ISSN: 3029-0724

Review Article

Journal of Environmental Science and Agricultural Research

Does Garlic (*Allium Sativum L*) Growth Parameters Significantly Affected by NPSZnB Blended Fertilizer and Crop Rotation at Debre Berhan Condition

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Received: November 29, 2024; **Accepted:** December 09, 2024; **Published:** December 14, 2024

ABSTRACT

Garlic (Allium sativum L, 2n=16) belongs to the family Alliaceae and is the second most widely used Allium species next to onion. Garlic is a frost-tolerant, perennial bulbous herb that stands upright and is 30-100 cm tall with narrow flat leaves that bear small white flowers and bulbils. For this reason, it is grown largely in the Debre Berhan areas. This experiment is laid out 40cm between blocks x 20 cm between plots x 5cm between plants in our living compound at Debre Berhan Metropolitan City. The result showed that there is a significant difference in the tested parameters. From the analysis ANOVA, applying NPSZnB blended fertilizer generally increases leaf length and plant height compared to plant sown in the rotation field.

Keywords: Garlic, Crop Rotation, NPSZnB, Fertilizer

Introduction

Garlic (Allium sativum L, 2n=16) belongs to the Alliaceae family and is the second most widely used Allium species next to onion [1,2]. Garlic is a frost-tolerant, perennial bulbous herb that stands upright and is 30-100 cm tall, with narrow flat leaves that bear small white flowers and bulbils [3]. It is an annual herbaceous plant that produces both bulbs and biennial seeds. In contrast to onions with a hollow scape, garlic scapes are smooth, spherical, and solid over their entire length. Cloves are–6-35 smaller bulblets that make up the bulb, encased in a thin layer of whitish or pinkish peppery sheaths. Most garlic cloves do not grow blossom stalks. Globose, frequently with bulbils, many flowers, long peduncles, and umbels. Oblong, acuminate, greenish-white, or slightly tinged with purple sepals are present. It is widely used worldwide as a seasoning or condiment for its pungent flavor. It is a fundamental component of many or most dishes from various countries, including Ethiopia. Garlic adds a taste to foods, making them more palatable and digestible [4]. In Ethiopia, garlic is used to prepare foods, particularly some types of stew, and to make dried foods for storage [2]. Garlic was produced in the Debre Berhan highlands of Ethiopia, mainly in the urban agricultural production system year to year. This study aimed to evaluate the effect of NPSZnB blended fertilizer and crop rotation in a small land area using our compound.

Materials and Methods

The experiment was conducted at Debre Berhan in an open field in a living compound. Debre Berhan is found in the North Shoa zone of the Amhara regional state, 130 km North of Addis Ababa, located at a latitude and longitude of 9041‟ N 39032‟E/9.6830N 39.5330E, respectively, and an altitude of 2840 m above sea level. The area receives a mean annual rainfall of 927.10 mm. The mean monthly maximum and minimum temperatures range from 18.3 to 21.8°C and 2.4 to 8.9°C, respectively. (6) (PDF) Influence of Clove Size and Nitrogen Rates on Garlic (Allium sativum L.) Growth and Yield at Debre Berhan, Central Highland of Ethiopia. Availablefrom:https://www.researchgate.net/publication/383259994_Influence_of_Clove_Size_and_Nitrogen_Rates_on_Garlic_Allium_sativum_L_Growth_and_Yield_at_Debre_Berhan_Central_Highland_of_Ethiopia#fullTextFileContent [accessed Sep 13 2024]. In our experiment, all the other factors (other than the treatments) were

Citation: Kebede Tedila Tadesse. Does Garlic (Allium Sativum L.) Growth Parameters Significantly Affected by NPSZnB Blended Fertilizer and Crop Rotation at Debre Berhan Condition. J Envi Sci Agri Res. 2024. 2(4): 1-4. DOI: doi.org/10.61440/JESAR.2024.v2.42

kept under control, and all the crop seeds were sown in one day by keeping 40 cm between blocks, 20 cm between plots, and 5 cm between plants.

Data Collected

Plant Height (cm): Plant height was measured in centimeters from the soil surface to the tip of the mature leaf using a ruler [5].

Leaf Number per plant (number) is the mean number of leaves produced by sampled plants and was calculated by dividing the total number of leaves counted from the sampled plants by the number of sampled plants to obtain the mean leaf number per plant [5].

Leaf Length (cm): The length of three leaves per plant (upper, medium, and lower) was measured at maturity using a ruler, and the average leaf length was measured [5].

Leaf Width (cm): The average diameter of leaves was measured in cm for ten randomly selected plants in four central rows. One leaf from each plant sample was measured at the widest part at physiological maturity [6].

The collected data for all parameters of the experiment were subjected to Analysis of Variance (ANOVA) using SAS software (version 9.3). Least significant difference (LSD) procedures at a probability level of 0.05, were used to determine differences between treatment means.

Results and Discussion

In this section (result and discussion), we briefly and precisely present the ANOVA and its interpretation. For this part, we present the results in line with current scientific views and current research outputs, especially in Ethiopia as much as possible. The parameters included in our experiment were the Leaf Width (cm), Leaf Length (cm), Plant Height (cm), and Leaf Number per plant (number).

Leaf Width (cm): The leaf width of garlic crops in the study area showed a significant difference between NPSZnB-blended fertilizer and crop rotation. From this significant difference, the maximum leaf width of the test plant (3.00 cm) was recorded from garlic plants sown in the rotation field, and the respective minimum leaf width of a test plant (1.37 cm) was recorded from garlic plants that received NPSZnB blended fertilizer (Table 1). There is one fact that in soil and plant nutrition science if the number of sinks is reduced, the capacity of the source significantly increases, and because of this, the width of the leaf increased as compared to the NPSZnB-treated plants, which had a greater number of leaves.

Table 1: Effect of npsznb fertilizer and crop rotation on plant height, leaf length, leaf width, and leaf number of garlic

Treatment	Leaf Length (cm)	Leaf Width (cm)	Leaf Number/Plant (number)	Plant Height (cm)
NPSZnB	53.00[a]	1.37[b]	10.00[a]	73.73[a]
Crop Rotation	51.32[b]	3.00[a]	7.70[b]	72.53[b]
LSD0.05	1.10	1.50	1.89	0.92
CV	10.00	4.50	9.50	12.30

Leaf Length (cm)

ANOVA showed a significant difference ($P<0.05$) in the leaf length of garlic plants treated with NPSZnB blended fertilizer and crop rotation. From this significant variation, the maximum number of leaves (53.00 cm) was recorded in plants treated with NPSZnB blended fertilizer, and the minimum leaf length (51.32 cm) was obtained from test plants sown in crop rotation (Table 1). This may be because nitrogen fertilizer increases the vegetative growth of crops more drastically. This result is the same as the results of Tena and Desta 2024 who experimented to see the effect of nitrogen rates on plant height, leaf length, leaf diameter, and leaf number of garlic at Debre Berhan, and they found that the length of leaves increased as the level of nitrogen fertilizer was increased.

Plant Height (cm)

A significant variation ($P< 0.05$) in plant height was attributed to the application of the NPSZnB-blended fertilizer and crop rotation of the test crop garlic. The maximum height of the test plant (73.73 cm) was recorded from garlic plants that were treated with NPSZnB blended fertilizer, whereas the minimum height (72.53 cm) was recorded from garlic plants that were sown with rotation (Table 1). This increase in plant growth might be due to the effects of auxins and nutrients exerted by bio-enrichment [7]. The height of garlic is dependent on the length of its leaf; therefore, the reason for the increase in height is the application of Nitrogen fertilizer. Moreover, this increment of height is similar to the work of Tena and Desta, who conducted an experiment to determine the effect of nitrogen rates on plant height, leaf length, leaf diameter, and leaf number of garlic at Debre Berhan, and found that the height of plants increased as the level of nitrogen fertilizer was increased [6]. Moreover, on the growth and height of garlic Abdisa and Negessa state that the rational use of use of potassium fertilizer greatly promoted garlic growth and yield and it had an obvious growth [8].

Number of Leaves per Plant (Number)

Regarding the number of leaves per plant, the treatments showed significant ($P<0.05$) differences among the test plants. Subsequently, the highest number of leaves (10.00) was recorded in plants treated with NPSZnB blended fertilizer, whereas the lowest number of leaves (7.70) was obtained from plants that were sown in rotation (Table 1). According to Fikru and Fikreyohannes, the highest number of leaves per plant was recorded at the combined application of the maximum rate of vermicompost and mineral nitrogen rates because of the availability of nitrogen and organic fertilizer, which helps the plant to complete their life cycle without nutrient stress [9].

Conclusion

Garlic (Allium sativum L, 2n=16) belongs to the family Alliaceae and is the second most widely used Allium species after onion. Garlic is grown in cooler areas, similar to Debre Berhan. The results showed a significant difference between the tested parameters. From the ANOVA analysis, the application of NPSZnB blended fertilizer generally increased the length of leaves and plant height as compared to plants sown in the rotation field, but leaf width was highly increased by crop rotation. As I have clearly stated, the experiment is under urban agriculture for this matter, and it is impossible to go further to yield and yield components of the test plant because of the user's frequent starting from horticultural maturity to physiological maturity. Therefore, it is best to repeat the experiment to obtain clear recommendations.

Competing Interests

The authors declare that there is no conflict of interest in this work.

Authors Contributions

The author (Kebede Tedila) contributed by designing the experiment and conducting continuous activities to write the paper and supervise all the work.

Acknowledgement

We deeply conduct continuous activities to express our warm gratitude to the Debre Berhan University College of Agriculture and Natural Resource Science for providing me with the required funds and research facilities.

Availability of Data and Materials

The data used in the research were obtained from the experimental site, and the citations used in the document are well-acknowledged. The data should only be shared if it is ethically correct to do so, where this does not violate the protection of human subjects, or other valid ethical, privacy, or security concerns.

Declaration of Funding

The work is facilitated by Debre Berhan University for the experiment only but doesn't receive any publication funds.

Figures from the Working Field

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