Project ID:NSF-SCH-2025-427

Project Title: Effect of Different Surfaces on Seed Germination and the Key Factors Influencing Growth

Category: Environmental Science
Name of the Student: Kanak Sarah Haneen
Name of the School: Sana Smart School
City & State: Chennai, Tamilnadu

Overview:

This experiment studies the effect of different surfaces on the germination of **fenugreek seeds**. The materials tested were kitchen paper towel, regular cotton, cotton cloth, M sand and soil. The fastest germination was observed in cotton, followed by cotton cloth and soil. The paper towel showed slower growth because it couldn't retain enough moisture, and M sand alone showed no growth. However, when yam sand was mixed with cocopeat, germination occurred successfully. This proves that M sand alone lacks the structure and moisture-holding capacity needed for germination. The results show that moisture and surface structure play vital roles in early seed growth.

Abstract

This project explores how different surfaces affect the speed of bean seed germination. By comparing seeds placed on moist paper towel, cotton , soil, sand, and cloth, the experiment measures time to radicle emergence and percentage of seeds germinated. Results will show which surface provides the most suitable conditions for germination, helping us understand the importance of moisture, aeration, and seed–surface contact in early plant growth. And also to understand whether inert materials like M sand can be modified to support plant growth.

Aim

To find out which surface helps seeds germinate the fastest under identical moisture, temperature, and light conditions.

Objective

To compare the germination speed and percentage of seeds on moist paper towel, cotton wool, soil, sand, and cloth under the same temperature, light, and moisture conditions, and identify the surface that supports the fastest and most uniform germination.

Variables

Independent Variable: Type of surface (paper towel, cotton, soil, sand, cloth).

Dependent Variables:

Time to first radicle emergence (days)

Total germination percentage after 7–10 days

Controlled Variables:
Same type of bean seeds, same number per surface, equal water amount, same temperature, same light conditions, same observation schedule.

Materials

- Fenugreek seeds 50 gm (10 gm in each surface)
- 5 trays/plates/containers
- Potting soil, M sand, cotton , paper towels, piece of cotton cloth
- Measuring cup for water
- Spray bottle (for even watering)
- Labels & marker

- Notebook and camera for daily observations

Experimental Design

Group the seeds by surface type (10 gm per surface). Keep all containers in the same location at room temperature. Water each surface with equal amounts of water initially and mist daily to maintain moisture. Observe and record germination daily for 7–10 days.

Procedure

1. **Preparation**

- Label five trays: Paper Towel, Cotton , Soil, M Sand and Cloth.
- Place each surface in its container.
- Moisten each surface with the same amount of water.

2. **Seed Placement**

- Place 10 gm seeds evenly on each surface.

3. **Observation**

- Check daily at the same time.
- Record how many seeds show a visible radicle (tiny root tip).
- Keep surfaces moist by spraying water if they start to dry.

4. **Data Collection**

- Continue observations until most seeds have germinated or 10 days have passed.

- Calculate % germination for each surface.

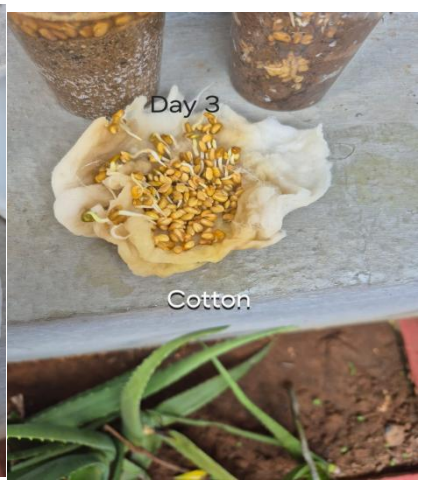
Data Table
Day 1

S.NO.	*SURFACE*	*% OF GERMINATION*
1	Paper towels	0
2	Cotton	0
3	Soil	0
4	Cloth	0
5	M Sand	0

Day 3

S.NO.	*SURFACE*	*% OF GERMINATION*
1	Paper towels	30%
2	Cotton	35%
3	Soil	30%
4	Cloth	20%
5	M Sand	0


Day 3
Kitchen paper towel


Day 3
Cotton

Day 4


Day 4
Soil


Day 4
Cotton

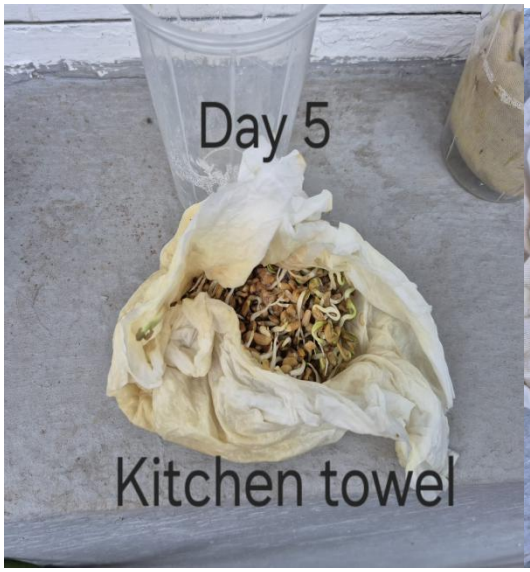

Day 4
Sand

Day 4

S.NO.	*SURFACE*	*% OF GERMINATION*
1	Paper towels	38%
2	Cotton	45%
3	Soil	35%
4	Cloth	20%
5	M Sand	0

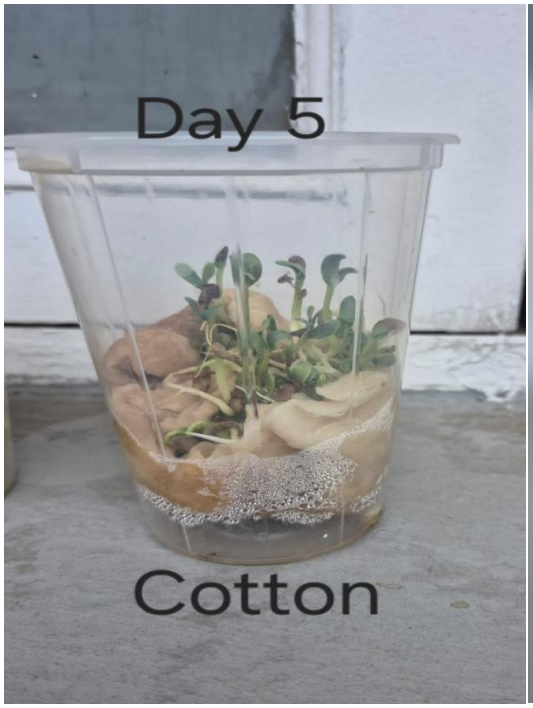
Day 5

S.NO.	*SURFACE*	*% OF GERMINATION*
1	Paper towels	45%
2	Cotton	60%
3	Soil	40%
4	Cloth	28%
5	M Sand	0%


Day 5
Kitchen towel


Day 5
Cotton cloth


Day 5
Sand



Results

- The fastest germination was seen in **cotton**, as it was able to retain moisture for a longer time, providing a humid and steady environment for the seeds.
- **Kitchen paper towel** and **soil** showed similar germination but with slightly slower growth compared to cotton, as they could not hold as much moisture.
- The **cotton cloth** showed slow germination, possibly because the cloth was thick and did not allow proper aeration inside, which may have affected the sprouting process.
- In **M-sand**, no germination was observed since it could not absorb water — the water stayed above the surface.
- When M-sand was mixed with cocopeat as a binding agent, germination began successfully because the mixture helped retain moisture.
- Overall, the experiment showed that moisture retention and proper aeration play a key role in determining how quickly and successfully seeds germinate.

Conclusion

Although cotton showed the fastest germination, the seedlings could not continue growing beyond the first two leaves due to the lack of nutrients. In contrast, seeds grown in soil showed steady and healthy growth into full plants, as the soil provided the necessary nutrients for development.Therefore, the experiment concludes that cotton is ideal for initial germination because it saves time and helps achieve faster sprouting. However, after the first stage, the seedlings should be transferred into soil for continued growth and healthy plant development. This combination — early germination in cotton followed by growth in soil — could help farmers and gardeners save time in the germination phase and improve cultivation efficiency.

Use to Society and Environment

This project helps people understand the best and most efficient way to start seeds for farming, gardening or planting drives. Faster, successful germination saves time, ensures more food production and increases greenery, which supports both society and the environment.

Extensions

- Compare results with different seed types (peas, lentils, wheat).
- Test the effect of light vs darkness on germination speed.
- Measure root length and shoot height after germination for deeper analysis.

Reference

- **https://www.vivatowels.com/en-us/cleaning-tips/everyday-cleaning/germinating-seeds-paper-towel#:~:text=Germinate%20seeds%20faster,new%20leaves%20in%20no%20time!**
- **https://www.sciencing.com/seeds-fastest-science-fair-project-6064794/**
- **https://www.sciencebuddies.org/science-fair-projects/project-ideas/PlantBio_p005/plant-biology/seed-size-planting-depth**
- **https://craftulate.com/fast-growing-seeds-kids/**