

NC SARE Grant

Graduate Student Proposal

Project Title: Growing *Alpinia caerulea* in Zone 4 as a *Zingiber originale* culinary and landscape alternative

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Requested Amount of Funding: \$7,110.11

- **Faculty Adviser Information:** Professor Neil Anderson
- **Institution Contact Information.** Regents of the University of Minnesota, 600 McNamara Alumni Center S.E., 200 SE Oak St, Minneapolis, MN 55455
- **Work Location.** Plant Growth Facilities, 1552 Gortner Avenue, St. Paul, MN 55108
- **Will your proposed research/outreach primarily focus on socially disadvantaged or limited resource farmers/ranchers?** This project has the potential to create a new income stream for farmers if they choose to grow this new crop. This crop has been shown to be drought tolerant and could be a new crop for the region. This crop also can be used for erosion control and soil stabilization.
- **Project Category Information:** Crop Production
- **Commodity Category:** Vegetable/Herbs Crops, Ornamental Fruits

Project Summary

Alpinia caerulea is a perennial herb crop native to eastern Australia. It is commonly referred to as native ginger. The berries and the new leaves and shoots of the plant are edible and can be eaten raw or cooked, but the seeds should be avoided. The plant is drought tolerant, cold resistant and can be grown indoors. The plant can be grown from rhizomes as well as seeds and has been used in erosion control (Fern, 2021).

This proposal is to present research opportunities for incorporating *Alpinia caerulea* into midwestern growing schemes. Currently there is little published information about *Alpinia caerulea*, so this research aims to outline germination, transplantation, and growing conditions for *Alpinia Caerulea* in midwestern greenhouses. This research will need to address that this new market will have differing climates and soil different to *Alpinia caerulea's* native Australia. The outcome of the project will be a guide for production in the upper Midwest (as defined as Minnesota, Wisconsin, North and South Dakota), along with promotional materials that will include nutritional information. Researchers, producers, growers, and farmers can benefit from this published research as a means to grow a crop previously unknown to them.

Description

This project aims to establish *Alpinia caerulea* growing practices in a greenhouse setting for United States Zone 4 production and transplantation. Additionally, there will be a nutritional comparison between *Alpinia caerulea* and *Zingiber originale* for marketing purposes.

Outcomes

The guide produced by the research will inform growers and farmers on germination, growing

and transplanting practices of a crop previously unknown to them. Research will be conducted on the nutritional benefits of *Alpinia caerulea* and those results will be compared to the more commonly known ginger (*Zingiber originale*). This will aid in marketing the new crop compared to *Zingiber originale*, which will be presented along with the research guide. A long-term outcome of this project would be for the incorporation of *Alpinia caerulea* into existing crop systems for farmers and greenhouse growers.

Statement of Problem, Background, Justification

Alpinia caerulea is often referred to as “native ginger” and can be used in cooking as a ginger replacement. *Alpinia caerulea* is an understory crop that provides soil stabilization and erosion control. It can be grown as a crop or an ornamental fruit and is believed to have medicinal properties. *Alpinia caerulea* is relatively unknown in the northern hemisphere. More popular is traditional or common ginger (*Zingiber originale*). *Zingiber originale* is commonly used in cooking globally and is frequently imported to the United States from China and India. China and India are the largest producers and exporters of *Zingiber originale* and the United States is the largest importer of common ginger (McCormick). Common ginger (*Zingiber originale*) can be grown in America and in zone 4, but has a long germination time (six to eight weeks) and is used strictly for cooking purposes. It is germinated through planting and sprouting of the rhizome and the rhizome is used in cooking. The shoots and leaves of *Zingiber originale* are also edible (Shahrajabian, 2021). While many are familiar with *Zingiber originale*, its long germination time and low amount of rhizome produced per the labor used for the production (Shahrajabian, 2021), it is not a crop that is frequently grown by Midwestern farmers and growers, despite an increase in popularity by consumers (McCormick). The long germination, and cold intolerance, partnered with the short growing seasons in Minnesota, are some of the

reasons why there is not a large growing market in Minnesota for growing *Zingiber originale*.

While *Alpinia caerulea* is little known by the American public, the flavor profile of common ginger is well known. *Alpinia caerulea* has reportedly a very similar flavor to common ginger (He, 2011). It's short germination time of 10 – 28 days, makes it a valuable crop for farmers and growers to diversity their production means and it is a way to add a new crop to their production when people will already be familiar with its flavor. The short germination time makes it well suited for the Minnesota climate and short growing season. The new shoots, leaves and berries are edible, and the flowers of the crop could also be used for ornamental purposes. The plant is an evergreen, and the flowers can bloom year-round and is considered an ornamental fruit. The flowers are also attractive to pollinators (Fern, 2021). The addition of this plant to midwestern landscapes has the potential to increase pollinator presence.

Little research has been done on *Alpinia caerulea* production in Zone 4. Sale and production of *Alpinia caerulea* has largely been limited to Australasia, but the introduction of *Alpinia caerulea* can help diversify the product selection and variety for growers and greenhouse producers. As an edible crop that can also be used for landscaping and erosion control, *Alpinia caerulea* has a wide variety of uses that would be beneficial to its new producers. Little research is available on the nutritional content of *Alpinia caerulea*, but there are many nutritional benefits to *Zingiber originale* that are well known in Zone 4. This research has the potential to create a new market for this crop and allow it to compete with the current ginger market, while providing a crop that grows faster. This research is new, in that it has never been done before in zone 4 for commercial crop production. This research is important because ginger is popular for its cooking properties and its purported medicinal properties. To find a replacement that grows faster or even has more

nutritional benefits could create a good market for growers. Being able to grow *Alpinia caerulea* in zone 4 will reduce shipping costs and create a local food source. This will have a positive impact on the environment, as most of the world's ginger is currently grown in India and the United States imports most of its ginger from China. To date, no projects have been done through SARE on *Alpinia caerulea*.



Figure 1: The blue fruits of the Alpinia caerulea and the broad green leaves.

Taxonomic description: *Alpinia caerulea* is a clumping perennial in the Zingiberaceae family. *Alpinia caerulea* is a subtropical understory plant, preferring warm temperate conditions with shade and moist soil.

The common name of the plant is Native Ginger. The plant geographic distribution of the plant is limited to Eastern Australia and a few limited instances in Australasia. *Alpinia caerulea* typically grows in subtropical, warm temperate conditions with part shade to full shade and moist soil. The soil should have adequate drainage. This suggests that the growing conditions could

replicated in a greenhouse, but there would be limits to zone 4 field settings. The plant is not known to be invasive or aggressive (Steward, 2016 and He, 2011).

Crop Species History and Potential Uses

Use by indigenous people:

This plant has historically been used by the Aboriginal people for both cooking and crafts (He, 2011). The plant is mostly edible. The rhizomes, new shoots, leaves and berries are edible. The seeds are not reported to be toxic, but are bitter and are recommended to be avoided.

Additionally, the leaves can be used to wrap food for cooking purposes (Steward, 2016).

Does this crop have any particular attributes useful for medicinal or other purposes?

The Aboriginal people used the leaves of the plant to moisten their mouths while on long walks in dry conditions, and the berries are reported to have anti-angiogenic properties (He, 2021).

Other uses or Additional Items of Potential Interest:

The extensive root system can be used for soil stabilization and erosion control in landscapes.

The plant also is recommended for ornamental purposes (Fern, 2021).

Sustainable Production:

Propagated through seeds and plant division. This ginger variety takes considerably less time to germinate than *Zingiber originale*, so plant production should use fewer greenhouse resources.

Since the crop is not well known in Zone 4, extensive marketing may need to be done in order to increase sales and convince greenhouses, growers and farmers to grow the crop. Additional marketing may be necessary to the public regarding how to use the plant. The plant also can assist with erosion control and soil stabilization (Steward, 2016), so this crop could also be marketed to ecological restoration efforts.

New Crop Species History and Potential Uses:

Most of the plant can be used in cooking, with additional uses in landscaping for soil stabilization, erosion control and ornamental purposes.

Domestication and breeding history:

Alpinia caerulea was domesticated in Australia. At present Australia is where the current range and production of the crop takes place. The seeds and seedlings can be purchased commercially, and the plant can also be found in wild settings.

Name and Description of Cultivars on the Market:

Native Ginger, Blue Fruited Ginger, Redback Ginger, Australian Blue Ginger. Currently *Alpinia caerulea* is distributed by seed in Australia by native plant vendors, but there is no found market for the plant on other continents or for sale by other means.



Nursery & Seedlings > Expert Growers > Marketing & Sales > Shipping & Distribution

Figure 2. Historical distribution of the Alpinia caerulea

There is an existing market in Australia for the *Alpinia caerulea*. There are several online businesses that sell both the plants and the seeds for retail distribution. Currently there are no retailers in North America that sell this plant. Existing growers such as Gertens, that have the infrastructure to grow new crops from seeds could reasonably grow and market this crop.

Additionally, due to the research that this crop requires, it would also be fitting for an educational institution such as the University of Minnesota or another agricultural institution to grow, research and market the crop. Similar research has been done at the University of Minnesota, regarding Kernza, which is a relatively new crop that also provides ecosystem services such as erosion control and soil stabilization. Kernza is a variety of wheat, which is a crop that has extensive uses and markets, and yet there was room for research on this wheat variety. Similarly, there is likely room for research and development into native ginger, even though there is an established ginger market.

Life Cycle:

The life span of the *Alpinia caerulea*; it is a perennial crop with rhizomes that can be harvested in its second growing season (National Parks of Singapore, 2021).

Plant Characteristics:

Alpinia caerulea can grow two to three meters tall. The plant produces dark green leaves that are broad-lanceolate shaped. The inflorescence is a spike with white flowers (Tucker Bush, 2020).

The flowering plant bears white blooms (Figure 3) and features blue round fruits (National Parks of Singapore) (Figure 1). Flowers bloom in late spring and early summer (He, 2011).



Figure 3: The white blossoms of the Alpinia caerulea.

Climate and Potential Production Environment:

The plant is very heat tolerant but is also cold tolerant (National Parks of Singapore, 2021).

Alpinia caerulea can be produced in traditional greenhouse settings but can also be grown by farmers in fields. Since the plant can be grown from seed as well as the rhizome, it is well suited to production on farms.

Marketing Story:

This plant is very unknown to those in the Midwest but is a versatile crop that can bring a variety of benefits to whomever farms it. The plant does well as a flowering ornamental plant, an edible food crop, and is also great for erosion control. Its versatility combined with its lesser-known status should make it a unique gem for farmers looking to diversify their crops. This plant would be especially beneficial to farmers that work directly with restaurants and grocery stores, as the plant as a food crop does well in a variety of cuisines.

Impact on sustainable agriculture in the North Central Region:

This project will largely address two of the three aspects of sustainability, the economy, and the environment. Through the potential for additional revenue for local farmers, it can increase their earnings and profitability. An even greater impact may be had regarding potential benefits to the environment. *Alpinia caerulea* is a valuable crop for both its ability to provide erosion control, its drought tolerance, and reducing watering needs. Its ability to be grown in Zone 4 can replace traditional ginger (*Zingiber originale*), which will eliminate shipping costs and transportation emissions. These economical and environmental benefits will translate into social benefits for farmers and their communities. It benefits everyone to reduce emissions and to grow locally, and the added financial benefits will help farmers be more self-reliant, allowing them to reinvest in their businesses and communities.

Approach and Methods:

There is little research that has been done on *Alpinia caerulea* in the northern hemisphere, but it is purported to be very similar to *Zingiber originale* (He, 2011), which can be found in local grocery stores and markets. Despite the prevalence in American cuisine, most of the traditional ginger (*Zingiber originale*) consumed is imported from China. If there were a replacement for this traditional ginger, it would create a new market for a crop in Minnesota, reducing shipping costs and environmental impacts for importing a crop.

The main objective of this project is to identify the best practices for cultivating *Alpinia caerulea* in Minnesota. Additional research is being conducted to compare the nutrition of the new crop with *Zingiber originale*. This is partially because there few publications and research done on the nutritional benefits of *Alpinia caerulea* and knowing the nutritional benefits will help market the new crop to a newer audience.

In order to find the best management practices for growing the new crop, the crop should be attempted to be grown in both a greenhouse and in a field setting. *Alpinia caerulea* has a germination period of 10-28 days (Tucker Bush, 2020). The plant should then be started indoors 10 - 28 days prior to the last frost day in Minnesota, and then transplanted into a greenhouse bed and also a field setting. It is important that the field setting and greenhouse be close to each other so that data can be collected at similar times on the same day. Plants should be monitored for growing rates, amounts of leaves, height, number of inflorescences, and number of fruiting bodies. Data should be taken and compared for when the indoor plant flowers and produces berries vs the outdoor plant.

Personnel to run the growing, along with the nutritional analysis, will be needed. As will space in a greenhouse and the physical supplies of seeds. Additional physical supplies will include a growing medium, plug trays, plant trays, containers, and labels. At present, there are no plans to include fertilizers or plant growth regulators to establish a baseline of growth for the plant without inputs. The seeds do not need to be presoaked or treated. The seeds will be established in the growing medium based on the recommendations from the seed packet. The primary research will be conducted by Mary Nieting, a student in the Master in Professional Studies program studying Horticulture at the University of Minnesota. The research will be monitored by Dr. Neil Anderson.

After the plant has matured and the fruits have been produced, a nutritional analysis will be performed on the fruits, leaves and shoots.

The nutritional analysis is critical to the success of the crop because it will show how the crop can be a replacement for *Zingiber originale*, which is currently imported to Minnesota. Showing

a nutritional comparison between the two crops is important because of many perceived benefits of eating and cooking with *Zingiber originale*. The intent of the analysis is to show that there are similar nutritional benefits in replacing *Zingiber originale* in cooking with *Alpinia caerulea*.

Outputs:

The results of the research will be a comparison on the nutritional benefits of *Alpinia caerulea* compared to *Zingiber originale*. Additional results will include best practices for the propagation of *Alpinia caerulea*. The output of this research will be published in papers detailing the best practices for starting to grow *Alpinia caerulea* in a greenhouse setting and in a field/farm setting. There will also be a published paper that gives a detailed nutritional analysis of the crop.

This project stands to benefit consumers, as they will have access to locally grown nutritional crops, as opposed to importing them, as well as the financial impacts to farmers who can grow these new crops. And everyone stands to benefit from this project if we can take a food that is mostly imported and create a market for it here.

Outreach:

An eOrganic article would be written to introduce the crop to local farmers. A seminar series will also be done at the University of Minnesota, where local farmers are invited. Articles can also be written for extension, which will have a broad, but Minnesota-based readership.

Summary Table of Outcomes, Outputs, Activities, Inputs, and Evaluation

Expected Outcomes	Inputs and Activities	Outputs	Evaluation/Monitoring Plan; Measuring methods
This research will produce the best management practices	Mary Nieting is the primary researcher and the research will	A report will be prepared for SARE, along with articles for	Success in this project will be if there is a new crop grown in

<p>for germinating and growing <i>Alpinia caerulea</i> in Minnesota. The researchers will find the nutritional properties of the crop, which has little current research on. Knowledge will be gained in plant growing in a greenhouse versus a field setting and in marketing. This research also has a chance to increase the biodiversity of farms and create a crop that aids in erosion control.</p>	<p>be monitored by Dr. Neil Anderson. Their time will be a considerable input in the project. University of Minnesota greenhouse facilities and field sites will be used to conduct the research. Physical supplies of seeds, growing medium, plug trays, plant trays, labels and containers will also be needed.</p>	<p>University of Minnesota Extension and eOrganic online. There will be a seminar series hosted at the University of Minnesota that will invite local farmer participants.</p>	<p>the field setting that bears edible fruits. Once this is achieved, further indicators of success will be the implementation of this plant into growing schemes of local farmers. An alternative to the success of the fruit would be the introduction of the plant for erosion control and as a landscape plant.</p>
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Evaluation Plan

How will the effectiveness of this project be measured? The ideal outcome of the paper and research is for the crop to be incorporated into the growing plans and schemes of Minnesota farmers. This project will be considered a success when Minnesotan farmers start growing the crop and it can be purchased at local grocery stores and farmers markets. Other indicators of success will be increased knowledge for Minnesotan farmers on this new crop and how to implement it into their growing plans. A more finite measure of success will be the successful production of a fruit bearing plant that was grown in a Minnesota field setting.

Experience and Roles

Project Mentor

The project mentor will be Dr. Neil Anderson. Dr. Anderson holds a Ph.D. in Horticulture and is a professor of horticulture at the University of Minnesota. Prior to completing his doctoral program, Dr. Anderson received his B.S. in Ornamental Horticulture and M.S. in Horticulture. Dr. Anderson will serve as a liaison between the primary researcher and the University.

Primary Researcher

Mary Nieting is the intended primary researcher for the project. Mary received her B.S. in Environmental Science from the University of Minnesota and is currently pursuing her Master's degree in Horticulture, also at the University of Minnesota. This project will be related to her thesis through the knowledge gained in research, experiment design, and report writing, as well as outreach with farmers and the scientific community.

This project will require access to university labs for the nutritional analysis, greenhouse space and field plots to grow the crop, along with staff for watering and maintenance.

Additional Partners

Staff at the Plant Growth Facility, along with farmers who chose to grow the new crop, are additional partners in the project, and the success of the project will depend on their cooperation.

Budget and Budget Justification

To accomplish the goals of this research project, the budget is a requested total of \$7,110.11.

This number is comprised of a salary for the primary researcher for them to complete the experiment and publish their findings, along with the space materials needed. The project is expected to run for the length of the growing season from May until October and this time will

be covered by a monthly stipend of \$1,000 for 7 months for a total of \$7,000. Additional work on the project of watering done by the green house staff is included in the fees for the use of the Plant Growth Facility.

Materials needed for the completion of the project include:

- *Alpinia caerulea* seeds (\$3.14 for a packet of 25 seeds x 4 packets, plus international shipping - \$14.99)
- Germination mix*
- Growing medium*
- Plant labels*
- Markers (\$5.00)
- Plug trays*
- Containers*

The * items are included in the space rental fees at the Plant Growth Facility. A 75 foot long space of bench will be rented at a cost of \$.0308, totaling \$2.31 a day, for 28 weeks for a total of approximately \$65.

The total sum of the costs for the project will be \$7,000 (salary) + \$40.11 (seeds and see shipping) + markers (\$5) + facility rental fee (\$65) = \$7,110.11

References:

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