

## Article

# Response of Carnation (*Dianthus caryophyllus*) to NPK Compound Fertilizer and Corno Seaweed Extract: Effects on Vegetative and Flowering Growth, Volatile Oil Quality, and Active Compounds Analyzed by GC-MS

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**Abstract:** The experiment was conducted in the wooden shade house of the Department of Horticulture and Landscape Engineering, College of Agriculture, University of Basrah. Carnation plants with eight-month-old were used in the study. The experiment included two factors, the first factor was the application of NPK compound fertilizer at three concentrations: 0, 1.5, and 3.0 g pot<sup>-1</sup>. The second factor was the foliar application of Corno seaweed extract at three concentrations: 0, 3, and 5 mL L<sup>-1</sup>. All measurements of the studied characteristics were taken when the plants reached the flowering stage. The results showed that there were a significant effect of the NPK fertilizer on the vegetative and floral growth characteristics of the carnation plants. The highest concentration of 3.0 g pot<sup>-1</sup> gave the greatest values for plant height, stem diameter, leaf area, total number of flowers per plant, flowering period length, and specific weight of volatile oil (53.05 cm, 0.53 cm, 10.66 cm<sup>2</sup>, 34.71 flowers, 7.05 cm, 80.64 days, 0.7478 g mL<sup>-1</sup>, respectively). Likewise, the seaweed extract at 5 mL L<sup>-1</sup> had a significant positive impact on the same characteristics. The interaction between the NPK fertilizer at 3.0 g pot<sup>-1</sup> and the seaweed extract at 5 mL L<sup>-1</sup> further improved the vegetative and floral characteristics, with the highest recorded values for plant height (61.34 cm), stem diameter (0.56 cm), leaf area (12.26 cm<sup>2</sup>), total number of flowers per plant (40.68 flowers), flowering period length (7.22 cm), and specific weight of volatile oil (0.7550 g mL<sup>-1</sup>). The results of GC-MS analysis showed many active compounds in the flowers which alkaloids, saponins, tannins, glycosides, resins, coumarins, cinnamic acid, lignan, and gallic acid. These compounds differed in concentration and abundance depending on the treatment applied. Also, the study highlighted that carnation flowers contain biologically active compounds, which differ based on the treatment conditions.

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## 1. Introduction

The carnation (*Dianthus caryophyllus* L.) is one of the world's most important picking flowers. This plant originally from the Mediterranean region, carnations began to spread across Europe in the sixteenth century and reached America by the mid-nineteenth century (Singh et al., 2005). Carnation plant is belonging to the Caryophyllaceae family, that includes plants that typically grow in the temperate zones of the northern hemisphere. This family contains 2,100 species and 89 genera,