

Mentzelia decapetala: The Rising Star of Great Plains Wildflowers



*Figure 1: Mentzelia decapetala growing in Mitchell County, Kansas, photo by Mike Haddock, (<https://www.kswildflower.org/largePhotos.php?imageID=1422&aCategory=f&lastModified=2007-10-20>)*

**Requested Amount of Funding:** \$7,074.76

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**Faculty Advisor Information:** Dr. Neil O. Anderson, B.S. Ornamental Horticulture, M.S. Horticulture, Ph.D. Horticulture

**Institution Contact Information:** Regents of the University of Minnesota, Department of Horticultural Science, 305 Alderman Hall, 1970 Folwell Avenue, Saint Paul, MN 55108

**Work Location:** Plant Growth Facilities- West, 1552 Gortner Ave, St Paul, MN 55108

**Project Category:** Crop Production- Ornamentals & Turf

## Summary

“*Mentzelia decapetala*: The Rising Star of Great Plains Wildflowers” is a proposed project to be conducted at the University of Minnesota. The expected outcomes of this project are determining the germination and growth requirements of *Mentzelia decapetala*, creating a production guide to inform growers of these requirements, and producing and maintaining a website to make results of this research freely available. If this project is successful *Mentzelia decapetala* will become a sustainably grown floriculture crop that will provide a new income stream for nurseries and growers in Minnesota and the North Central region more broadly.

## Description

*Mentzelia decapetala* (ten-petal blazingstar) is an herbaceous perennial native to the North Central region. This research project will determine its efficacy as a floriculture crop.

## Introduction

Across the prairies of the United States stunning, starburst white flowers have been waiting to be discovered by gardeners and plant-lovers. *Mentzelia decapetala* (figure 1) is also known as ten-petal blazingstar, prairie lily, sand lily, evening starflower, and tenpetal stickleaf (Runkel, 2009; USDA plants). The common names of this species evoke desert nights with a blanket of stars overhead and the blooms of *M. decapetala* seeming to mimic the starlight on the ground. As interest from consumers for native plant species and prairie gardens increases, the star-like beauty of *M. decapetala* has the potential to be the next big floriculture crop. Very little research has been published on

*M. decapetala* to date. This proposal aims to create a framework for research on germination, greenhouse growth, transplanting, and plug growth of *M. decapetala* for use as a bedding plant.

### **Taxonomic Classification and Description**



*Figure 2: A cluster of Mentzelia decapetala in bloom (photo by Joy Viola, Northeastern University, Bugwood.org)*

*Mentzelia decapetala* (figure 2) is in the family Loasaceae. Genetic research done on this family suggests that *M. decapetala* is in its own independent clade. The most closely related species of *Mentzelia* are *M. nuda* (figure 3) and *M. laevicaulis*. Both species are shrubs, larger than the low-growing delicate leaved *M. decapetala*. These relatives also differ in habitat, being found at higher elevations in the Rocky Mountains, while *M. decapetala* grows in the lowlands of the Great Plains. The main similarity

between these species is their large, showy flowers, which are thought to be convergent characteristics (Schenk, 2011).



Figure 3: *Mentzelia nuda* in bloom  
(<https://www.opsu.edu/Academics/SciMathNurs/NaturalScience/PlantsInsectsOfGoodwell/plants/pasturefiles/pasture117.html>)

As common names of *M. decapetala* suggest, the blooms of this species have ten petals and resemble a starburst; roughly two hundred stamens erupt out of the center of the flowers, petals are white or light yellow and stamens are light yellow. Singular flowers grow at the end of branches and the blooms are fragrant. Bracts are lanceolate in shape. Leaves are lanceolate in shape and have cleft or wavy edges (figure 4). The Loasaceae is the stick-leaf family; barbed hairs grow on the leaves of *M. decapetala* that can cause them to stick to clothing or animal fur. Stems are yellowish in color. The overall height of this species can range from 30 to 90 centimeters. *Mentzelia decapetala* has a long spindle shaped taproot with smaller roots growing out of it; the roots are sensitive and this may create a challenge during transplanting (Rickett, 1966; Runkel 2009; Kansas Wildflowers and Grasses). *Mentzelia decapetala* produces seeds in pods

that are about one half inch long, each pod can contain many seeds. Individual seeds are ovate and flat (figure 8). The seeds are known to be edible, but more research is needed for exploration as a food crop. (Rickett, 1966; Runkel 2009)



Figure 4: Leaves of *Mentzelia decapetala* resemble those of a woody ornamental cut flower/cut foliage crop, *Grevillea robusta* (<https://www.opsu.edu/Academics/SciMathNurs/NaturalScience/PlantsInsectsOfGoodwell/plants/pasturefiles/pasture136.html>)

### **Geographic Distribution and Habitat**

The northern reach of *M. decapetala* is Alberta, Saskatchewan, and Manitoba Canada, it can be found south to Texas and Mexico. The western range is to Nevada, and the eastern range is to Illinois (figure 5) (Rickett, 1966; USDA plants). The seeds used for initial research were collected in California, near Joshua Tree National Park. Further research on this species may reveal that the native range is greater than previously thought, or that it has established beyond its native area. The broad range of *M. decapetala* suggests that it is highly adaptable and has the potential to grow outside of its native distribution.

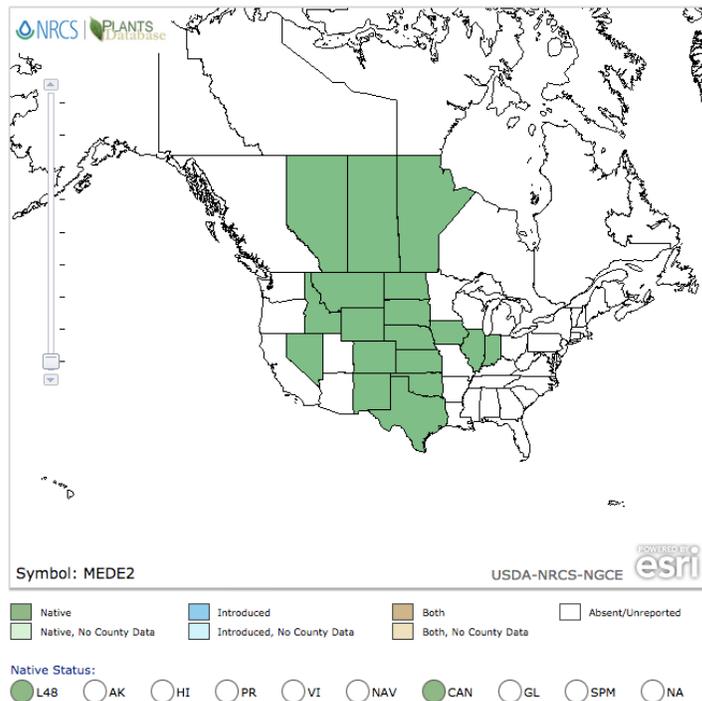


Figure 5: Map of *M. decapetala* native range (<https://plants.usda.gov/core/profile?symbol=MEDE2>)

*Mentzelia decapetala* is a perennial species commonly found in the prairie grasslands of the Great Plains. *Mentzelia decapetala* is likely fairly drought tolerant due to its distribution throughout the Great Plains region. *Mentzelia decapetala* usually grows in areas with a lot of sun exposure. It can be found in dry soils and soils containing a high concentration of lime. As noted above, it is less likely to be found in rocky, mountainous areas as some other species in its genus. Flowers normally bloom between June and September (figure 6); they open at dusk and close late in the night. *Mentzelia decapetala* relies on pollination from moths and other nocturnal insects. (Rickett, 1966; Runkel 2009; Schenk, 2011, Plants of the Southwest)



Figure 6: *Mentzelia decapetala* with a showy display of flowers on a hemispherical plant shape (photo cred. Whitney Cranshaw, Colorado State University, Bugwood.org)

### Commercial Breeding History

Currently there are two seed producers that sell *M. decapetala*: Plants of the Southwest (<https://plantsofthesouthwest.com/products/mentzelia-decapetala?variant=11501475909>) and J.L. Hudson Seed Co. (<https://www.jlhudsonseeds.net/SeedlistM.htm>). Plants of the Southwest suggests a four-week cold-treatment for *M. decapetala* to induce germination. The seed that Plants of the Southwest started with were collected from the wild in Northeast New Mexico; they use organic growing practices and are dedicated to producing and selling native species. It is unlikely that Plants of the Southwest has done any breeding experiments with *M. decapetala*. J.L. Hudson Seed Co lists similar information about germination and required growing conditions as Plants of the Southwest, they did not respond to a request for further information. There are no growers that I am aware of who are cultivating *M. decapetala* as a plug or potted plant.

### **Tendency to Naturalize or Become Invasive**

It is not yet known if *Mentzelia decapetala* has the potential to become invasive. The broad range of this species suggests that it may be able to naturalize in new areas. Research on the possibly invasive qualities of this species should be investigated, especially if the potential for export exists. (USDA plants)

### **Statement of Problem, Background, Justification**

To date very little research has been done on growing conditions and possible cultivation of *Mentzelia decapetala*. The purpose of this proposal is to fund research on germination and growing requirements of this species and develop a culture sheet for future growers.

*Mentzelia decapetala* is native to the North Central region. It is both drought tolerant and winter hardy (figure 7). These characteristics will make *M. decapetala* very desirable in the bedding plant market. If given the right growing conditions this species is a low maintenance perennial that could be grown as a bedding plant or in container gardens.

The ability of *M. decapetala* to tolerate drought conditions will make it a very sustainable crop to grow both in terms of cost and use of natural resources. Concern over water usage could motivate some growers and consumers to select native prairie species over classic garden plants that require frequent watering



Figure 7: A *Mentzelia decapetala* plant in winter, displaying the silvery white foliar display (<https://www.opsu.edu/Academics/SciMathNurs/NaturalScience/PlantsInsectsOfGoodwell/plants/pasturefiles/pasture136.html>)

### **Approach and Methods**

The experimental activities for this project will occur at the University of Minnesota Plant Growth Facilities-West. One greenhouse (including a mist house), and a walk-in cooler will be used for all experiments. The experiments (table 1) are designed to observe the life cycle of *M. decapetala* when grown from seed and to measure if raising pH of soilless media through the addition of calcium carbonate has a beneficial effect on the growth rate and survival of *M. decapetala* seedlings. (Texas Greenhouse Management Handbook)



Figure 8: Seeds of *M. decapetala* (photo by S. Bartow)

### Experimental conditions

#### Cooler (for cold stratification)

- 3-5C
- Dark cooler

#### 369 B-4 Mist house (for germination)

- Day/night temperature: 21C/21C
- Lighting: 16 hours, at 150  $\mu\text{mol m}^{-2} \text{s}^{-1}$
- Mist every 10 minutes, for 7 second duration

#### 369 B-5 Production house (for growing after germination)

- Day/night temperature: 19C/16C
- Lighting: 16 hours, at 500  $\mu\text{mol m}^{-2} \text{s}^{-1}$
- Fertilization: 125 ppm N CLF 15-5-15 Cal-Mag (CLF)
- Monthly fungicide treatments
- Watering: through capillary mat until transplanting, then twice daily AM/PM

Stage 1	Stage 2	Stage 3	Stage 4
4 week cold stratification	Move to mist house for germination	Move to production house after germination, trays placed on capillary mat to encourage downward root growth	Transplanting when true leaves are observed, moved to benches in production house, switch to overhead watering.

Table 1: Stages of experiment

Experimental procedure (table 2)

Control: standard soilless media and fertilizer

- Media for Germination: Germination Mix (BM2), covered with vermiculite (fine-medium)
- Media for Transplanting: Mycorrhizae soilless medium
- Seeds will be sown in 128 trays and placed in cooler for stratification for 4 weeks. Trays will be covered with clear plastic cover to keep in moisture. Media will be misted with water once per week.
- After stratification 128 trays will be placed in mist house (uncovered) for ~2-3 weeks, or until germination occurs. 128 trays will be cut in half. ½ of tray will be moved to production house after initial germination, other half of tray will be left in mist house to observe if late germination occurs.
- After germination seedlings will be moved to production house 369 B-5 (figure 9).
- When the first true leaves emerge seedlings will be transplanted into 4” peat pots.

Experimental group #1

- Media for Germination: Germination Mix (BM2), covered with vermiculite (fine-medium)

- Media for Transplanting: Mycorrhizae soilless medium
- Ground limestone (calcium carbonate) will be added only to Mycorrhizae soilless medium.
- Seeds will be sown in 128 trays and placed in cooler for stratification for 4 weeks. Trays will be covered with clear plastic cover to keep in moisture. Media will be misted with water once per week.
- After stratification 128 trays will be placed in mist house (uncovered) for ~2-3 weeks, or until germination occurs. 128 trays will be cut in half. ½ of tray will be moved to production house after initial germination, other half of tray will be left in mist house to observe if late germination occurs.
- After germination seedlings will be moved to production house 369 B-5 (figure 9).
- When the first true leaves emerge seedlings will be transplanted into 4" peat pots.

#### Experimental group #2

- Media for Germination: Germination Mix (BM2), covered with vermiculite (fine-medium)
- Media for Transplanting: Mycorrhizae soilless medium
- Ground limestone (calcium carbonate) will be added to both Germination Mix and Mycorrhizae soilless medium to raise the pH of media.
- Seeds will be sown in 128 trays and placed in cooler for stratification for 4 weeks. Trays will be covered with clear plastic cover to keep in moisture. Media will be misted with water once per week.

- After stratification 128 trays will be placed in mist house (uncovered) for ~2-3 weeks, or until germination occurs. 128 trays will be cut in half. ½ of tray will be moved to production house after initial germination, other half of tray will be left in mist house to observe if late germination occurs.
- After germination seedlings will be moved to production house 369 B-5 (figure 9).
- When the first true leaves emerge seedlings will be transplanted into 4” peat pots.

Crop	# of seeds	Plug tray size	Soilless media	Additional Inputs
Control	50	128	Germination Mix, covered in 2 cm of vermiculite. Mycorrhizae soilless media used for transplanting.	N/A
Experiment #1	50	128	Germination Mix, covered in 2 cm of vermiculite. Mycorrhizae soilless media used for transplanting.	Addition of calcium carbonate in stage 1
Experiment #2	50	128	Germination Mix, covered in 2 cm of vermiculite. Mycorrhizae soilless media used for transplanting.	Addition of calcium carbonate in stage 1 and stage 4

*Table 2: Summary of experimental materials and their uses*



*Figure 9: Mentzelia decapetala cotyledons in a germinated seedling. (Photo taken by S. Bartow)*

## **Outputs and Outreach**

The primary output of the proposed project will be a product information guide on the cultural requirements of growing *M. decapetala* from seed. Another important output will be an expansion of existing research and knowledge on this species. The third output will be a website that details all research that has been completed on *M. decapetala*.

To reach growers, researchers, and others in the floriculture industry who may be interested in propagating *M. decapetala* a website will be created that showcases the results of the proposed research. The website will contain the completed product information guide and details of the experimental procedures used to develop it. A short video will be embedded on the website that briefly shows the steps of the experiment and the various stages of development of *M. decapetala*. The website will have a message board where growers can ask questions or offer feedback on the product information

guide. This will also allow growers to share their own unique findings on growing *M. decapetala*. The creation of a website and message board will allow the proposed research to continue in an informal manner beyond the completion of the product information guide.

### Summary

Expected Outcomes	Inputs and Activities	Outputs	Evaluation/Monitoring plan
<p>Learning Outcomes: to increase knowledge of germination and growing requirements of <i>Mentzelia decapetala</i>.</p> <p>Action Outcomes: <i>Mentzelia decapetala</i> becomes a new bedding plant and further knowledge is gained on how to grow it from seed.</p>	<p>Inputs: primary researcher (Sage Bartow), and other contributors. The greenhouse and plant growth facility. Seeds, soilless media, containers, labels, misc. supplies.</p> <p>Activities: The research experiment on <i>M. decapetala</i>'s germination and growth, and soil pH requirements.</p>	<p>1. Product information guide on growing <i>M. decapetala</i> from seed. Will detail duration of cold stratification, seed germination time, time from transplant to finish, preferred container size, and preferred soil pH.</p> <p>2. Website summarizing research, to make information publicly available.</p>	<p>Evaluation of success will be based on germination percentage of planted seed, rate of survival of plants from germination to maturity, and rate of survival of transplanted specimens.</p>

Table 3: Summary table of proposed project

### Outcomes

The primary learning outcome of this project will be that growers will learn the germination and growing requirements for *Mentzelia decapetala*. By cultivating *Mentzelia decapetala*, a species native to the North Central region, the action outcomes will be nursery production of a crop that provides numerous ecosystem services to

pollinators and other native species. This will provide a new revenue stream for nurseries in the North Central region and various positive impacts to native species in the area.

### **Evaluation Plan**

It will be necessary to ensure that the knowledge obtained by this research project reaches the desired audience. The message board included on the website will give the researchers some idea of how growers are using the information generated by this project. A few native plant nurseries will be selected as partners in testing nursery production of *Mentzelia decapetala*, such as: Morning Sky Greenery (<https://www.morningskygreenery.com/>) in Morris, MN, Outback Nursery and Landscaping (<http://www.outbacknursery.com/>) in Hastings, MN, and Prairie Moon Nursery (<https://www.prairiemoon.com/>) in Winona, MN. Once cultivation of *Mentzelia decapetala* begins at these nurseries, seasonal surveys will be conducted that evaluate the success of the product information guide as a tool for producing this crop.

### **Experience and Roles of Personnel**

Faculty Advisor: Dr. Neil O. Anderson, B.S. Ornamental Horticulture, M.S. Horticulture, Ph.D. Horticulture

Key researcher: Sage Bartow, currently pursuing a MPS in Horticulture.

Relevant experience of key researcher:

- Volunteer at Greenbelt Native Plant Center (2020)

- Preliminary research on *Mentzelia decapetala* completed in Hort 6141 course during Spring 2021 semester

## **Budget**

Total budget: \$7,074.76

- Salaries: The primary researcher (Sage Bartow) will complete the project for a monthly stipend of \$500 per month, \$6000 total for a 12-month period.
- Website hosting for 3 years: \$432
- Materials, supplies, greenhouse, and land rental: \$450
  - Seeds
  - 128 plug trays
  - 4” peat pots
  - Mycorrhizae soilless medium, Germination mix, and vermiculite
  - Calcium carbonate
  - Fertilizer
  - Sharpies and tags
  - 30 square feet of greenhouse space
  - 1 acre of land at St Paul Research and Outreach center
  - Miscellaneous other supplies

## **Literature Cited**

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