 were advanced to field trials at SDSU.

6.2b Yielded findings that led to completion of study: MN1280 was not a significant improvement over other white cultivars and removed from evaluation. ND213 has greater winter tolerance than ND054, these selections were named by NDSU for release; however, ND054 is not recommended for SD.

6.2c Yielded findings that allow for implementation of new practice, process or technology _1_. MN1296, MN1369 and MN1325 are being named and released by University of Minnesota based on positive response from SD and other states at NE2220 multistate meeting. These cultivars will be recommended for SD when released.

6.3 Number of industry representatives and other stakeholders engaged with research results _70_. Results were presented at the NE2220 multi-state meeting 2023 to 2025. MN1325, MN1369, ND054, and 213 vines and fruit were presented at the 4th Local Foods Conference (9/24) with strong interest by stakeholders. Cane hardiness of new UMN selections were reported at 2025 NE2220 multi-state meeting.

7.1 Number of stakeholders that gained knowledge, tools, technologies 70. Selections are moving forward for public release with strong interest in adopting. 7.2 Six growers indicated they would plant the seedless grapes when named. Objective 2&3. Test the potential for chemical modification of to delay timing of bud break (deacclimation) or enhance/accelerate acclimation to mitigate potential freeze damage. 6.2a no, 6.2b Chemical treatments did not influence acclimation and freezing tolerance. 6.2c. not recommended for use, 6.3 and 7.1 same as Obj. 1.

NARRATIVE

ACCOMPLISHMENTS (REQUIRED)

If this is an annual report, list your accomplishments for this reporting period. If this is a final report, your accomplishments should be cumulative and include all accomplishments previously reported on and updated to include activities conducted this past reporting period. Indicate how these accomplishments associated with each of your project's objective(s), outcome(s), and/or indicator(s). This listing should identify your project's partners and their contributions. Additional accomplishments can be added as needed.

+	#	Accomplishment (1,200 char.)	Related to (Objective/ Outcome)
-	1	Yr. 1. 22_23 The two table grape selections (MN1325 and MN1369) were re-propagated yielding 30 and 50 vines respectively for 2024 experiments. The two white wine grapes (Itasca and MN1280) were propagated yielding 20 vines each for acclimation experiments in 2024.	1,2
-	2	Yr. 1. 22_23 Itasca and MN1280 were planted in field and budbreak observed. MN 1280 showed 40% winter kill. There was no difference in budbreak timing.	1,3
-	3	Yr. 1. 22_23 An additional seedless table grape selection (MN1296) was acquired and propagated for this study.	1,2
-	4	Yr. 1. 22_23 It was noted that selection MN1325 did not propagate as readily as MN1369. MN1325 and MN1369 showed chlorosis under standard greenhouse conditions indicating potential sensitivity to higher pH conditions.	3
-	5	Yr. 1. 22_23 Established and trained ND054 and ND213 in vineyard for winter survival evaluation.	1
-	6	Yr. 2. 23-24 Additional MN1325 and MN1396 vines (260 total) were propagated and grown up to (replace materials lost in 22-23 power outage) continue developing acclimation studies.	1,2
-	7	Yr. 2. 23-24 Replicated study of the potential of chemical enhancement (ethephon and Protone) was initiated in MN1369. Vine growth characteristics and tip abscission were monitored weekly.	2
-	8	Yr. 2. 23-24 New seedless table grape selection MN1296 was propagated. Rooting response was slow and vines are not vigorous.	1,2
-	9	Yr. 2. 23-24 Additional ND054 and ND213 propagated to provide sufficient fruit for harvest and fruit quality characteristics. Six additional NDSU selections were obtained and propagated for field planting.	1,2
-	10	Yr. 2. 23-24 Reported propagation and chlorosis differences for seedless table grapes at the NE2220 multistate conference (10/24).	3
-	11	Yr. 2. 23-24 Presented new seedless selections at the 4th Annual Local Foods Conferece (9/24). Growers viewed vines and were able to taste seedless fruit and fruit of the NDSU selections ND054 and ND213.	3
-	12	Yr. 3 24-25 Replicated study of chemical (ethephon and Protone) influence on acclimation and freezing tolerance using MN1369. Neither chemical enhanced rate of acclimation as indicated by periderm development or freezing tolerance when compared to control. These chemicals are not recommended for trying to enhance freezing tolerance.	1,2,3
-	13	Yr. 3 24-25 Developed an advance selection evaluation pipeline (propagation, increase numbers, and moving candidates to 3-5 yr field trial) was established. Fourteen new advanced selections were obtained (4-University of Minnesota, 5-North Dakota State University and 5-Cornell University) and propagated for field evaluation. The pipeline contributed to the project self-sustainability.	1,2,3

-	14	Yr. 3 24-25 Reported seedless tablegrape performance and propagation issues at the 2025 NE2220 multistate conference and growers meeting. Six growers expressed interest in adopting selections upon release.	3
-	15	Yr. 3 24-25 Lose of 75% of ND054 and 50% of MN1280 winter injury losses were reported to the breeders and at NE2220 multistate meeting. Winter injured selections will be listed as marginal in cultivar recommendations.	3
-	16	Yr. 3 24-25 Winter injury was sustained by MN1296 which limited its propagation and indicated it may not have similar freezing tolerance as the other two selections. Additional seedless table grape MN1296 materials were obtained and propagated. MN1296 was observed to take longer to establish field ready plant than MN1369 and 1325. Longer evaluation period will be necessary prior to making grower recommendations.	1,2,3
-	17	Yr. 3 24-25 Relative vigor of the 3 seedless selections was determined. Their vigor varied, with MN1369 >MN1325>MN1296 in vine vigor. Information will be used in recommendations.	1,3
-	18	Replicated planting of MN1369 and MN1325 prepared. These will provide opportunity for growers to observe at field days.	1,2,3

CHALLENGES AND DEVELOPMENTS (REQUIRED)

Provide any challenges to the completion of your project or any positive developments outside of the project's original intent that you experienced during this reporting period. Also, provide the corrective actions you took to address these issues. If you did not attain an approved objective, outcome(s), and/or indicator(s), provide an explanation in the Corrective Actions column. For developments, you may put "N/A" under Corrective Actions. Additional challenges/developments may be added as needed.

+	#	Challenge or Development (1,200 char.)	Corrective Action
-	1	Test of Protone and Ethephon indicated no enhancement of the acclimation processes.	These chemicals will not be recommended as winter survival aids. Field winter evaluation will continue to be used for rapid check (four vine tests).
-	2	Not all selections had sufficient freezing tolerance.	Field evaluation protocol developed with a short term test to determine promising selections for replicated longer term evaluation. Other advanced selections were obtained to replace those removed and to supplement the project.
-	3	New selections in this study (MN1369, MN1325 and MN1296) were not used for a digital grower publication.	The remaining promising selections from this project and new selections obtained during the project will continue to be evaluated beyond the time of the grant. Information contributed from this project and others resulted in the selections entering the naming and release process. Recommendations will be made to growers using identified new cultivars.
-	4	Greenhouse infrastructure failure resulted in loss of materials in the first year. Not all genotypes propagated efficiently due to genotype character or due to winter injury decreasing viability of propagation materials received.	Larger numbers were propagated in remainder of first and second year to enable the project.
-	5	MN1325 did not propagate as readily as MN1369. MN1325 and MN1369 showed chlorosis under standard greenhouse conditions indicating potential sensitivity to higher pH conditions.	MN1325 repropagated for field evaluation. This will continue to be evaluated in the field.
-	6	MN1296 propagation wood showed winter injury diminishing materials available.	Additional materials were obtained for propagation.

-	7	Timing of budbreak of MN1369 and MN1325 was uniform.	Increased emphasis was placed on winter survival instead of budbreak timing.
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UPCOMING ACTIVITIES (REQUIRED FOR ANNUAL REPORTS)

Provide a description of the activities that you are planning to complete during the next reporting period. Additional activities can be added as needed. Please note, if this is a final report there should be no upcoming activities associated with the project, and this section should be left blank.

+	#	Activity (600 char.)	Anticipated Completion
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LESSON LEARNED (REQUIRED FOR FINAL REPORTS)

The recipient or subrecipient is required to provide recommendations or advice that others may use to improve their performance in implementing similar projects. If this is an annual report, please skip this section. (1200 char.)

1. Protone and Ethephon did not enhance acclimation and freezing tolerance and will not be recommended for grower use.
2. The seedless table grapes MN1369, MN1325 and MN1296 have differing vigor and establishment characters. MN1296 had winter injury in the final year of this project and will require additional evaluation to determine whether it is a good fit in SD.
3. MN1325 did not propagate as readily as MN1369. MN1325 and MN1369 showed chlorosis under standard greenhouse conditions indicating potential sensitivity to higher pH conditions.
4. Selections MN1280 and ND054 sustained winter injury and determined not suited for SD conditions.
5. Short term field survival identified selections with potential use in region, but longer term evaluation is necessary for viticulture production and consumer information.
6. Perennial plant studies require three years for mature plant performance, thus establishing an ongoing pipeline (propagation, increase numbers, and moving candidates to 3-5 yr field trial) will improve test processes needed to provide growers timely recommendations for emerging cultivars.

CONTINUATION AND DISSEMINATION OF RESULTS (REQUIRED FOR FINAL REPORTS)

Describe your plans for continuing the project (sustainability; capacity building) and/or disseminating the project results. If this is an annual report, please skip this section. (1200 char.)

This project aided in developing protocols that continue beyond to grant project. Based on the results a pipeline was established where materials will be continually incorporated in field evaluation for winter injury. Replicated field trials of promising selections (from short term test) will be propagated for viticulture production and potential consumer and grower interest. Short term winter tests of four vines and advancement of the promising selections to replicated production and grower and consumer interest evaluation will provide information needed for digital publications and field days. Fourteen new selections obtained in this project will move through revised field evaluation protocol. The results will be used in new grape recommendations for SD as cultivars are released and named. Results will continue to be reported in the NE2220 multistate meeting and at future growers days.

PROJECT BENEFICIARIES (REQUIRED FOR FINAL REPORTS)

Provide the number of project beneficiaries. If this is an annual report, please skip this section. (12 char.)

70

FEDERAL PROJECT EXPENDITURE

EXPENDITURE (REQUIRED)

You must respond to at least one cost category. Please note, the subtotal and total rows include formulas to auto-calculate totals. The approved budget should come from the accepted project plan or any approved budget amendments.

Cost Category	Amount Approved in Budget	Actual Federal Expenditures (Federal Funds Only)
Personnel	\$60,389.00	\$54,739.48
Fringe Benefits	\$2,407.00	\$3,606.64
Travel	\$1,248.00	\$0.00
Equipment	\$0.00	\$0.00
Supplies	\$4,200.00	\$3,597.25
Contractual	\$11,676.00	\$11,714.82
Other	\$17,651.00	\$2,245.75
Direct Costs Sub-Total	\$97,571.00	\$75,903.94
Indirect Costs	\$8,486.00	\$6,599.88
Project Expenditure Total Federal Costs	\$106,057.00	\$82,503.82

DISCUSSION OF EXPENDITURES (REQUIRED)

For 1st Annual Reports, if total project expenditures is less than 30 percent, and for 2nd Annual Reports, if total project expenditures is less than 60 percent, include a statement explaining how the grant funds will be expended and project activities completed as planned by the end date on the grant agreement. Any state approved budget amendments should be included here; include the line item that the funds are coming from and going to, as well as the date that the state approved the budget amendment. (1,200 char.)

Year 1 loss of plant material due to greenhouse power outage and subsequent freezing of actively growing plants impacted project initiation. Year 3 building remodeling and HVAC replacement prevented additional acclimation studies of MN1325 and MN1296 as freezing test equipment had to be placed in storage during renovations (this study would normally have occurred in Fall after the grant ended.

At end of project, budgeted but not spent was \$23,253.18 as University building remodel limited work in the fall acclimation season. The fringe rate overage of 1199.64 is directly related to how many credit hours the graduate student student took. In this case, the student took less credit hours in the summer which raised the fringe rate to 8% instead of the typical 1%. The contractual cost/unit area used increased incrementally each year resulting \$38.82 overage. These overages do not require a formal amendment of the budget.

PROGRAM INCOME (IF APPLICABLE)

If program income was earned on the project, grant recipients are required to report on the source, amount, and how funds were expended. Program income is gross income --earned by a recipient or subrecipient under a grant --directly generated by the grant-supported activity or earned only because of the grant agreement during the grant period of performance. Program income includes, but is not limited to, income from fees for services performed; the sale of commodities or items fabricated under an award (this includes items sold at cost if the cost of producing the item was funded in whole or partially with grant funds); registration fees for conferences, etc.

+	Source/Nature of Program Income (100 char.)	Amount Approved in Budget	Actual Amount Earned
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-	NA	\$0.00	\$0.00
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USE OF PROGRAM INCOME (IF APPLICABLE)

Describe how the earned program income was used to further the objectives of this project during the performance period. Any income generated must be reinvested back into the project and not set aside or reserved for future expenses after the grant ends. (1,200 char.)

NA

PPR ATTACHMENTS DESCRIPTION (IF APPLICABLE)

Grantors will rely on the data that is submitted in this form when they report to congress. However, if you think additional documents are necessary to support PPR, please attach then and provide a document name and description of document below.

+	Document Name	Document Description
-		