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NPK Fertilizer Effects on Growth and Flowering of Chinese Carnation

Mazin Amer Owain

Department of Horticulture and landscape, Gollege of Agriculture , Tikrit of University
*Corresponding author: mazin.a.owain@tu.edu.iq

Abstract: This study investigates the impact of varying levels of NPK chemical fertilizers on the growth and flowering of the Chinese carnation plant (Dianthus chinensis). Conducted during the 2022–2023 academic year at the University of Tikrit's College of Agriculture, the experiment utilized a randomized complete block design (RCBD) with four treatments: no fertilizer, high nitrogen (47% N), high phosphorus (41% P), and high potassium (43% K). Key growth metrics, including plant height, leaf count, total chlorophyll content, flower count, and floral dimensions, were measured. Results indicated significant differences between treatments. High potassium fertilizer resulted in superior vegetative growth, with the highest leaf count (38.17 leaves per plant), wet weight (28.74 g per plant), and dry weight (6.05 g per plant). It also produced the most flowers (10.66 per plant). High nitrogen fertilizer notably increased chlorophyll content (12.14 mg/g wet weight), enhancing photosynthesis efficiency. These findings demonstrate that targeted nutrient application can optimize growth and flowering in Dianthus chinensis, with high potassium levels being particularly effective. The implications of this study suggest that precise NPK management can enhance ornamental plant production, contributing to horticultural practices and commercial flower cultivation. Future research should explore the long-term effects of these fertilizers and their environmental impact.

INTRODUCTION

Oriental flower Dianthus chinensis is a spherical winter plant that is native to Asia and Europe and grows to a height of short to medium. It resembles a rabbit and has thin, green, and sometimes bluish-tinged leaves. In the spring, it produces a dense cluster of brilliant flowers that have a mild, pleasant scent and come in a variety of colours. As a houseplant, Chinese wisteria blooms on chilly nights in the spring, but may be killed off by severe frost or cold. Because it takes around 12 weeks for the plant to get from seed to blossom, it's best to start the seeds inside eight weeks before transferring the seedlings to their final location. As a biennial plant, Chinese carnations can be grown in a variety of permanent settings, including seaside regions that are warm and rarely frosty, indoors in containers and rock gardens, and even in certain terrestrial basins [1].

Various nutrients are essential at various points in a plant's life cycle. To finish its life cycle, a plant requires both macroelements, which play an internal synthetic function, and microelements, which are necessary for the plant's growth and development but required in lesser amounts [2]. Of all essential nutrients and in greater quantities through crops, N-P-K is the most underutilized in most arable soils [3]. The slices (2007) indicated that the uese of chemical fertilizer increases production by about 50% and provided that it is added in a balanced manner, including the major nutrients (NPK)) and with absorption rates equal to growth rates. Nitrogen plays a vital and important role in the synthesis of important chlorophyll and cytochrome in photosynthesis and respiration, as well as in the synthesis of enzymes, enzyme accompaniments, proteins and proteoplasm, and plays an essential role in the increase of biomass in the plant.

Porphyrin Rings is involved in the formation of porphyrin rings and is involved in the biosynthesis of plant hormones such as oxins, gerilins and vitamins and in the installation of important organic bases in the construction of RNA and DNA [4]; [5]; [6]. Phosphorus plays a key role in stimulating the growth of roots, flowers and cell division. It is found in young parts such as buds and root limbs. Cell division is rapid and metabolism is high. It contributes to the storage and transfer of the energy generated from the photosynthesis process within the plant for later use in growth and reproduction. Its lack causes delayed plant maturity [7]. It is the component of key molecules such as nuclear acids, phospholipids and ATP triphosphate adenosine) and accounts for about 0.2% of dry plant weight.

Potassium plays an important role in the process of photosynthesis and enzymes activation and is involved in the production of ATP compound [8], its shortage causes the reduction of photosynthesis rate and ATP production. It plays a key role in the synthesis of proteins, regulate the osmosis, phloem sap, ketone- anion equilibrium, energy transfer, and plant stress resistance [9]. It also controls root growth and helps the plant to resist drought, increases its resistance to disease and regulates the opening and closing of stomachs. The study aimed to learn the Chinese carnation plant's response to the type of chemical fertilizer and its impact on the characteristics of vegetable and floral growth.

METHODS

The University of Tikrit's Department of Horticulture and Landscape, in conjunction with the College of Agriculture, conducted a sucking experiment on seedling Chinese carnations under a wooden cover. On January 9, 2020, seedlings were grown in the Department of Horticulture and Landscape's plastic house throughout the 2022–2023 season using a plants tray and Batmos media.

Seedlings were transferred to pot 12 cm on 15/11/2022 planted in a medium of mixed soil and batmos 1: 1 The study included a chemical fertilize type factor with four levels: no fertilize, high nitrogen fertilizer (nitrogen 47%), high phosphorus fertilizer (phosphorus41%) and high potassium fertilizer (potassium 43%). fertilizzed 2g per liter and added 150 ml per pot. The single factor experiment was performed by Randomize complete block design RCBD with three repeats and a rate of 4 pounds for the experimental module. The following measurements were taken at the end of the experiment in April: variables such as plant height, leaf count, total chlorophyll content in leaves, flower count, floral stand length, flower diameter, total wet and dry weight of plant, and number of flowers.

Table 1. The results provided offer a detailed analysis of the soil's physical and chemical properties.

The Physical and Chemical Qualities of The Soil	Results
Sand%	37
Green%	26
Clay%	37
Soil weaving	Clay Blend Sand
pH (pH)	7.11
Electrical Connection (EC) (Decimeter. M-1.25 m(°	3.46
Organic matter (g. kg^{-1})	1.16
Nitrate (NO3) (mg .kg^{-1})	11.8
Ammonium (NH4) (mg .kg^{-1})	13.3
Phosphorus (mg .kg^{-1})	14.2
Potassium (mg .kg^{-1})	2.04

Laboratory tests on the soil were conducted at the University of Tikrit's Department of Soil and Water, located in the Faculty of Agriculture.

A. The number of leaves

During the conclusion of the trial season, we counted the number of plants in the experimental unit and divided it by five to get the rate of leaves per plant.

B. Dry substance in leaves (%)

The samples elected from each experimental unit were placed in an electric oven at a temperature of 70 m until the weight stabilized [10] and weighed and calculated the percentage of dry material according to the following formula.

C. Rate of total number of flowers

The number of flowers was calculated after discontinuing the removal of flowers until the end of the flowering of the five plants selected for each experimental unit, and then the rate of the total number of flowers per plant was calculated as follows.

D. Length of flower branch

The length of the Flower branch was measured using the listed ruler for four plants and then took the Flower branch length rate by collecting the floral lengths of four flowers from each plant and dividing them by 4 and then collecting the floral holder length rate for four plants and splitting by 4.

E. Flower diameter

Flower diameter was measured using vernia for four flowers and divided by 4 to extract the flower diameter rate for each plant.

F. Leaf content of chlorophyll

To measure the quantity of chlorophyll (mg), the intriguing paper samples were treated with an 80% acetone solution, followed by measuring the light density of the extractor at 645 and 663 nm, as described in Abbas and Abbas (1992). Using the following formula, L-1 is determined: Total chlorophyll (mg. L-1) = 20.2 × optical density on length 645 + 8.02 × optical density on length 663.

RESULTS AND DISCUSSION

From the data of Table (1) and (2) was found that there are moral differences between the study transactions, where fertilizer coefficients with high potassium fertilizer are higher in the characteristics of vegetable growth, giving the highest paper intake rate of 38.17 sheets. Plant-1, the highest tender and dry weight rate (27.32 and 5.64) is superior to comparator treatment. As for the description of the number of flowers, the table data indicate that the high potassium fertilizer coefficients are higher in which the highest number of flowers compared to the rest of the coefficients is 10.66. Plant-1.

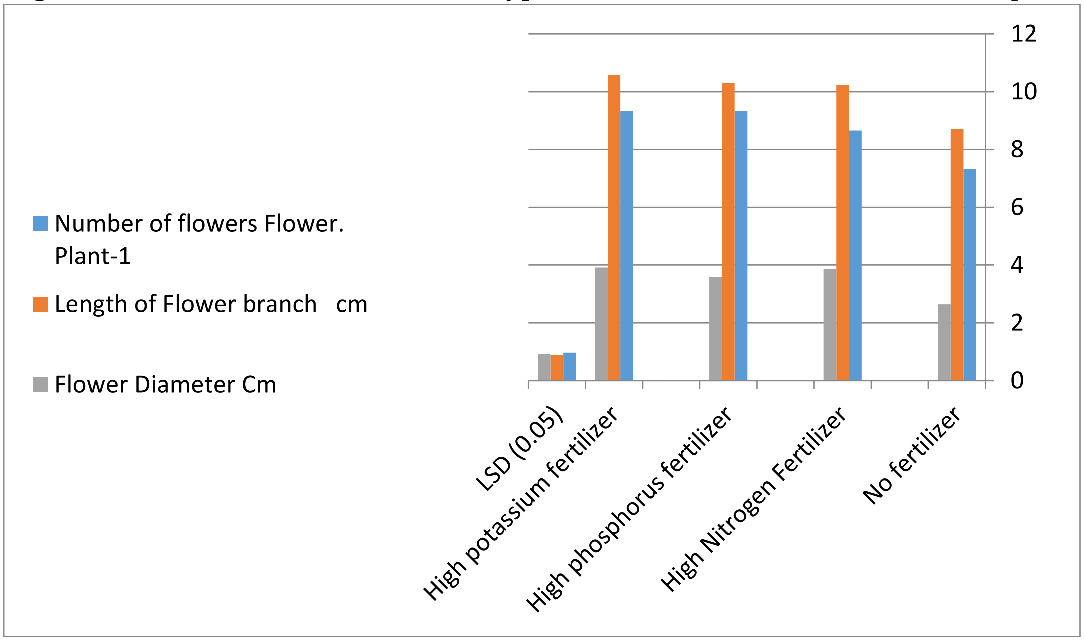
Table 2. Impact of chemical fertilizer type in the vegetative growth qualities of Chinese carnation

Chemical fertilizer	Number of leaves leaves. Plant^{-1}	wet Weight gm. Plant^{-1}	Dry Weight gm. Plant^{-1}	Total chlorophyll mg. g^{-1} wet weight
No fertilizer	**33.24**	**24.70**	**4.89**	**10.54**
High Nitrogen Fertilizer	**35.22**	**27.23**	**5.37**	**11.68**
High phosphorus fertilizer	**37.26**	**27.32**	**5.64**	**11.84**
High potassium fertilizer	**38.17**	**28.74**	**6.05**	**12.14**
LSD (0.05)	**1.13**	**1.55**	**0.21**	**2.12**

The positive effect on the vegetative growth qualities of fertilizer fertilizer treatment NPK may be attributed to the role of physiological nitrogen in its entry into the composition of the Porphyrin molecule found in important metabolic compounds such as chlorophyll tinctures as well as important cytochromate in respiration, photosynthesis and enzyme-based accompanying work (1999). Potassium also plays an essential role in the effectiveness of enzymes and maintains the persistence of Hansch and Mendel proteins, 2009 4. Among the foregoing, NPK elements share and work side by side in controlling the action of enzymes and building proteins [11].

The transaction with high potassium composted fertilizer resulted in a moral increase in the rate of vegetable and syphilis growth compared to the control [12]. The number of branches, the number of tubers per plant, the rate of tuberculosis weight and the total product of the plant's experimental unit also increased compared with the treatment of the control without composting [13];[14]. This illustrates the important role that fertilization plays as nitrogen enters the synthesis of proteins that are the active ingredient of proteoplasm, thereby increasing the plant's vegetative growth as well as the important role that potassium plays in its effectiveness in the work of enzymes and maintaining protein stabilization [15].

Figure 1. Effect of chemical fertilizer type in Chinese carnation ' disinfectant qualities



CONCLUSION

The study investigated the impact of different levels of NPK chemical fertilizers on the growth and flowering of the Chinese carnation plant, Dianthus chinensis, under an unheated vegetable canopy at the University of Tikrit. The results indicated that high potassium fertilizer significantly enhanced vegetative growth, as evidenced by the highest leaf count (38.17 leaves per plant), wet weight (28.74 g per plant), dry weight (6.05 g per plant), and chlorophyll content (12.14 mg/g). Furthermore, high potassium fertilizer also led to the highest number of flowers (10.66 flowers per plant). These findings imply that potassium plays a crucial role in enhancing both the vegetative and floral attributes of Dianthus chinensis. High nitrogen and phosphorus fertilizers also showed positive effects, particularly in increasing leaf chlorophyll content and enzyme activity, which are essential for protein synthesis and overall plant growth. The implications of these findings suggest that optimizing potassium levels in fertilizer applications can substantially improve the growth and flowering of Chinese carnations, potentially leading to higher ornamental plant yields. Further research is recommended to explore the long-term effects of these fertilizers on soil health and plant resilience, as well as to investigate the interaction between NPK levels and other microelements in diverse growing conditions.

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Conflict of Interest Statement:*The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.*