IRJMETS

e-ISSN: 2582-5208

International Research Journal of Modernization in Engineering Technology and Science

(Peer-Reviewed, Open Access, Fully Refereed International Journal)

Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

EFFECTS OF COW DUNG AND UREA ON THE GERMINATION AND GROWTH OF OKRA (*ABELMOSCHUS ESCULENTUS* (L.) MOENCH

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ABSTRACT

This research was carried out at the Green House, Center for Ecological Studies, University of Port Harcourt, Abuja Campus to investigate the distinct effects of cow dung and urea on the germination and growth of *Abelmoschus esculentus* (Okra). The experiment was laid out on a Completely Randomized Design (CRD) using 3 treatments (Cow dung, Urea and Control) with four replications. The growth parameters analyzed were on plant height, number of leaves, leaf width and leaf length and the results obtained revealed that cow dung had more effect in all the parameters studied in comparison to the control, where a steady increase in plant height is observed over the weeks, reaching a mean value of 8.4 in week 5, the application of urea led to a significant setback, with a substantial decrease in mean height recorded in week 3 (0.8). Conversely, cow dung consistently demonstrated a positive influence on okra growth, consistently surpassing the control mean heights and peaking at 9.8 in week 5. Similar trends were observed in leaf length and width, where urea negatively hinders elongation and expansion, while cow dung promotes longer and broader leaves. The number of leaves is adversely affected by urea but significantly increased with cow dung application, indicating contrasting impacts on leaf abundance. These findings underline the differential effects of urea and cow dung on various growth parameters, emphasizing the potential of cow dung to foster enhanced germination and sustained growth in okra plants.

I. INTRODUCTION

Vegetables are one of the most significant food crops for humans worldwide. Okra is a popular vegetable produced mainly for its tender young fruits, or pods. A sticky, viscous component found in the pods is used to thicken soups and stews.[1] When fresh okra fruits are hard to come by during the dry season, the fruit can also be chopped, dried, or powdered, and then preserved for use in soups.[1] *Abelmoschus esculentus* immature fruits and leaves are employed as a thickening agent in soups due to its high vitamin and mineral content, according to Ufere *et al.* [2]

Okra has been called "a perfect villager's vegetable" because of its robust nature, dietary fiber, and distinct seed protein balance of both lysine and tryptophan amino acids (unlike the proteins of cereals and pulses)[3,4].Okra seed is rich in protein and unsaturated fatty acids such as linoleic acid.[5] Okra is filled with dietary fiber, that is required for colon health and digestive health. The fiber Okra offers helps to cleanse the intestinal system, letting the colon to operate at higher amounts of effectiveness. In addition, the vitamin A plays a role in wholesome mucous membranes, assisting the digestive system to function adequately[6].

Okra cultivation performance is dependent on a number of variables, including the fertility of the soil, the availability of water, and the application of suitable agricultural techniques. Growing interest in sustainable agriculture in recent years has centred on encouraging eco-friendly methods and minimizing reliance on artificial chemicals. Using organic manure is one such technique that has various advantages for plant growth and soil health.

Organic fertilizers play a pivotal role in enhancing the growth of *Abelmoschus esculentus,* commonly known as okra. One of the primary advantage of organic fertilizers lies in their ability to enrich soil structure and fertility. Compost and manure, are key components of organic fertilizers, they improve soil aeration and water retention, creating an optimal environment for okra roots to grow and access nutrients.[7]

In addition to nutrient availability, organic fertilizers support a diverse and beneficial microbial community in the soil. These microorganisms participate in nutrient cycling processes, fix atmospheric nitrogen, and suppress harmful pathogens. Consequently, okra plants grown in organically fertilized soil benefit from the synergistic relationship between plant roots and these microorganisms, leading to improved growth and overall plant health.[7]

Moreover, the use of organic fertilizers contributes to environmental sustainability. Unlike chemical fertilizers, organic alternatives do not introduce harmful chemicals into the soil and surrounding ecosystems. This reduction in chemical contamination promotes biodiversity and ecological balance. Okra plants cultivated in such environments are not only healthier but also contribute to the overall health of the ecosystem, aligning with the principles of sustainable agriculture.[8]

II. METHODOLOGY

2.1 Source of Materials

The mature *Abelmoschus esculentus* seeds used in this study, the fertilizers (urea and cowdung) and the soil were sourced from the Faculty of Agricultural Science demonstration farm, University of Port Harcourt, Rivers State.

2.2 Study Area and Experimental Design

The Ecological Centre, Plant Science and Biotechnology Department, Faculty of Science, University of Port Harcourt, Rivers State was the research location.

The therapy consisted of using cowdung as an organic fertilizer and urea as inorganic fertilizer. There were three different treatments: control, urea (3.44g) and cowdung (100g) Each bucket in the experiment weighed 7 kg, and there were 3 treatments and 4 replicates for the organic fertilizer and inorganic, making a total of 16 buckets that were used.

2.3 Methods

2.3.1 Viability Test

The germination method were used to conduct the viability test. 10 *Abelmoschus esculentus* seeds were deposited in a clear plastic container with a moist serviette inside, and they germinated after five days at room temperature.

2.3.2 Measurement of soil

A weighing balance were used to measure 7 kg of soil into each of the 16 perforated bags.

2.3.3 Measurement of Urea and Cowdung

six seeds were sown in each bucket for each replication of the organic and inorganic fertilizer treatments (control, urea and cowdung), which were all carefully mixed with the 7kg soil using a sensitive weighing scale.

2.4 Measurement of Growth Parameters

The growth parameters measured weekly were plant height (cm), leaf length (cm), leaf width (cm), and the number of leaves per plant.

2.4.1 Plant Height

A long ruler was used to measure this from the soil's surface to the plant's terminal bud. Every week, the measurement were taken and it is expressed in centimetres.

2.4.2 Number of leaves

This was discovered by counting the quantity of leaves on every *Abelmoschus esculentus* plant. Every week, the number of leaves were recorded.

2.4.3 Measurement of leaf width

It was measured with a ruler. By measuring the distance between the sides of the plants at the selected reference point.

2.4.4 Measurement of leaf length

It was measured with a ruler. To measure the length of the leaf, the ruler was positioned from the base to the apex of the leaf margin. It was measured in centimetres.

2.5 Statistical Analysis

To ascertain whether the results were significant or not, statistical analysis were performed on the values obtained from measuring the growth parameters.

III. RESULTS AND DISCUSSION

3.1 GERMINATION

Plate 3.1: After viability test

6 out of 10 seeds sprouted.

$$\text{Viability (\%)} = \frac{\text{Number of viable seeds}}{\text{Total number of seeds}} \times 100$$

$$\text{Viability (\%)} = \frac{6}{10} \times 100 = 60\%$$

The 60% acquired viability result indicated that 60% of the tested okra seeds are viable, or capable of germination, under the specified circumstances. The portion of seeds that should develop into robust, strong plants is indicated by the percentage here. The majority of the seeds seem to be viable for planting and have the potential to grow and successfully germinate, with a viability percentage of 60%.

After planting, it was noted that the *Abelmoschus esculentus* seeds began to germinate after two weeks. Data collection began two weeks following planting and continued every week for five weeks.

3.2 Effect of different treatments of organic and inorganic fertilizer on the plant height of *Abelmoschus esculentus*

The data suggested that both urea and cow dung have distinct effects on the germination and growth of okra plants compared to the control. In the control, there were a steady increase in plant height over the weeks, reaching a mean value of 8.4 in week 5. However, the application of urea appears to have a negative impact on okra growth, with a substantial decrease in mean height observed in week 3 (0.8), indicating a temporary setback. Cow dung, on the other hand, demonstrated a positive influence on okra growth, consistently surpassing the control mean heights in all weeks and reaching the highest mean value of 9.8 in week 5. These results suggested that while urea may initially impede growth, cow dung fosters favorable conditions for enhanced germination and sustained growth of okra plants.

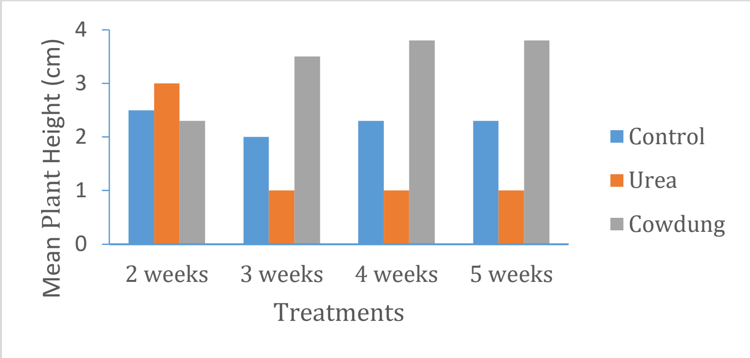

Fig 3.1: Effect of different treatments of organic and inorganic fertilizer on the plant height of *Abelmoschus esculentus*

3.3: Effect of different treatments of organic and inorganic fertilizer on the leaf length of *Abelmoschus esculentus*

The data indicated notable variations in the effects of urea and cow dung on the leaf length of okra plants compared to the control. In the control, the leaf length showed a gradual increase, reaching a mean value of 2.2 in week 5. Urea treatment, however, resulted in a significant deviation from the control trend, with a considerable decrease in mean leaf length as observed in weeks 3, 4, and 5. This suggested that urea negatively hinders the elongation of okra leaves. Conversely, the application of cow dung appears to have a positive influence on leaf length, consistently exceeding the control mean lengths in all weeks and reaching the highest mean value of 2.7 in week 5. These findings imply that while urea hinders leaf development, cow dung contributed to the promotion of longer leaves in okra plants.

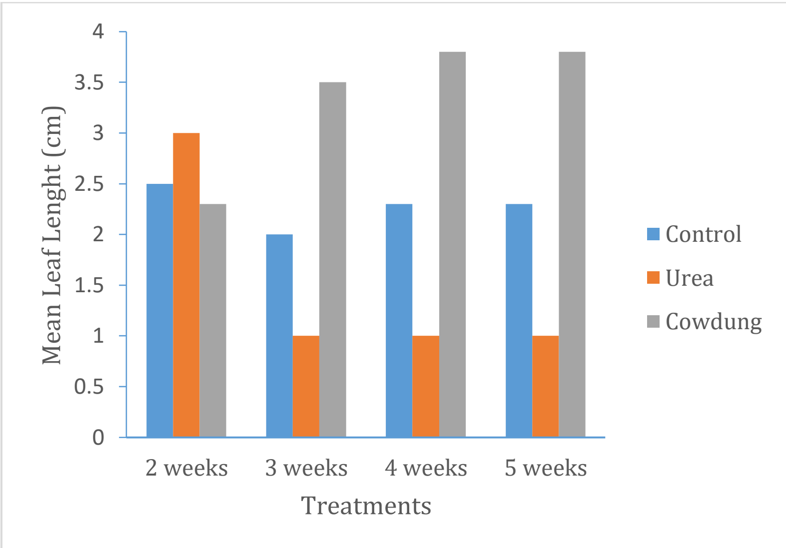

Fig 3.2: Effect of different treatments of organic and inorganic fertilizer on the leaf length of *Abelmoschus esculentus*

3.4: Effect of different treatments of organic and inorganic fertilizer on the leaf width of *Abelmoschus esculentus*

The data illustrated distinct effects of urea and cow dung on the leaf width of okra plants compared to the control group. In the control group, leaf width gradually increases over the weeks, reaching a mean value of 2.3 in week 5. Urea treatment, however, resulted in a deviation from this trend, with a consistent decrease in mean leaf width observed in weeks 3, 4, and 5. This suggested that urea negatively influences the expansion of okra leaves. Conversely, the application of cow dung appears to have a positive impact on leaf width, consistently surpassing the control group mean widths in all weeks and reaching the highest mean value of 2.7 in week 5. These findings implied that while urea hinders leaf width, cow dung contributed to the promotion of broader leaves in okra plants, reflecting the differential effects of these fertilizers on leaf morphology.

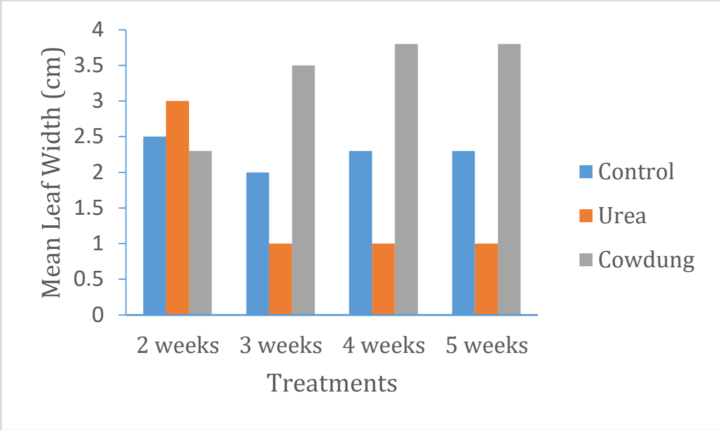

Fig 3.3: Effect of different treatments of organic and inorganic fertilizer on the leaf width of *Abelmoschus esculentus*

3.5: Effect of different treatments of organic and inorganic fertilizer on the number of leaves of *Abelmoschus esculentus*

The data suggested discernible effects of urea and cow dung on the number of leaves in okra plants compared to the control. In the control, the number of leaves remains relatively stable over the weeks, with a mean value of 2.3 in both weeks 4 and 5. Urea treatment results in a notable increase in the number of leaves in week 2 but is followed by a sharp decline in subsequent weeks, with a consistent mean value of 1.0 observed from weeks 3 to 5. This indicated that urea application adversely affects the leaf production in okra plants. Conversely, cow dung treatment leads to an increase in the number of leaves, surpassing the control group mean values in all weeks and reaching a peak mean value of 3.8 in weeks 4 and 5. These findings suggested that while urea hampers leaf development, cow dung promotes an increase in the number of leaves in okra plants, highlighting the contrasting impacts of these fertilizers on leaf abundance.

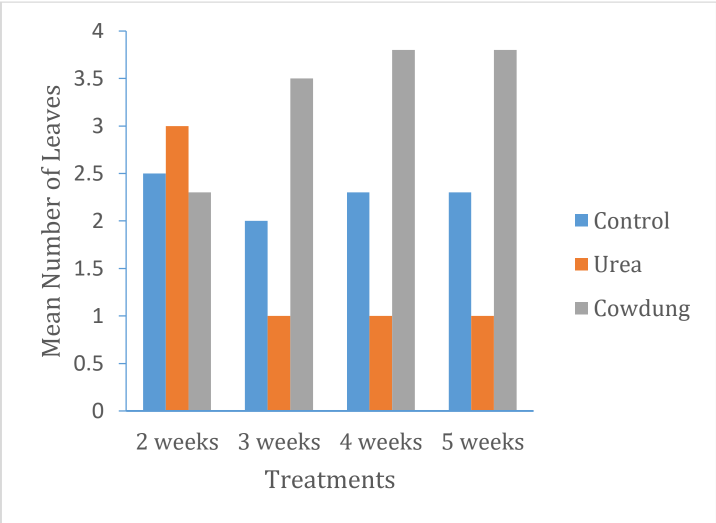

Fig 3.4: Number of leaves of different weeks of control for *Abelmoschus esculentus*

The results of the study on the effects of urea and cow dung on the germination and growth of *Abelmoschus esculentus* (okra) highlight distinct influences on various growth parameters compared to the control. In terms of plant height, the control exhibited steady growth, while urea application showed a temporary setback in week 3, indicating a negative impact on okra growth. Conversely, cow dung consistently fostered positive influences, with higher mean heights surpassing the control and peaking at 9.8 in week 5. These findings suggested that while urea may initially impede growth, cow dung creates favourable conditions for enhanced germination and sustained growth. Similar trends were observed in leaf length and width, where urea negatively impacted these parameters, hindering elongation and expansion of leaves, while cow dung positively influenced both, promoting longer and broader leaves. Furthermore, the number of leaves was adversely affected by urea but significantly increased with cow dung application, highlighting the contrasting effects of these fertilizers on leaf production. Overall, the study underscores the importance of considering the differential impacts of urea and cow dung on various growth aspects of okra plants, providing valuable insights for optimizing cultivation practices.

IV. CONCLUSION

Crop yield, reproductive growth, development, nutritional value depends on the fertility of the soil, to increase the productivity, it is advisable to apply fertilizers. The results revealed that *Abelmoschus esculentus* (okra) plant responded well to both organic and inorganic fertilizer - the best growth parameters were obtained from buckets treated with cow dung.

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