Effect of Varied Soil Textures on Germination and Growth Parameters of *Luffa acutangula* (L.) Roxb.

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Abstract

A study on the "Effect of varied soil textures on germination and growth parameters of (*Luffa acutangula*)" was conducted at QUSIT in Peshawar, Pakistan. uniformly six *L. acutangula* seeds were planted into four medium sized pots in four different types of soil texture i.e., loam, clay, silt, and sand. The germination rate, plant length, number of leaves, flower count, and leaf area and germination percentage of *L acutangula* seeds were tested on a weekly basis. The highest germination percentage of *L acutangula* seeds was recorded under loam soil (100%) followed by clay and silt is (70%) and sand is (50%). The maximum plant height was observed in loam is (20.5 cm). And the lowest plant height was recorded in sand is (16.3 cm). while the highest 1st ,2nd, 3rd and 4th and 5th and 6th and 7th leaf area were recorded in silt is (6. cm^2), (5.4 cm^2) and (2.4 cm^2) and (1.7 cm^2) and (1.6 cm) and (1.5 cm) and (1.3cm). And the lowest 1st ,2nd ,3rd and 4th 5th and 6th and 7th leaf area were recorded in sand is (5.6 cm), (4.8 cm), (03 cm) and (1.6 cm) and (1.4 cm). Moreover, the maximum number of flowers were recorded in plants grown in loam is 2 flowers and silt are 1 flower. The number of leaves per plant also showed an increase in plants grown under loam and clay as compared to other treatments. In comparison to clay, silt, and sand, the loam soil produced the best results for *L acutangula* plants in terms of germination, number of leaves, and leaf area.

Key words: Germination, Growth, Leaves area, Soil Texture.

1. Introduction

The condition and sustainability of the soil are directly tied to people, society, and the environment. (Zhou et al. 2020), soil is the most significant direct supply of nutrients and water for plant growth. Decaying soil structure limits soil aeration and water transport, which inhibits plant growth. Understanding how different types of vegetation affect soil characteristics and ecohydrological processes is therefore crucial, particularly in the ecologically hazardous semi-arid area of the Loess Plateau. Restoration of vegetation influences the characteristics of the soil and, consequently, hydrological processes (Liu et al. 2020 and Zhang et al. 2021). In order to improve soil conditions, organic matter content, soil aggregation, and water retention must all be increased. On the Loess Plateau of China, research has examined the impact of various vegetation types with varying restoration ages on soil physical properties (Yang et al. 2020; Gu et al. 2019). These studies found that vegetation restoration decreased bulk density and increased aggregate stability and saturated water conductivity (Wu et al. 2023).

Luffa acutangula, a member of the Cucurbitaceae family, is also known as ridge gourd and is a common vegetable in Asian nations. It goes by various slang names in various tongues, including English (Ridge gourd, Angled luffa, and Urdu) (Turai). (preetha et al. 2019). *Luffa acutangula*, also known as the ridge gourd or *Luffa acutangula,* is a vegetable crop that is cultivated in South Asia. In Indian rural areas, it is frequently referred to as "Turai." Due to their excellent nutritional content, unrepented Ridge gourd fruits with a soft, dark green colour are cooked and consumed. (Al-Snafi, 2019). The ripe fruits of the Ridge gourd are used for a variety of things, including cleaning mattresses and sponges. (Manikandaselvi et al. 2016). The major issue with growing Ridge gourds, which have multiple harvests, is the enormous amount of fertilizer that is needed, which reduces the crop's profitability for farmers. (Kumar et al. 2022). If the necessary number of fertilizers is not promptly and adequately supplied, the production and nutritional quality of Ridge gourd begin to decline (Ananda Murthy et al. 2020). Additionally, regular use of chemical fertilizers degrades soil quality and harms microbial ecosystems. SS use for Ridge gourd production could therefore be a possible method to reduce the input of chemical fertilizers and enhance soil health (Kumar et al. 2022). Uses for medicines According to ayurvedic literature, the fruits of *L. acutangula* are useful as diuretics and for splenic expansion in addition to being used to cure vata, kapha, anemia, leukoderma, and tumors. On *L. acutangula*, various biological activity has been reported. The fruit of L. *acutangula* is consumed as food in practically all of India in addition to its medicinal benefits. Ridge gourd has been associated with several health advantages in Ayurveda, and contemporary clinical research is also in favor of these claims. According to Ayurveda, ridge gourd boosts vata and kapha while calming and pacifying the pitta dosha in the body. Ridge gourds have a dull flavor; however, they have a lot of health advantages: (preetha et al. 2019). It has been established that a major factor affecting SOC dynamics is soil texture. According to reports, clayey soils have higher SOC stores than sandy soils because macroaggregates physically protect SOC to a greater extent. As a result, the clayey percentage is regarded as a valuable and extensively used indication of SOC storage capacity. However, compared to sandy soil supplemented with maize waste, a clayey soil exhibited increased CO2 emission. In comparison to sandy soils, clayey soils may have greater microbial biomass and greater metabolic capability because C and N are more readily available. Although only a small number of studies have shown residue C mineralization in soils with varying textures, this may be the primary cause of the stronger priming effect in clayey soils with higher C levels. It is also unclear how various agricultural residual components and soil texture interact. (Liu et al. 2022). Climate factors have complex effects on how soil texture affects crop productivity. In comparison to coarse-textured soils (such as sandy loam), fine-textured soils (such as silty loams) frequently have a higher capacity to hold water and more resistance (smaller saturated hydraulic conductivity) to plant water uptake in wet conditions (Lehmann, 2019). Insufficient drainage and waterlogging in fine-textured soils can result in denitrification and yield loss. Fine-textured soils have greater water retention (e.g., higher suction due to finer pore spaces) and greater unsaturated hydraulic conductivity than coarse-textured soils in unsaturated circumstances (water-limited environment). If the climate is same, crops cultivated on fine-textured soils may be less sensitive to drought than crops grown in coarse-textured soils (Huang et al. 2021). Crop yields respond differently to irrigation or groundwater supplies depending on the texture of the soil. In coarse-texture soils, regular irrigation is needed during the growth season because of the limited water holding capacity, especially when evapotranspiration is high (Huang, 2020). When there is a shallow groundwater table, soil texture affects crop output, and coarse-textured soils have a shallower optimal groundwater level than fine-textured soils (Zipper et al. 2015).

2. Materials and Methods

The experiment was performed at QUSIT Peshawar, Pakistan. Various soil textures the same institution supplied soil and *Luffa acutangula* seedlings in 2023. Sand, clay, silt, and loam made up the soil. Each treatment used four pots with an equal amount of soil in each pot. In order to prevent biotic stress, which can affect seed germination, uniformly six *Luffa acutangula* seeds per treatment were chosen and put in pots with six seeds per pot and an inch of depth. The pots were then covered with net fabric for the first several days. There were three versions of the experiment. A field's worth of pots were watered at once. To remove viruses, bacteria, weeds, and other contaminants such as contaminated plant remains, the soils were first sieved and sterilized. In a roomy area, pots were positioned. Data was gathered every week until the plant's closure.

2.1. Germination & Growth Attribute

The germination percentage of *Luffa acutangula* seeds was calculated by tallying the sprouted seeds each day until all of the seeds had popped. Plant length, flower and leaf count, and leaf area were tracked weekly until the sixth week. Then, means were calculated.

2.2. Collection of seed;

2.2.1. Loofah sponges being dried

Before using loofa gourds as sponges, they must be processed. They should be hung in the sun to dry once the skin has been peeled off and the fiber interiors have been cleaned.

2.2.2. The best way to prepare the seed of *luffa acutangula*

You must prepare the mature gourds before using your homemade loofah sponges. The washing and drying of the sponges can be done in four steps.

1) Remove the skin first. When gourds have browned and dried on the vine, their skin is rather simple to peel and crack off. If the fruits are ripe but still green, it might be simpler to let them dry out a little more before peeling them for a few days in a warm environment

2) Take the seeds out. The internal cavities of mature sponges contain seeds that are dark brown or black. Shake them out and save fully developed seeds for the following year's sowing. Spread the seeds out on a paper plate or towel to dry for a week if you want to save them. Put them in marked envelopes once they are completely dried.

3) Use a hose or powerful jet of water to rinse the sponge clean after it has been liberated from the outer peel and the seeds have been taken out. You can soak the sponges in a 10% bleach solution for 30 minutes if they are stained. When finished soaking, rinse with fresh water.

4) Clean loofah sponges should be hung in the sun to dry or placed somewhere warm and turned frequently to ensure speedy and even drying.

2.3. Sowing season

The luffa plant needs to be started in the spring, after the cool season has passed, around April. It is a warm-season plant.

2.4. Method of sowing

For improved germination and plant health, the seeds should be planted early in pots. Make sure, the soil temperature is warm and place them in pots 2 cm deep. The seedlings can be transplanted outdoors after a month, when they have their first leaves, after the plant has germination, which takes approximately a week. Since luffa plants are known to be vulnerable to transplant shock, they should be left outside in the pots for a few days to get the plants used to the outdoor climate. It takes 120–150 days for the plants to be entirely outside before they are ready to be picked.

2.5. How to grow loofah gourds from seed:

Plant seeds five to six weeks prior to transferring them outside. Avoid starting them too early since seedlings that are too mature won't transplant well.

1) Pre-seeding seed soaking should last for 24 hours. Start by using hot water. Before soaking, you can scarify the seeds by rubbing their sides against medium-grit sandpaper. This can speed up germination by thinning the seed coat. Just a few sandpaper strokes are required.

2) In four-inch pots filled with pre-wetted seed starting mix, plant the seeds. Place them a half-inch deep. In soil blocks, loofah seeds can also be grown.

3) To improve humidity, cover trays with plastic wrap or a seeding dome.

4) Using a heating mat will boost germination rates and hasten the sprouting process. A heating mat can be a game-changer when sprouting seeds because gourds are heat-loving plants. The ideal temperature for them to germinate is around 85 F. (30 C). With a heating pad, loofah gourd seeds have borne fruit in as short as five days and as long as three weeks. Germination typically takes 7 to 14 days.

5) Remove the plastic wrap or dome once the seeds have sprouted to provide proper airflow. Maintain an eye on the soil's moisture level and attempt to keep it just barely damp but not drenched.

6) When the seedlings have grown their first real set of leaves, start feeding them. I use an organic liquid fertilizer at half the suggested rate. Just before I transplant the seedlings, I fertilize as well.

2.6. Sunlight:

When indoors, requires filtered sunlight and a warm climate, and requires full sunlight for 6 to 8 hours every day.

2.7. Water:

Plants require routine watering. Always keep the soil wet.

2.8. Luffa seedlings

A vegetable with a long growing season, loofah takes months to produce its crop of fibrous sponges. The seeds should be sown inside, or you should buy seedlings from a nearby nursery, to give the plants a head start.

2.9. Containerized luffa plant growth

Loofah can be grown in a container, but make sure it is big enough to hold the root ball of this substantial plant. Choose a grow bag or pot that is 20 gallons or 18 to 24 inches wide. It should be half potting soil and half compost or old manure. Additionally, I would advise supplying the growing media with some slow-release organic fertilizers. When choosing where to place your container, keep in mind that a potted loofah plant grows very huge. However, you can let the vine trail over the sides of the pot. Ideally, it should be close to a trellis or fence. Just be aware that it can take over your deck or patio!

2.10. Plant measuring:

A quick and easy process exists for measuring plant growth. You can easily determine the growth rate of laboratories specimens or the rate at which your indoor plants are developing. To keep track of the plant's development rate, just a few basic supplies and sometime are required.

2.11. Set the ruler at the base of the plant

A ruler can be used to measure smaller plants, while a measuring tape, yardstick, or meter stick may be needed to measure larger plants. Make sure the bottom of the ruler is set to zero. The ruler's starting point should be level with the ground if you are measuring a plant in a pot.

2.12. Record the height of the plant

The plant should be measured from the lowest point to the highest point. With the date and the height noted, record this information on a chart. Every two to three days, repeat.

2.13. Calculate the average using the growth rate formula.

By dividing the size change by the length of time it has been growing, you can determine the average daily growth rate. The equation for the growth rate formula is display style frac (S2-S1) frac (S2-S1) T, where S1 is the first measurement, S2 is the second measurement, and T is the number of days between each. This figure is rather broad the rate of plant growth is highly variable and can significantly vary from day to day. Without the use of advanced laboratory apparatus, it is currently impossible to forecast the exact daily growth rate.

3. Results

3.1 First Week

Table 1 shows that the highest germination percentage of luffa acutangula seeds was recorded under loam soil (80%) followed by silt and is clay (30%) while sand is (50%), The highest plant height was recorded in plants grown in loam. (4.5cm). And the lowest plant height was recorded in sandy soil. (4 cm). while the first and 2nd leaf area parameters shows highest results in loam (2.8 cm^2 and 1.9 cm). While the lowest first and 2nd leaf area parameters shows the lowest result in sand (2.4 cm and 1.6 cm). The numbers of leaves per plant were similar with each other and had no effect due to soil texture during its first week.

Table 1. Effect of different soil textures on germination and growth of Luffa acutangula during the first week

Soil Texture	Total No. of Seeds	No. of Germinated Plants	% Germination	Plant Height	No. of Leaves	Leaf Area 1st Leaf	Leaf Area 2nd Leaf
LOAM	6	5	80%	4.5cm	3	2.8cm^2	1.9cm^2
CLAY	6	2	30%	4.2cm	3	2.7cm^2	1.9cm^2
SILT	6	2	30%	4.1 cm	3	2.7cm^2	1.8cm^2
SAND	6	3	50%	4 cm	3	2.4	1.6cm^2

The means of data are presented in the table.

Sandy soil **loamy soil** **silt soil** **clay soil**

Images of first 1st week of luffa acutangula seed growth

3.2. Second Week

Table 2 shows that the highest germination percentage of luffa acutangula seeds was recorded under loam soil (100%) followed by sand is (50%) while clay and silt is (70%), The maximum plant height was observed in loam is (9.4 cm). And the lowest plant height was recorded in silty soil is (8.5 cm). while the highest 1^{st} ,2^{nd} and 3^{rd} leaf area were recorded in loam is (5.4 cm, 4.8 cm and 2.3 cm). And the lowest 1^{st} ,2^{nd} and 3^{rd} leaf area were recorded in sand is (5.3 cm, 4.3 cm and 02 cm). The number of leaves per plant also showed an increase in plants grown under loam (6) and clay (5) as compared to other treatments.

Table 2. Effect of different soil textures on germination and growth of Luffa acutangula during the second week:

Soil Texture	Total No. of Seeds	No. of Germinated Plants	% Germination	Plant Height	No. of Leaves	Leaf Area 1^{st} Leaf	Leaf Area 2^{nd} Leaf	Leaf Area 3^{rd} Leaf
LOAM	6	6	100%	9.5cm	6	5.04 cm^2	4.8 cm^2	2.3 cm^2
CLAY	6	4	70%	9.4 cm	5	5.04 cm^2	4.6 cm^2	2.2 cm^2
SILT	6	4	70%	8.5 cm	3	5.04 cm^2	4.3 cm^2	2.2 cm^2
SAND	6	3	50%	9.4 cm	5	5.03 cm^2	4.3 cm^2	02 cm^2

The means of data are presented in the table.

Silt soil

loamy soil

sandy soil

clay soil

Images of second 2nd week of luffa acutangula seed growt

3.3. Third week

Table 3 shows that the highest germination percentage of *luffa acutangula* seeds was recorded under loam soil (100%) followed by clay and silt is (70%) and sand is (50%). The maximum plant height was observed in loam is (10.8 cm). And the lowest plant height was recorded in silt is (09 cm). while the highest 1st ,2nd, 3rd and 4th leaf area were recorded in clay is (6.1 cm^2), (5.3 cm^2) and (2.2 cm^2) and (1.6 cm^2).And the lowest 1st ,2nd ,3rd and 4th leaf area were recorded in sand is (5.5 cm),(4.7 cm),(02 cm) and (1.5 cm). The number of leaves per plant also showed an increase in plants grown under loam (9) and sand (6) as compared to other treatments.

Table 3. Effect of Different Soil Textures on Germination and Growth of Luffa acutangula During the Third Week

Soil Texture	Total No. of Seeds	No. of Germinated Plants	% Germination	Plant Height	No. of Leaves	Leaf Area 1st Leaf	Leaf Area 2nd Leaf	Leaf Area 3rd Leaf	Leaf Area 4th Leaf
LOAM	6	6	100%	10.8cm	9	5.8cm^2	4.8cm^2	2.3 cm^2	1.9 cm^2
CLAY	6	4	70%	10.5cm	5	6.1cm^2	5.3cm^2	2.2 cm^2	1.6 cm
SILT	6	4	70%	09 cm	5	5.6cm^2	5.1cm^2	2.2 cm^2	1.4 cm^2
SAND	6	3	50%	10.4 cm	6	5.5cm^2	4.7cm^2	2 cm^2	1.5 cm^2

The means of data are presented in the table.

Clay soil **loamy soil** **silt soil** **sandy soil**

Images of third 3rd week on luffa acutangula seed growth

3.4. Fourth week

Table 4 shows that the highest germination percentage of luffa acutangula seeds was recorded under loam soil (100%) followed by clay and slt is (70%) and sand is (50%). The maximum plant height was observed in loam is (13.8 cm). And the lowest plant height was recorded in silt is (12.1 cm). while the highest 1st ,2nd, 3rd and 4th and 5th leaf area were recorded in silt is (6.4 cm^2), (5.3 cm^2) and (2.3 cm^2) and (1.6 cm^2) and (1.5 cm). And the lowest 1st ,2nd ,3rd and 4th 5th leaf area were recorded in sand is (5.5 cm),(4.7 cm),(02 cm) and (1.5 cm) and (1.4 cm). The number of leaves per plant also showed an increase in plants grown under loam is (13) and silt is (7) as compared to other treatments.

Table 4. Effect of Different Soil Textures on Germination and Growth of Luffa acutangula during the Fourth Week

Soil Texture	Total No. of Seeds	No. of Germinated Plants	% Germination	Plant Height	No. of Leaves	Leaf Area 1st Leaf	Leaf Area 2nd Leaf	Leaf Area 3rd Leaf	Leaf Area 4th Leaf	Leaf Area 5th Leaf
LOAM	6	6	100%	13.8cm	13	5.8cm^2	4.8cm^2	2.3cm^2	1.9cm^2	1.3cm^2
CLAY	6	4	70%	12.4cm	6	6.2cm^2	5.1 cm	2.2cm^2	1.4cm^2	1.5cm^2
SILT	6	4	70%	12.1cm	7	6.4cm^2	5.3cm^2	2.3cm^2	1.6cm^2	1.5cm^2
SAND	6	3	50%	12.3cm	6	5.5 cm	4.7cm^2	02 cm^2	1.5 cm^2	1.4 cm^2

The means of data are presented in the table.

Loamy soil **clay soil** **silt clay** **sandy soi**

Images of fourth 4^{th} week of luffa acutangula seed growth

3.5. Fifth week

Table 5 shows that the highest germination percentage of luffa acutangula seeds was recorded under loam soil (100%) followed by clay and silt is (70%) and sand is (50%). The maximum plant height was observed in loam is (17.5 cm). And the lowest plant height was recorded in sand is (12.6 cm). while the highest 1^{st} ,2^{nd}, 3^{rd} and 4^{th} and 5^{th} and 6^{th} leaf area were recorded in silt is (6.4 cm^2), (5.3 cm^2) and (2.3 cm^2) and (1.6 cm^2) and (1.5 cm) and (1.4 cm). And the lowest 1^{st} ,2^{nd} ,3^{rd} and 4^{th} 5^{th} and 6^{th} leaf area were recorded in sand is (5.5 cm), (4.7 cm), (02 cm) and (1.5 cm) and (1.4 cm) and (nil). Moreover, the maximum number of flowers were recorded in plants grown in loam is (2) and silt is (1) . The number of leaves per plant also showed an increase in plants grown under loam and clay as compared to other treatments.

Table 5. Effect of Different Soil Textures on Germination and Growth of Luffa acutangula During the Fifth Week

Soil Texture	Total No. of Seeds	No. of Germinated Plants	% Germination	Plant Height	No. of Leaves	Leaf Area 1^{st} Leaf	Leaf Area 2^{nd} Leaf	Leaf Area 3^{rd} Leaf	Leaf Area 4^{th} Leaf	Leaf Area 5^{th} Leaf	Leaf Area 6^{th} Leaf	No. of Flowers
LOAM	6	6	100%	17.5cm	16	5.8cm	4.8cm	2.3cm^2	1.9 cm^2	1.3 cm^2	1.1cm^2	2
CLAY	6	4	70%	14.4cm	11	6.2cm	5.1cm	2.2cm^2	1.4cm^2	1.5cm^2	1.4cm^2	0
SILT	6	4	70%	14.8cm	10	6.4cm	5.3cm	2.3cm^2	1.6cm^2	1.5cm^2	1.4cm^2	1
SAND	6	3	50%	12.6cm	8	5.5cm	4.7cm	02cm^2	1.5cm^2	1.4cm^2	Nil	0

The means of data are presented in the table.

Clay soil **sandy soil** **silt soil** **loamy soil**

Images of fifth 5th week of luffa acutangula seed growth

3.6. Sixth week

Table 6 shows that the highest germination percentage of luffa acutangula seeds was recorded under loam soil (100%) followed by clay and silt is (70%) and sand is (50%). The maximum plant height was observed in loam is (20.5 cm). And the lowest plant height was recorded in sand is (16.3 cm). while the highest 1st ,2nd, 3rd and 4th and 5th and 6th and 7th leaf area were recorded in silt is (6. cm^2), (5.4 cm^2) and (2.4 cm^2) and (1.7 cm^2) and (1.6 cm) and (1.5 cm) and (1.3cm). And the lowest 1st ,2nd ,3rd and 4th 5th and 6th and 7th leaf area were recorded in sand is (5.6 cm), (4.8 cm), (03 cm) and (1.6 cm) and (1.4 cm) and (nil). Moreover, the maximum number of flowers were recorded in plants grown in loam is (2) and silt is (1). The number of leaves per plant also showed an increase in plants grown under loam and clay as compared to other treatments.

TABLE 6. Effect of Different Soil Textures on Germination and Growth of Luffa acutangula During the sixth Week.

Soil Texture	Total No. of Seeds	No. of Germinated Plants	% Germination	Plant Height	No. of Leaves	Leaf Area 1st Leaf	Leaf Area 2nd Leaf	Leaf Area 3rd Leaf	Leaf Area 4th Leaf	Leaf Area 5th Leaf	Leaf Area 6th Leaf	Leaf Area 7th Leaf	No Of F		No. of Fruits
LOAM	6	6	100%	20.5cm	17	5.9cm	4.9cm	2.3cm	$2cm^2$	$1.4cm^2$	$1.1cm^2$	$1cm^2$	2	8	1
CLAY	6	4	70%	18.2cm	11	6.3cm	5.2cm	2.3cm	1.5cm	$1.5cm^2$	$1.4cm^2$	$1.2cm^2$	0	10	3
SILT	6	3	70%	18.5cm	10	6.5cm	5.4cm	2.4cm	1.7cm	$1.6cm^2$	$1.4cm^2$	$1.3cm^2$	1	3	1
SAND	6	4	50%	16.3cm	9	5.6cm	4.8cm	03cm	1.6cm	$1.4cm^2$	Nil	Nil	0	1	1

Loamy soil **silt soil** **sandy soil** **clay soil**

Images of sixth 6th week of luffa acutangula seed growth

4. Discussion

Loam particles range in size from sand (2.0–1.0 mm) to silt (0.05–0.002 mm), whereas clay is less than 0.002 mm, according to the USDA. *Triticum aestivum* grows at a different pace in each soil sample, according to analysis. Seven plants grew to a length of 47 cm in loamy soil; however, they were only 25 cm long in sandy soil. In clay soil, seven plants with 28 cm lengths were established. Five plants totaled 38 cm in height after being grown on silt soil (Hakimzadeh Ardakani et al. 2023). After feeding each plant in each soil in an equal amount, it was found that the productivity of plants in loamy soil was higher than that of plants in the other soil samples (Plants grown on clay soil improved over those grown on sand and silt soil, but not as much as those grown on loam. In sandy soil, the plants grew the least well. This demonstrates that loamy soil is best for Triticum aestivum plant growth and that loamy soil increases wheat crop productivity the highest (Rashid et al. 2021). As 10 seeds were sown in varied textures of soil i.e., loam, clay, silt and sand. In contrast to other soil types, loam soil allowed all okra seeds to germinate. This demonstrates that loam soil was suitable for okra germination. While silt and sand were not very conducive to okra germination, clay soil followed in terms of germination percentage. This may have happened because the earth was soft and the seeds produced roots that were easily able to penetrate the soil (Sharma et al. 2018). The yield of rice grains was considerably impacted by the roughness of the soil. In comparison to sandy soil, clay soil produced 46% more rice grains per acre. Clay soil has more fine particles than sandy soil, which may hold water and nutrients better. As a result, it can keep more of the water and nutrients that the rice plant needs to survive. In contrast, sands allow for simpler passage through their aggregation but retain fewer water and nutrients, which may not be enough to meet the needs of the plants, especially during the growth of grains. When variants were assessed on sandy and clay soil in China, the similar finding was made. Yet, at different nitrogen levels, clay showed a lower yield increase than sandy soil. The similar result was observed in a rainfed lowland in Thailand (Mihretie et al. 2022). Rice planted in soils with higher clay contents produced more grain and accumulated more biomass than rice cultivated in soils with lower clay contents (Dou et al. 2016).

5. Conclusion

Luffa acutangula seeds can be grown well on loam soil, producing plants with favorable overall production and growth characteristics. Plants planted on loam soil produced the best results, followed closely by clay, sand, and silt. Compared to clay, loam soil has a much finer texture that makes it easier for plant roots to pierce without encountering any resistance. In loam and clay soil, the amount of nutrients available has a significant impact on plant development, flower production, and overall plant length. As can be observed, loam soil has better general growth characteristics and a higher germination rate than other types of soil.

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