



“A STUDY ON THE EFFICIENCY OF MORINGA OLEIFERA PLANT EXTRACT ON GROWTH AND DEVELOPMENT OF OKRA AND GREEN GRAM PLANTS”

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Abstract: In agricultural settings, Moringa oleifera emerges as a sustainable solution, offering biopesticide properties for the protection of plant and to increase its growth. During the present study, the preparation of extracts from various parts of moringa oleifera such as, leaves, flowers and drumstick was done. The soil samples were collected from nearby garden and processed for the further experimental analysis. The polyethene pots of 1 kg capacity was used and filled with processed soil samples. For the experiments, okra and green gram seeds were added to the pots. To this, the moringa extracts was added at different concentrations. Like 25ml, 50ml, 75ml and 100ml. For each concentration two trials were maintained with one control to observe the differences in the growth parameters. From the experimental results, the 100ml moringa oleifera extract was found effective in the overall growth and development of Okra and Green gram plant without the influence of synthetic fertilizers.

Index Terms - *Moringa Oleifera, Moringa extract, Green gram plant, Okra plant.*

I. INTRODUCTION

As a member of the Moringaceae family, the Moringa oleifera stands out with its singular genus comprising 13 species. This versatile tree thrives in tropical and subtropical regions, exhibiting remarkable adaptability to varying water availability and soil conditions, making it a resilient option for cultivation (1). Renowned for its exceptional nutritional content, Moringa oleifera contains a wealth of macro and micronutrients, including Potassium, Calcium, Magnesium, Iron, and Copper (2). Its multipurpose nature extends to the realm of health, with its diverse array of nutrients and health benefits offering significant potential in combating malnutrition and addressing dietary deficiencies, particularly in tropical regions (6). Moringa is a plant of significant economic importance, found both in the wild and under cultivation across many regions globally. In our country, it is commonly grown as a versatile tree in homesteads and along roadsides, particularly in the north western area, and well-known for its use as a vegetable. Numerous studies have highlighted the substantial value of moringa, emphasizing its diverse and beneficial use (7). Moringa oleifera exhibits potent anti-tumor properties, attributed to compounds like benzyl carbamate, beta-sitosterol, isothiocyanates, and niazimicin were found abundantly in its leaves and seeds (8). Traditional medicinal applications of Moringa encompass a wide range of ailments, including back pain, lumbago, sore throats, and hypertension, underscoring its value as a natural antibiotic and therapeutic agent (9).

In agricultural settings, Moringa oleifera emerges as a sustainable solution, offering biopesticide properties for plant protection and biofertilizer capabilities to enhance plant growth and drought resistance (10). Its efficacy as a biopesticide against various pests and diseases has been demonstrated, highlighting its potential in integrated pest management strategies (11). Moreover, Moringa leaf extracts serve as effective biofertilizers, enriching the biochemical content of plants and their resilience to drought conditions (12). In the cultivation of crops like Abelmoschus esculentus (okra) and Vigna radiata L. (green gram), Moringa extracts play crucial roles in promoting growth and combating pests and diseases (13). As an organic fertilizer and growth regulator, Moringa extract aids in optimizing plant health and productivity, ensuring sustainable agricultural practices (14).

Traditional medicine uses the flowers, leaves and roots of moringa oleifera to cure rheumatism, ascites, and poisonous bites. They also serve as a stimulant for the heart and circulatory system. The root bark and roots from the young trees are known to cause skin irritation and blisters (16). Moringa oleifera is claimed to have the potential to manage or cure over 300 diseases, like cancer, diabetics and hypertension. Additionally in certain African nations, the seeds of moringa oleifera are employed to purify water. Overall, the multifaceted benefits of Moringa oleifera underscore its significance as a valuable resource in agriculture, healthcare, and environmental sustainability, offering diverse solutions to global challenges. Based on the above concept, in the present study, an attempt has been made to use the extracts from various parts of moringa to evaluate the effect on Okra and Green gram plant.

II. MATERIALS AND METHODS

Table1: Preparation of Moringa Plant Parts Extract

Sl.no	Extract type	Material used	Preparation
1	Moringa leaves extract	200 gm of moringa leaves, and blender, water, white cloth.	Collect the moringa leaves and wash with distilled water. The collected moringa leaves are stored overnight at freezing temperatures, After, 24 hours take moringa leaves and remove the moisture from the leaves. Crush the preserved leaves with blender and by using water then drain through the white cloth
2	Moringa flowers extract	50 gm of moringa flower, blender, water, white cloth.	Collect the moringa flower and wash with the distilled water and remove the moisture from the flower. Crush the flower with blender using water and then drain through the white cloth.
3	Drumstick extract	50 gm of drumstick, cutter, blender, white cloth.	Collect the drumstick and wash with the distilled water and remove the moisture from the drumstick. Chop the drumstick into small pieces and crush the drumstick pieces with blender and drain through the white cloth.
All the above extractions were mixed in the ratio of 1:1 and diluted to 500ml normal water and used for preparation of various concentrations that are presented as fallows.			

2.1 Preparation of various concentration of Moringa Oleifera extract.

- Control (no moringa extract).
- 25 ml moringa extract is diluted with 500 ml of water.
- 50 ml moringa extract is diluted with 500 ml of water.
- 75 ml moringa extract is diluted with 500ml of water.
- 100 ml moringa extract is diluted with 500 ml of water.

2.2 EXPERIMENTAL SECTION

Collection of Soil Sample: A composite soil sample was collected from the nearby garden. The soil sample collected was air dried, grinded and sieved to get uniform size and unwanted materials were removed from the soil. The processed soil sample was stored until further analysis was done.

Experimental Set-Up: 18 clean polyethene pots were purchased, thoroughly washed & dried. The polythene pots used was 1kg capacity. To each pot the processed soil samples were added and Okra and Green gram seeds were added. After the addition of seeds, the prepared moringa extract was added at different concentrations, like 25ml, 50ml, 75ml and 100ml and one control was maintained separately. For all the concentrations, two trials were maintained in order to get the accurate results. Weekly 2 days, the moringa extract spraying was done. All the treatments were kept for observation for germination of Okra and Green gram seeds. The germination and overall growth and development of okra and green gram plant was evaluated in terms of various growth parameters.

Calculation of Germination Index: After 4 days, both okra and green gram seeds began to germinate. The number of seeds that were germinated was counted on the 10th day. Based on the number of seeds germinated, the percentage of germination index was calculated by using following equation.

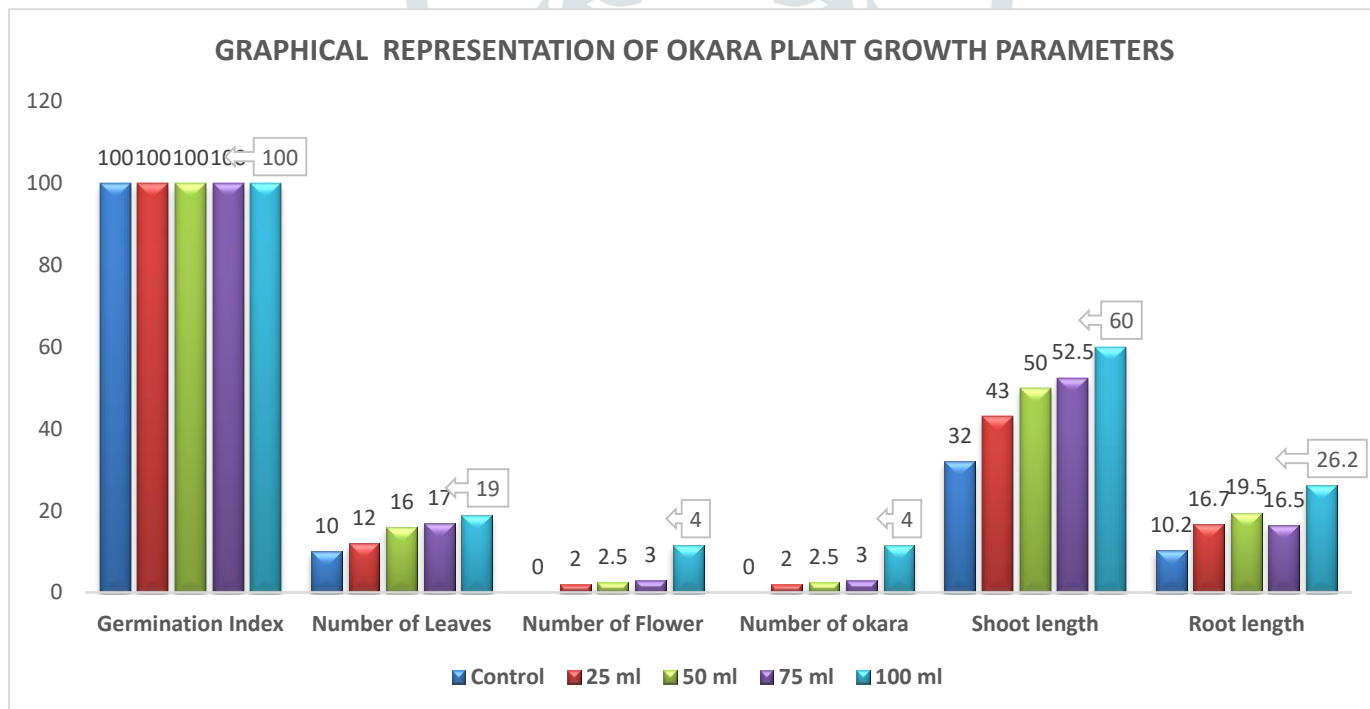
Germination Index (GI) % = Number of Seeds Germinated / Total No. of Seeds Sowed X 100.

- **Measurement of shoot length:** Using a centimetre scale, the shoot's length was measured from base to the tip. By calculating the shoot length of each plant in all the treatments, the average shoot length was determined.
- **Measurement of root length:** A centimetre scale was used to measure the root length from the tip to the root collar region. By calculating the root length of each plant in all the treatments, the average root length was recorded.
- **Measurement of number of leaves:** The total number of leaves produced in each plant was counted and the average value of the leaves produced was noted.
- **Measurement of number of flowers:** The number of flowers produced on each plant was counted and the average value was noted.
- **Measurement of number of pods:** The total number of pods in each plant was counted in all the treatments, and the average value was calculated.

III. RESULTS AND DISSCUSION

Table 3.1: Growth Parameter of Okara Plant

Treatments		Germination Index (%)	No. of leaves	No. of flower	No of okara	Shoot length	Root length
	Control	2	10	0	0	32	10.2
25ml	T1	2	10	2	2	40	11.9
	T2	2	14	2	2	46	21.5
	Mean	100	12	2	2	43	16.7
50ml	T1	2	15	3	3	52	17.5
	T2	2	17	2	2	48	21.5
	Mean	100	16	2.5	2.5	50	19.5
75ml	T1	2	16	4	4	49	16
	T2	2	18	2	2	56	17
	Mean	100	17	3	3	52.5	16.5
100ml	T1	2	20	5	5	59	31
	T2	2	18	3	3	61	21.5
	Mean	100	19	4	4	60	26.2



3.2 Growth Parameters of Okra Plant

Variation of Germination Index (GI): For the experimental study, the total number of okra seeds added to grow pots are 2. After the addition of moringa extract, all the seeds were germinated. Including control, In all the treatments, the germination index was found to be 100%. From the results, it shows that, irrespective of variations in the concentrations, the moringa extract was found to be effective in promoting good germination in okra seeds.

Variation in Number of Leaves: The number of leaves counted manually. The total number of leaves produced in each plant was counted, the average values was recorded. It was observed that, a variation in the number of leaves was observed in all the treatments. The average number of leaves produced in control was 10. The average number of leaves in 25 ml treatment is 12. The average number leaves produced in 50 ml treatment is 16. The average number of leaves produced in 75 ml treatment is 17. The average number of leaves produced in 100 ml treatment is 19. In comparison with the control, the higher number of leaf formation was observed in 100 ml moringa extract treatments.

Variation in Shoot Length: The length of shoot was measured from the base to the tip of the shoot using centimeter scale. The average value was considered based on the two trials. The average value of shoot length in control was 32 cm, in 25 ml treatment, the observed average value was 43cm, in 50ml treatment, the average value was 50cm, in 75ml treatments, the average shoot length was 52.2cm and in 100ml treatment, the average value recorded was 60cm. Based on the experimental study, it was found that, in comparison with the control, the effective shoot length was found to be higher in 100 ml treatment.

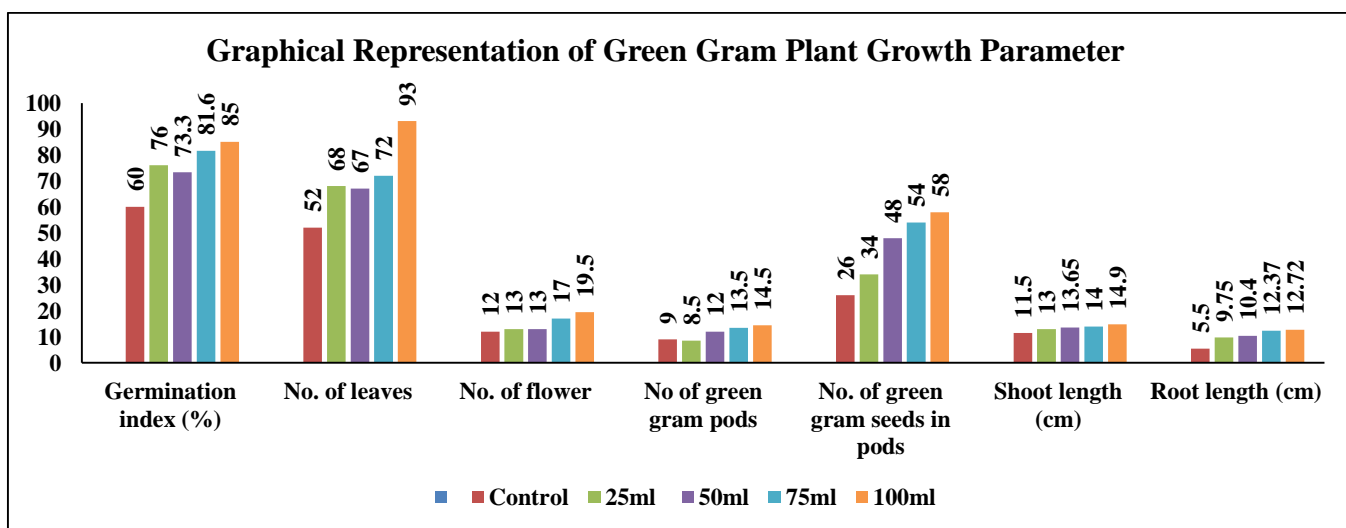
Variation in Root Length: The length of root was measured from tip to the root collar. The length of root in the control was found to be 10.2cm. In 25 ml treatment, the average root length was found to be 16.7 cm and in 50 ml treatment, the root length was found to be 19.5 cm, in 75ml treatment, the root length was found to be 16.5cm and in 100ml treatment, the recorded value was found to be 26.2 cm. In comparison with the control, the effective root length was observed in 100 ml treatment.

Variation in Number of Flowers: During the experimental study, a variation in the flower formation was observed. In control, there is no formation of flowers. The average number of flowers found in all the treatments ranges from 2 to 4. In comparison with the control, the higher value of flowers was observed in 100 ml treatment with an average value of 4.

Variation in Number of Okra: During the present investigation, a variation in the formation of okra was observed in all the treatments. From the experimental results, it was found that, in control, there is no formation of okra. The average number okra found in all the treatments ranges between 2 to 4. In comparison with the control, the higher number of okras was observed in 100 ml treatment with an average value of 4.

Table 3.3: Growth Parameter of Green Gram Plant

Treatments		Germination index (%)	No. of leaves	No. of flower	No of green gram pods	No. of green gram seeds in pods	Shoot length (cm)	Root length (cm)
	Control	60	52	12	9	26	11.5	5.5
25ml	T1	22	64	14	10	40	12.6	9.8
	T2	24	72	12	7	28	13.4	9.7
	Mean	76	68	13	8.5	34	13	9.75
50ml	T1	20	62	16	11	44	13.9	10.6
	T2	24	52	14	13	52	13.4	10.2
	Mean	73.3	67	13	12	48	13.65	10.4
75ml	T1	25	70	18	14	56	14.6	13
	T2	24	74	16	13	52	13.4	11.75
	Mean	81.6	72	17	13.5	54	14	12.37
100ml	T1	25	98	18	15	60	13.4	12.25
	T2	26	88	21	14	56	16.4	13.2
	Mean	85	93	19.5	14.5	58	14.9	12.72



3.4 Growth Parameters of Green gram plant

Variation of Germination Index (GI): For the experimental study, the total number of green gram seeds added to the pots are 30. After the addition of moringa extract, a variation in seed germination was observed in all treatments. In control, the germination index was found to be 60% and in 25ml treatment, the average germination index was found to be 76.6%. In 50ml treatment, the average germination index was found to be 73.3%. In 75 ml treatment, the average germination index found was 81.6%. In 100 ml treatment, the average germination index was found to be 85%. From the results, it shows that, the 100ml moringa extract treatments was found to be effective in promoting good germination in green gram.

Variation in Number of Leaves: The number of leaves was counted manually for each plant in all the treatments. by taking the average, the values were recorded for each treatment. It was observed that, a variation in the number of leaves were observed for each plant. The average number of leaves produced in control was 52. The average number leaves produced in 25 ml treatment was 68. The average number of leaves produced in 50ml treatment was 67. The average number of leaves produced in 75 ml treatment was 72. The average number of leaves produced in 100ml treatment was 93. During the present study, in comparison with the control, the higher number of leaf formation was observed in 100ml moringa extract treatments.

Variation in Root Length: The length of root was measured from the tip to the root collar. The length of root in the control was found to be 11.9cm. In 50 ml treatment, the average root length was found to be 10.4cm. In 25 ml treatment, the average root length was found to be 9.7cm. In comparison with the control, the higher value for root length was observed in 100ml treatment with an average value of 12.72cm.

Variation in Shoot Length: The length of shoot was measured from the base to the tip of the shoot using centimeter scale. The average value was considered based on the two trials. The average shoot length in control was 11.5 cm and in 25 ml treatment, the observed value was 13cm. Based on the experimental study, it was found that, in comparison with the control, the effective shoot length was found to be in 100ml treatment with an average value of 14.9 cm.

Variation in Number of Fowers: During the experimental study, a variation in the flower formation was observed. In comparison with the control, the average value of number of flowers formed were found to be higher in 75ml and 100ml treatments. In control, the average number flower was observed is 12 and in 100 ml, the average value for flower formation was found to be 28.5.

Variation in Number of Legumes: During the present investigation, a variation in the number of legumes formation was observed in all the treatments. The average value in control was 9 and the average values for 25 ml treatment was found to be 8.5. The average values for 50 ml treatment were found to be 12. The average number of legumes in 75 ml treatment was found to be 13.5 and the number of legumes in 100ml treatment was 14.5. In comparison with the control, the higher average value for legumes was observed in 100ml treatment followed by 75ml moringa extract treatment.

Variation in Green Gram Seeds: From the results, it was observed that, the number of green gram seeds in control was 26. The average value for 25ml treatment was 34. The average value for 50 ml treatment was 48. The average value of green gram seeds for 75 ml treatment is 54. In comparison with the control, the higher value for green gram seeds was observed in 100 ml treatment with an average value of 58.

IV. SUMMARY AND CONCLUSION

From the result obtained, the present study is summarized as follows. For the experiment 2 okara and 30 green gram seeds were used, in all the moringa extract treatments of Okra and Green gram plants the seed germination achieved was 100%. In both the plants, a variation in the growth parameters like seeds germination, root length, shoot length, number leaves, flower and pods and legume formations were observed. In comparison with the control, with all the treatments like 25ml, 50ml, 75ml and 100ml, effective growth of plants was observed in 100ml moringa extract treatments. The present study, clearly implies that, the Moringa oleifera extract influence on the better growth and development of Okra and Green Gram plant for better yield with out the application of chemical fertilizers.

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