

The Growth and flowering of marigold (*Tagetes erecta* L.) plants influenced by different amounts of nitrogen

Maqsood Ali Wagan^{1*}, Farhan Ali Wagan²

¹Department of Horticulture, Sindh Agriculture University Tandojam, Pakistan

²Department of Plant pathology, Sindh Agriculture University Tandojam, Pakistan.

*Corresponding Author

Maqsood Ali Wagan

Department of Horticulture,
Sindh Agriculture University
Tandojam, Pakistan.

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Abstract: The present study was conducted at private field during 2023, The aim was to examine how nitrogen affects the growth and flowering of marigold (*Tagetes erecta* L.). We used one variety of Marigold (African marigold) that we bought from Hyderabad market. The seeds were healthy and disease-free. We applied five different amounts of nitrogen as treatments: T_1 = control, T_2 = nitrogen 25 kg ha⁻¹, T_3 = nitrogen 50 kg ha⁻¹, T_4 = nitrogen 75 kg ha⁻¹, T_5 = nitrogen 100 kg ha⁻¹. We designed the experiment using a Completely Randomized Design (CRD) with three replications. The following observation was recorded viz Height of plant (cm), branches plant, initiation days of flower, number of flowers plant-1, weight of single flower (g), diameter of flower (cm).the present study had a significant results for all parameters, the maximum results was observed in T_5 = nitrogen 100 kg ha⁻¹ highest plant height (42.97cm), highest number of branches (16.11), more days to flower initiation (57.00), highest number of flowers (43.1), maximum Weight of single flower (g) (7.81 g) and maximum diameter of a single flower (14.10) followed by T_4 = nitrogen 75 kg ha⁻¹ height of plant (40.17 cm), number of branches per plant (13.21), days to flower initiation (54.00), number of flowers per plant (38.1), weight of single flower (5.10 g), diameter of single flower (12.00 cm) while the minimum result was observed in T_1 = control plant height (18.54 cm). Number of branches (6.01), days to flower initiation (42.00), number of flowers per plant (17.3), Weight of single flower (2.11 g), diameter of a single flower (6. 60. cm).The study concluded that N_5 = 100 kg ha⁻¹ was the optimal dose of nitrogen for enhancing the growth and flowering of marigold plants.

Keywords: amount of nitrogen, growth, marigold.

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INTRODUCTION

Scientifically known as *Tagetes erecta* L., commonly known as marigold, is one of the most well-known flowers. It is a member of the Compositae or Asteraceae family (Kumar, N., N. Kumar, J. P. Singh, and H. Kaushik, 2016). These flowers are used for a variety of occasions, such as nonreligious or spiritual gatherings, birthday celebrations, features, and major holidays. There is beautiful marigold foliage available in a variety of forms, hues, and sizes. They are therefore perfect for creating garlands or any other type of lawn adornment. Marigold has both decorative and therapeutic uses. Because of its essential oil content and fragrant quality, it is widely utilized in the cosmetic and perfume industries (Regaswamy, D. and J. Koilpillai, 2014). Due to a short cropping period, little finance, and poor maintenance, this flower became well-liked by flower gardeners due to its lack of investment and care. African marigold plants are sold loose in Pakistani markets to be used to make garlands. Due of its changeable peak and plant life coloration, marigold is particularly utilized for beautifying and

panorama flowers in addition to reduced flowers. It is unexpectedly excellent as a bedding plant in a herbaceous border and works well to fill in the gaps, provide color, and border recently planted shrubberies. (Arora et al.: 2002) Mulching is a practice that helps the flora grow and develop in the right ways. by the use of soil temperature modification, offering improved increased nutrition availability and improved moisture retention. Mulching raises the moisture content and temperature of the soil. control the weeds other from enhancing the chemical and physical homes of soil, increasing the soil's production. (Wagan et al.: 2022) harvest. Within the technology of finite resources, there could be Standardizing precision farming technologies is necessary for farmers who want to increase productivity without lowering water footprint for each crop produced unit. mulching as well as its Effective use can result in a higher soil natural count number. as well as by improving additional soil characteristics. Typically straw Crop leftovers, plastic mulch, or rice husk can be utilized as artificial mulches for decorative plants. The crop of marigolds is weak rival in general and experience severe infestation of a lot of

annual weeds in their early stages of growth, so applying. Mulching not only keeps weeds out but also improves the soil floor microclimate that promotes the boom and blossoming. The current studies are completed in order to Analyze how different mulching techniques affect the behavior of flowers. and marigold flower characteristics.

Marigold is a versatile and valuable flower that has many uses and benefits. It is one of the oldest and most sustainable flowering plants in the world, and it is widely grown in tropical and subtropical regions. (Jyothi, 2017) It is also known as Calendula, Sayapatri, or Gainda in different languages (Singh et al., 2017). There are three main types of marigolds that are cultivated for their ornamental qualities: French, African, (Gnyandev et al., 2014; Singh et al., 2019) and triploid. Triploid marigolds are hybrids of French and African marigolds. Marigold is very popular in South Asia, where it is used for various religious and cultural purposes, such as decorating temples, statues, and buildings, and making garlands for ceremonies and weddings. Marigold also has medicinal and cosmetic properties, as it contains antioxidants and essential oils that have various applications. Marigold can also produce natural substances that can be used for food, dye, oil, and pigment production, especially xanthophylls. Marigold cultivation is a profitable business for many farmers and entrepreneurs, as it has a high demand and a value-added potential. Marigold also benefits from nitrogen fertilization, which helps it produce more and larger flowers. Nitrogen is an important nutrient for ornamental plants, as it stimulates the growth of side shoots, which increase the number of flowers. Plants need nitrogen, phosphorous, and potassium as basic macro nutrients throughout their life cycle (Maharnor et al., 2011; Sasikumar et al).

Materials and methods

This study was conducted at private field during 2023, The aim was to examine how nitrogen affects the growth and flowering of marigold (*Tagetes erecta* L.). We used one variety of Marigold (African marigold) that we bought from Hyderabad market. The seeds were healthy and disease-free. We applied five different amounts of nitrogen as treatments: T_1 = control, T_2 = nitrogen 25 kg ha⁻¹, T_3 = nitrogen 50 kg ha⁻¹, T_4 = nitrogen 75 kg ha⁻¹, T_5 = nitrogen 100 kg ha⁻¹. We designed the experiment using a Completely Randomized Design (CRD) with three replications.

Observation to be recorded

We recorded the following observations: Height of plant (cm), branches plant, initiation days of flower, number of flowers plant-1, weight of single flower (g), diameter of flower (cm)

Statistical analysis

We used Statistics 8.1 to perform a statistical analysis of the data (Statistics.2006). We used the LSD (Least Significant Difference) test to compare the treatments when necessary.

Results

Plant height (cm)

Plant height (cm) shows how the plant responds to the cultivar or the management conditions. (Figure. 1) shows the results for plant height (cm) of marigold under different nitrogen doses. The results are significant ($P < 0.05$). The highest plant height (42.97cm) was observed in T_5 = nitrogen 100 kg ha⁻¹, followed by T_4 = nitrogen 75 kg ha⁻¹ (40.17 cm), T_3 = nitrogen 50 kg ha⁻¹ (34.27 cm) and T_2 = nitrogen 25 kg ha⁻¹ (28.27 cm). The lowest plant height (18.54 cm) was observed in T_1 = control.

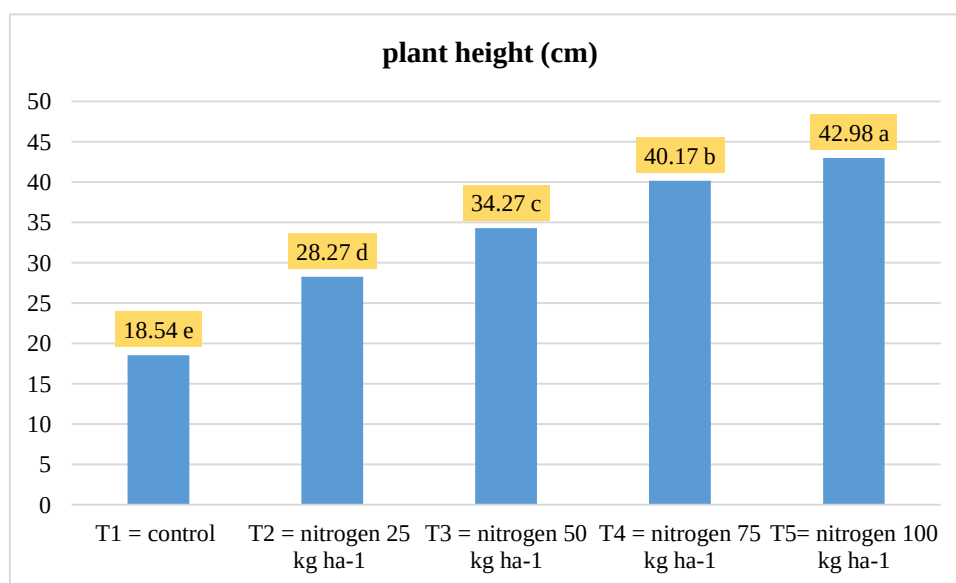


Figure 1. Plant height (cm) of marigold effected by different amounts of nitrogen

Number of branches -1

The number of branches of marigold plants (*Tagetes erecta* L.) under different nitrogen doses. The number of branches shows how the plant reacts to the cultivar or the management conditions. (Figure 2) shows the results for the number of branches of marigold under different nitrogen doses. The results are significant ($P < 0.05$). The highest number of branches (16.11) was observed in T_5 = nitrogen 100 kg ha⁻¹, followed by T_4 = nitrogen 75 kg ha⁻¹ (13.21), T_3 = nitrogen 50 kg ha⁻¹ (11.11) and T_2 = nitrogen 25 kg ha⁻¹ (9.11). The minimum number of branches (6.01) was observed in T_1 = control.

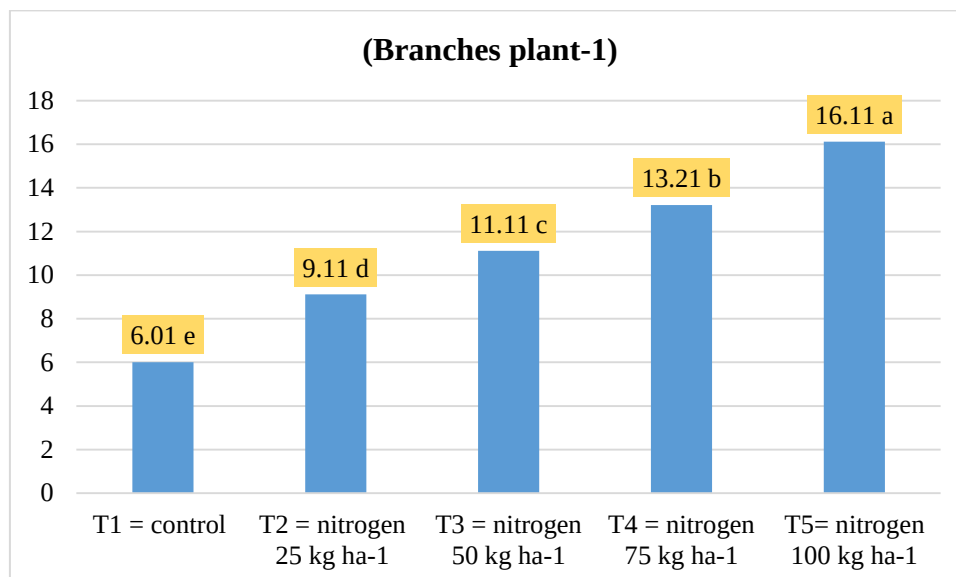


Figure 2. Number of branches of marigold effected by different amounts of nitrogen .

Days to flower initiation

Days to flower initiation of marigold plants (*Tagetes erecta* L.) under different nitrogen amounts. The days to flower initiation shows how the plant reacts to the cultivar or the management conditions. (Figure 3) shows the results for the days to flower initiation of marigold under different nitrogen amounts. The results are significant ($P < 0.05$). The more days to flower initiation (57.00) was observed in T₅ = nitrogen 100 kg ha⁻¹, followed by T₄ = nitrogen 75 kg ha⁻¹ (54.00), T₃ = nitrogen 50 kg ha⁻¹ (51.00) and T₂ = nitrogen 25 kg ha⁻¹ (48.00). less days to flower initiation (42.00) was observed in T₁ = control.

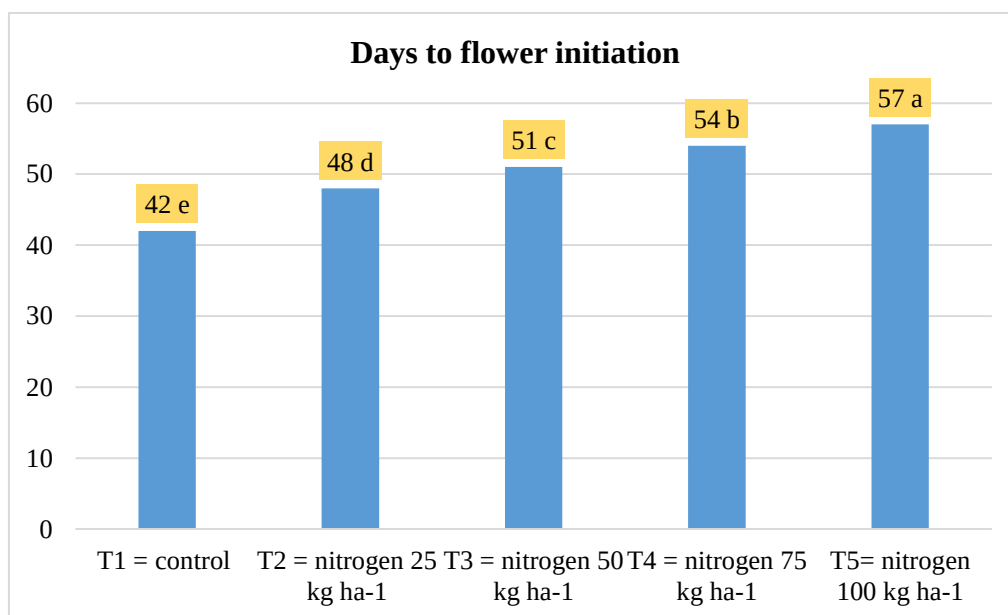


Figure 3. days to flower initiation of marigold effected by different amounts of nitrogen .

Number of flowers plant -1

The number of flowers marigold plants (*Tagetes erecta* L.) under different nitrogen doses. The number of flowers per plant shows how the plant reacts to the cultivar or the management conditions. (Figure 4) shows the results for the number of flowers per plant of marigold under different nitrogen doses. The results are significant ($P < 0.05$). The highest number of flowers (43.1) was observed in T₅ = nitrogen 100 kg ha⁻¹, followed by T₄ = nitrogen 75 kg ha⁻¹ (38.1), T₃ = nitrogen 50 kg ha⁻¹ (32.8) and T₂ = nitrogen 25 kg ha⁻¹ (26.7). minimum number of flower per plant (17.3) was observed in T₁ = control.

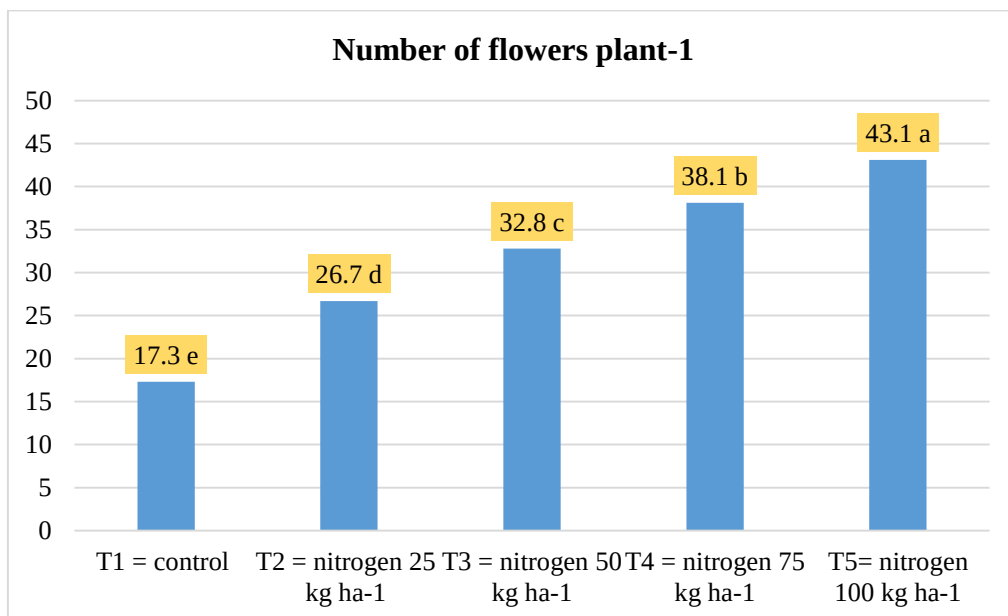


Figure 4. number of flowers per plant of marigold effected by different amounts of nitrogen .

Weight of single flower (g)

The Weight of single flower (g) marigold plants (*Tagetes erecta* L.) under different nitrogen doses. The Weight of single flower (g) shows how the plant reacts to the cultivar or the management conditions. (Figure 5) shows the results for the Weight of single flower (g) of marigold under different nitrogen doses. The results are significant ($P < 0.05$). The maximum Weight of single flower (7.81 g) was observed in T₅ = nitrogen 100 kg ha⁻¹, followed by T₄ = nitrogen 75 kg ha⁻¹ (5.10 g), T₃ = nitrogen 50 kg ha⁻¹ (4.81 g) and T₂ = nitrogen 25 kg ha⁻¹ (3.71 g). The minimum Weight of single flower (2.11 g) was observed in T₁ = control.

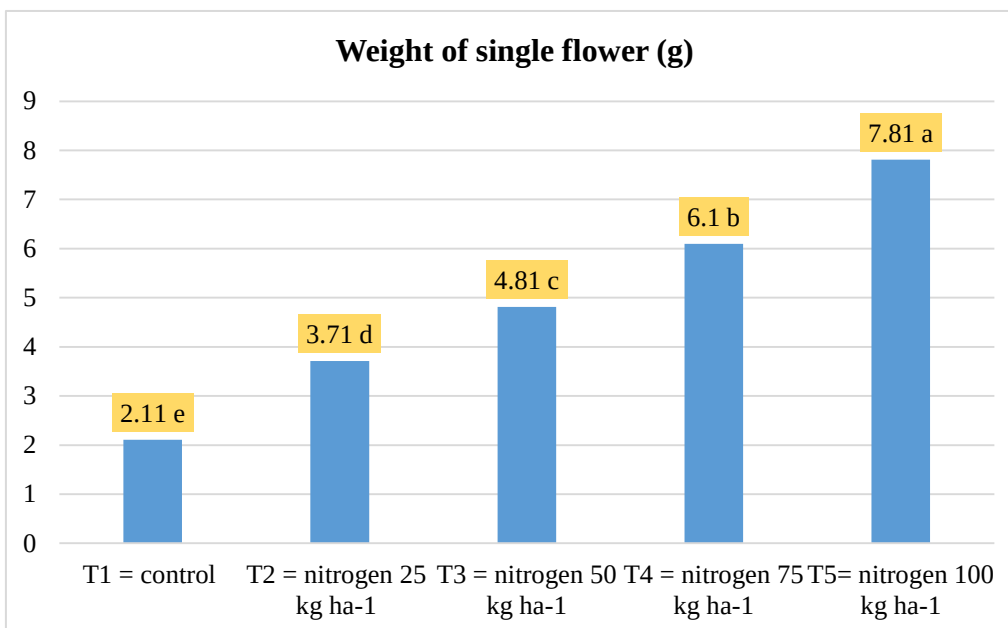


Figure 5. weight of single flower (g) of marigold effected by different amounts of nitrogen .

Diameter of a single flower (cm)

The Diameter of a single flower (cm) marigold plants (*Tagetes erecta* L.) under different nitrogen doses. The Diameter of a single flower (cm) shows how the plant reacts to the cultivar or the management conditions. (Figure 6) shows the results for the Diameter of a single flower (cm) of marigold under different nitrogen doses. The results are significant ($P < 0.05$). The maximum diameter of a single flower (14.10) was observed in T₅ = nitrogen 100 kg ha⁻¹, followed by T₄ = nitrogen 75 kg ha⁻¹ (12.00 cm), T₃ = nitrogen 50 kg ha⁻¹ (12.00 cm) and T₂ = nitrogen 25 kg ha⁻¹ (8.20 cm). The minimum diameter of a single flower (6.60 cm) was observed in T₁ = control.

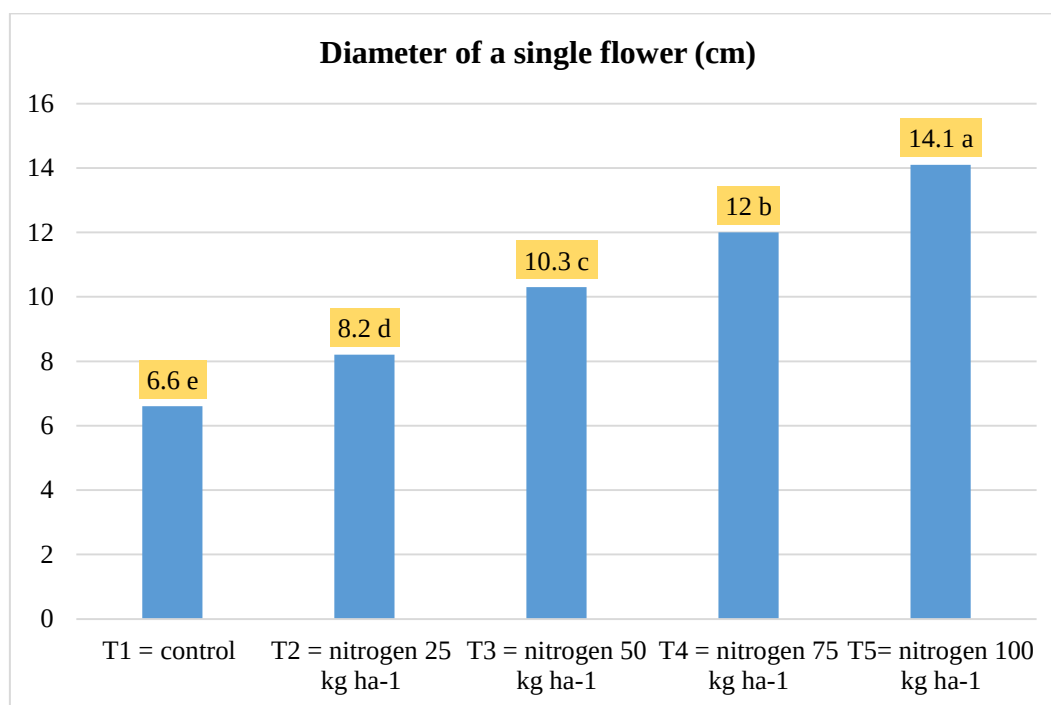


Figure 6. Diameter of a single flower (cm) of marigold effected by different amounts of nitrogen .

Discussion

Marigold plants respond to different amounts of nitrogen fertilizer. Nitrogen is an essential nutrient for plants, but it can be depleted from the soil by intensive farming and poor management. Therefore, artificial fertilizers are used to improve the soil quality and productivity (Aslam et al., 2016).

The results showed that nitrogen fertilizer had a significant effect ($P < 0.05$) on the growth and flowering of marigold plants. The highest values of plant height, number of branches, time to flower initiation, flower weight, number of flowers, flower diameter, blooming period and flower persistence were achieved with 100 kg N ha⁻¹, followed by 90 kg N ha⁻¹ (Pratiksha et al., 2020). A similar study on marigold cultivar “Pygmy” also found that nitrogen fertilizer influenced all these parameters, and recommended 110 kg N ha⁻¹ for optimal growth and flowering in the Peshawar valley (Bi et al., 2010).

The lowest values of these parameters were observed with 0 kg N ha⁻¹, indicating that nitrogen fertilizer is necessary for marigold cultivation. However, too much nitrogen fertilizer can also be detrimental, as it can cause excessive vegetative growth and delay flowering. A study on pot marigold found that 100 kg N ha⁻¹ was not economical, and suggested 60 - 80 kg N ha⁻¹ as the best range for yield and quality. The study also reported that the optimal plant density was 50 plants m⁻², as it increased seed and oil production (Anuradha et al., 1990).

Conclusions

This study showed that the growth and flowering of marigold plants were improved by applying different amounts of nitrogen. The best results for all the measured traits were obtained from the plants that received 100 kg Nitrogen ha⁻¹ dose. This means that nitrogen enhances the vegetative growth and helps the plants to flower faster and better.

Recommendations

To make the marigold plants bloom earlier, more nitrogen should be given. The optimal dose for achieving the highest growth and flowering is 100 kg Nitrogen ha⁻¹. Nitrogen is important for the plants to develop their leaves and stems and to move the flowering process along during the blooming stage.

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