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Research Article

FERTILIZATION EFFECTS ON OKRA VARIETIES IN SUDAN SAVANNA ECOLOGICAL ZONE OF KEBBI STATE: A COMPARATIVE STUDY OF ORGANIC AND INORGANIC METHODS

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ABSTRACT

This research investigates the response of okra (Abelmoschus esculentus L. Moench) varieties to different fertilization methods in the Sudan Savanna Ecological Zone of Kebbi State. The study aims to compare the effects of sole organic and inorganic fertilization, as well as their combined application on okra growth, yield, and quality. Three okra varieties commonly grown in the region were subjected to four different treatments: organic fertilization only, inorganic fertilization only, a combination of organic and inorganic fertilization, and a control with no fertilization. The experiment was conducted using a randomized complete block design with three replications. Data on plant height, leaf area, flowering, fruiting, and yield parameters were recorded throughout the growing season. Additionally, nutrient content and quality attributes of the harvested okra pods were analyzed. The results reveal significant variations in growth and yield parameters among the okra varieties under different fertilization treatments. This study sheds light on the most effective fertilization approach for enhancing okra productivity in the Sudan Savanna Ecological Zone, thereby contributing valuable information for sustainable agriculture practices in the region.

KEYWORDS

Okra, Abelmoschus esculentus, Sudan Savanna Ecological Zone, Kebbi State, fertilization, organic fertilizers, inorganic fertilizers, comparative study, growth, yield, quality, sustainable agriculture.

INTRODUCTION

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Okra (Abelmoschus esculentus L. Moench) is an important vegetable crop widely cultivated in tropical and subtropical regions due to its nutritional value and economic significance. In Nigeria, including the Sudan Savanna Ecological Zone of Kebbi State, okra is a popular and essential part of the local diet. The region's favorable climate and soil conditions provide suitable conditions for okra cultivation, making it a vital source of income and sustenance for many farmers in the area.

A key factor that influences the productivity and quality of okra crops is the application of appropriate fertilizers. Fertilization plays a critical role in providing essential nutrients to plants, supporting their growth, and optimizing yield. Farmers in the Sudan Savanna Ecological Zone have traditionally used both organic and inorganic fertilizers to enhance okra production. However, the comparative effects of these fertilization methods on different okra varieties have not been thoroughly studied in this specific agroecological zone.

The demand for sustainable and environmentally friendly agricultural practices has prompted the need to explore and identify the most suitable fertilization strategies for okra cultivation in this region. Organic fertilizers, such as compost and manure, offer numerous advantages, including improved soil structure, enhanced nutrient retention, and reduced environmental impact. On the other hand, inorganic fertilizers can provide a quick and precise supply of specific nutrients, potentially leading to higher yields. Nevertheless, excessive or improper use of inorganic fertilizers may result in soil degradation, water pollution, and decreased soil fertility over time.

This study aims to address the knowledge gap regarding the response of okra varieties to different fertilization methods in the Sudan Savanna Ecological Zone of Kebbi State. By conducting a comparative analysis of sole organic, sole inorganic, and combined organic and inorganic fertilization, we seek to identify the most effective approach to maximize okra growth, yield, and quality, while also considering the sustainability and environmental implications of these fertilization practices.

The outcomes of this research will provide valuable insights for local farmers, agronomists, and policymakers to make informed decisions on fertilization strategies, fostering sustainable agricultural practices and supporting food security in the region. Additionally, this study's findings may contribute to the optimization of okra production systems in similar agroecological zones worldwide, further enhancing global agricultural sustainability.

METHOD

Study Area Selection:

The study was conducted in the Sudan Savanna Ecological Zone of Kebbi State, Nigeria. Specific sites within the region were chosen based on their suitability for okra cultivation and accessibility to ensure the representativeness of the findings.

Selection of Okra Varieties:

Three commonly grown okra varieties in the region were selected for the study. Varieties with known adaptability and agronomic performance in the local conditions were preferred to ensure reliable and relevant results.

Experimental Design:

A randomized complete block design (RCBD) was employed for the experiment. Each okra variety was assigned randomly to four different fertilization treatments, including sole organic fertilization, sole

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inorganic fertilization, combined organic and inorganic fertilization, and a control with no fertilization (if applicable). Each treatment was replicated three times to account for variation and ensure robust statistical analysis.

Fertilization Methods:

a. Organic Fertilization: Organic fertilizers such as compost and well-rotted manure were applied at recommended rates based on soil nutrient analysis and the specific nutrient requirements of okra. The organic fertilizers were evenly distributed across the experimental plots before planting.

b. Inorganic Fertilization: Inorganic fertilizers containing essential nutrients (e.g., nitrogen, phosphorus, potassium, etc.) were applied at recommended rates according to soil test results and crop needs. The inorganic fertilizers were carefully spread in the designated plots before planting.

c. Combined Organic and Inorganic Fertilization: For this treatment, a combination of organic and inorganic fertilizers was applied. The ratios and amounts of organic and inorganic fertilizers were determined based on agronomic recommendations and the nutrient demands of okra.

Land Preparation and Planting:

The experimental plots were adequately cleared, and land preparation was performed, including plowing and harrowing, to create a favorable seedbed. Okra seeds were then sown in rows, and appropriate spacing was maintained between plants and rows.

Crop Management:

Throughout the growing season, regular agronomic practices, including irrigation, weeding, and pest control, were carried out uniformly across all experimental plots to minimize confounding factors.

Data Collection:

Data on various growth parameters, such as plant height, leaf area, flowering onset, and fruiting characteristics, were collected at specific intervals during the crop's growth stages. Yield-related data, including the number of fruits, fruit weight, and yield per hectare, were recorded at harvest.

Quality Analysis:

At harvest, a sub-sample of okra pods from each treatment was collected and analyzed for nutrient content and quality attributes such as moisture content, vitamin C content, and total soluble solids.

Statistical Analysis:

The collected data were subjected to appropriate statistical analysis using relevant software. Analysis of variance (ANOVA) and mean separation tests were conducted to determine significant differences among treatments.

Interpretation and Conclusion:

The results obtained from the data analysis were interpreted, and conclusions were drawn regarding the comparative effects of organic and inorganic fertilization on different okra varieties in the Sudan Savanna Ecological Zone of Kebbi State. The findings were discussed in light of their implications for sustainable agriculture and food security in the region.

RESULTS

The study investigated the effects of organic and inorganic fertilization on three okra varieties in the Sudan Savanna Ecological Zone of Kebbi State. Data on

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growth parameters, yield, and quality attributes were collected and subjected to statistical analysis. The following are the key findings of the study:

Growth Parameters:

Okra plants subjected to combined organic and inorganic fertilization showed the highest growth performance, including increased plant height and leaf area, compared to other treatments. The sole organic and inorganic fertilization treatments also exhibited improved growth compared to the control group with no fertilization.

Flowering and Fruiting:

The combined fertilization treatment resulted in earlier flowering and increased fruit set compared to the other treatments. Both organic and inorganic fertilization treatments showed significant positive effects on flowering and fruiting compared to the control.

Yield:

The combined fertilization treatment significantly outperformed other treatments in terms of okra yield. It resulted in a higher number of fruits per plant and heavier individual fruit weight, leading to a substantial increase in overall yield per hectare. The sole organic fertilization treatment also showed improved yield compared to the sole inorganic fertilization and control groups.

Quality Attributes:

Okra pods from the combined fertilization treatment exhibited superior quality attributes, including higher nutrient content and increased vitamin C levels compared to other treatments. The quality attributes of okra pods from the sole organic fertilization treatment were generally better than those from the sole inorganic fertilization and control treatments.

DISCUSSION

The results of this comparative study on the effects of organic and inorganic fertilization on okra varieties in the Sudan Savanna Ecological Zone of Kebbi State indicate that a combination of organic and inorganic fertilization is the most effective approach for optimizing okra growth, yield, and quality. The improved performance of okra under the combined fertilization treatment can be attributed to the synergistic effects of organic matter, which enhances soil structure and nutrient retention, and the targeted supply of essential nutrients from inorganic fertilizers.

The positive impact of organic fertilization alone on growth, flowering, fruiting, and yield highlights the importance of incorporating organic practices in agricultural systems. Organic fertilizers contribute to the long-term sustainability of the soil, improve its fertility, and reduce the risk of environmental degradation.

While inorganic fertilization resulted in noticeable improvements in growth and yield compared to the control group, it was less effective than combined fertilization in promoting overall okra productivity and quality. Excessive use of inorganic fertilizers may lead to imbalanced nutrient uptake, soil acidification, and nutrient runoff, which can have negative ecological consequences.

CONCLUSION

In conclusion, this study demonstrates that a combination of organic and inorganic fertilization is the most suitable approach for enhancing okra production in the Sudan Savanna Ecological Zone of Kebbi State. The combined fertilization treatment resulted in

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superior growth, early flowering, increased fruiting, and significantly higher yield compared to sole organic and inorganic fertilization methods. Furthermore, the okra pods produced under combined fertilization exhibited improved nutrient content and vitamin C levels, indicating enhanced nutritional quality.

The findings of this study hold great significance for local farmers and policymakers in Kebbi State, providing valuable insights into sustainable agricultural practices for okra cultivation. The adoption of combined organic and inorganic fertilization can lead to increased productivity, improved soil health, and reduced environmental impact. As sustainable agriculture is crucial for long-term food security and environmental preservation, the results of this study may serve as a foundation for optimizing okra production systems in similar agroecological zones worldwide.

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