



Space Chia Seeds

Salvia hispanica

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iLead Exploration
5th Grade



Abstract



I would like to conduct an experiment to find out if Salvia hispanica can germinate in microgravity.

Being able to germinate chia seeds in microgravity is important for the following reasons:

- They are a good plant protein
- They are full of nutrients.
- They are small
- They germinate quickly
- They can germinate on almost anything
- Chia plants self-pollinate.

Abstract conclusion

If we can grow chia seeds in microgravity it means astronauts will have easy-to-grow food that is nutritious.



Experiment Rationale

Astronauts need to be healthy and get the nutrients they need as easily as possible.

I learned about how chia seeds were used by native Americans to help them stay strong and hydrated on long journeys. I started learning more about chia seeds. I found out that they are very **nutritious**. They are a *plant protein* and can be a good **egg replacement** in recipes. **They are easy to grow** and **germinate quickly**. It is a food that is being studied as something that helps people with diabetes.

Experiment Rationale

Chia seeds could be good plants to grow on the moon or Mars.

- They are small, so they can be transported easily.
- They can self-pollinate, so no pollinators are needed for that part of their reproduction.
- They are healthy and can be an egg replacement in recipes.
- Astronauts could make foods that they are used to having on Earth to make them feel connected to their friends and families.

10 HEALTH BENEFITS OF CHIA SEEDS



Chia Seeds Improve
Blood Sugar Levels



Chia Seeds Are Rich in
Fiber and Prebiotics



Chia Seeds Help
You Burn Fat



Chia Seeds Boost
Your Energy Levels



Chia Seeds Improve
Body Detoxification
Pathways



Chia Seeds
are Naturally
Anti-Inflammatory



Chia Seeds
are Great for
the Heart



Chia Seeds Improve
Dental Health



Chia Seeds Increase
Brain Power



Chia Seeds Build
Lean and Strong Muscles



Chia seeds benefit the body in many different ways. Astronauts can use chia to recreate meals that typically require fresh eggs and that could offer mental health benefits as well.

Materials in Mixstix

Volume 1: 20 chia seeds in substrate

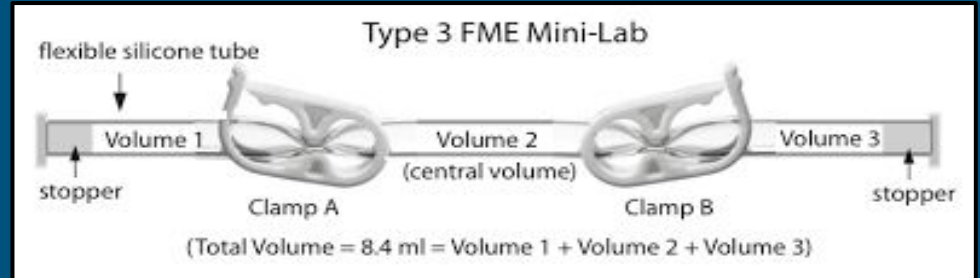
Volume 2: 3 mL water

Volume 3: 3 mL of formalin. *

Directions for the astronaut in charge will be:

Unclamp clamp A and shake at A=0.

Unclamp clamp B and shake at U-5.



* I considered using glycerin as the preserving agent because I read an article on preserving with that, but all of the previous DreamUp teams have used formalin to preserve plant material. I think that must be a good option.

Experiment Design

MixStix Type 3

- unclamp clamp A and shake on day one at the ISS to mix the seeds and water so that the chia seeds can germinate.
- I will have clamp B unclamped and the MixStix shaken before undocking so that the formalin can preserve what has grown.

*I will include a substrate material of some kind for the seeds to latch onto once the mucus forms on the outside in response to the water.



COSTS FOR TEAM CHIA

All prices are from Amazon.

I have a list made and ready to order if Team Chia is selected.

1 12 oz. Bag of USA grown black chia from Heartland Chia per bag	\$12.50
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Formaldehyde Formalin 37% solution, 1 Liter	\$40.00
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Mediums to test on:	
fabric - cotton	\$11.00
polyacrylamide gel	\$11.00
vermiculite	\$14.00
perlite	\$9.00
germination paper	\$13.00
EVA foam	\$26.00

I already have:
Purified water
Latex gloves
Eye protection
Specimen jars

TOTAL	\$110.50
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I have planned to buy more than enough chia seed, formalin and germination mediums so that I can share with teammates to have multiple people testing so we have more data to consider.

Hypothesis

I think that chia seeds will germinate both on Earth and in microgravity.

Chia seeds germinate quickly and easily. I think the material included with the chia seeds will be important, but given the proper material and ratio of water to seeds, they will successfully germinate in microgravity.

I think that the *Salvia hispanica* will germinate differently in microgravity than it does on Earth. I expect the growth to be spread out and varied in appearance. I expect the Earth tests will have growth that is straight and mostly vertical growth.



Subject Matter Experts

I currently have two experts who have agreed to help me as I research and experiment on chia seeds.

Subject Matter Expert



Chris Kummer is a co-founder and president of Heartland Chia. He has a degree in Agronomy and was the lead in developing early flowering chia with the researcher at The University of Kentucky. Mr. Kummer answered my questions about chia seed germination and asked to be kept up to date on my project.

Subject Matter Expert

Ed Read is the Greenhouse Manager at CSU Fullerton. He has shared information with me as well as offered questions for me to consider while planning my experiments.



RESOURCES

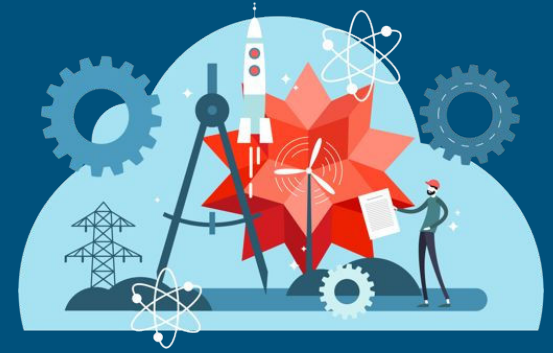
I have done research on chia seed history, growing methods, nutrition and health benefits and preservation at the following links:

[Chia Seeds | The Nutrition Source](#)

[how to grow chia seeds at home - Cultures For Health](#)

[Chia | Description, Plant, & Nutrition - Britannica](#)

[Glycerin-Preserved Foliage | Mississippi State University Extension ...](#)



Launch Team Development

If my experiment is selected I will use every resource available to me to build a dedicated team of iLead Exploration learners. I will connect with my DreamUp classmates and former DreamUp participants. I will also invite my friends who are Exploration students to apply for Team Chia. I will work with Mission Control and my EF to find others who will be an asset to the Launch Team. I will set up interviews with each candidate to build a team that works well together and uses each person's strengths. Team members will be selected to meet the different needs of researching, outreach, documenting Team Chia's progress and fundraising.



Outreach to iLEAD & the community

I have already been telling my friends about how awesome the DreamUp to Space Program is. If my experiment is selected I will connect with the Monday Message team at Exploration and share about Team Chia's experience. I will also connect with all those in charge of iLead Exploration social media accounts. I would be happy to attend iLead Exploration events, meetups and virtual classes and events to share my experience and let other learners know about this amazing opportunity to learn more about space exploration and science in general. I will also connect with local newspapers to share my team's story.

Fundraising



A lead teammate will be selected to head up fundraising, but each participant will be included as far as reaching out to friends, family members and business partners to seek financial support. The lead fundraiser will organize virtual and in-person events to raise funds and share our story. We will have fundraising letters, restaurant fundraising, and will engage businesses to agree to a matching campaign. All team members will participate in events as much as possible.

Personal Impact

I consider myself a scientist because of my interests and how I ask questions about how things work all the time. I am a curious person who loves to learn. If Team Chia is selected it will be an opportunity to develop my skills as a scientist and will create a foundation of advanced learning. I have already learned so much in the DreamUp classes and I know that creating an experiment to be tested in microgravity will grow my mind and increase my understanding of what is possible with science. This will be my first time working with a team on such an important project. I know my leadership and social skills will be developed. Having Team Chia selected could impact the entire course of my life.





I appreciate everyone who has invested in the DreamUp Program and I am grateful to be a part of it all. - Revery Atom Davis