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## Carnation: Deficiency and toxicity symptoms of nutrients in plant

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### Introduction

The carnation (*Dianthus caryophyllus* L.), a member of the Caryophyllaceae family, is one of the most widely used cut flowers for commercial purposes worldwide. Carnations need a sandy loam soil that drains well and has a pH between 5.5 and 7.0. In India, it is typically grown under protected cultivation. It is a heavy feeder that thrives when fed the proper fertilizer at the appropriate time. Micronutrient deficiencies occur above a pH level of 7.5. Nutrients can be provided through fertigation or direct application to the soil after the first three weeks during which nothing should be applied.

### Deficiency symptoms:

- 1. Nitrogen:** Symptoms begin when the soil content has reached 10 ppm. The leaves of the N-deficient plant lose their distinctive curl and become a brittle, straight, and erect shape. The emergence of a waxy cuticle and a bluish hue take place. The terminal leaf pair fusion tends to last longer than usual during the moment of bluish tint starts to develop. Even though the deficiency is typically detected before this phase, if allowed to go further, terminal leaf pairs will fuse and the growth of the developing point will be checked upward. The stem breaks through the joined leaf pairs one or two inches back from the apex due to the constant force of growth, resulting in the symptom known as "curly tip."

- **Management:** Applying 200 ppm of N during each irrigation, two to four times per week, can cure the deficiency.
- 2. Phosphorous:** Phosphorus deficiency results in stunted plants and reduced growth. The leaves start to slenderize, and the tips start to dry out and become yellow. In extreme circumstances, the entire plant will begin to turn yellow and die before its time.
- **Management:** Soil application of Super phosphate @ 200 g/ 100 sq ft.
- 3. Potassium:** Deficiency takes place when soil concentrations reach 40ppm. Symptoms include burning of the leaf blade and the appearance of yellowish necrotic patches on upper middle leaves. In severe cases, white spots appear right below the blossom on foliage plants, and the affected areas become dry and shrivelled. Flowers become deformed and less vibrant, the calyx begins to turn yellow, and the blooms die completely just as the petals start to open. K-deficient plants have decreased flower production, grade, stem strength, and longevity.
- **Management:** Spray of 200-300 ppm of K with each watering two to four times a week.
- 4. Calcium:** Thin and frail stems, tiny, and sleepy flowers, crescent-shaped necrotic lesions (2 to 5 cm) near the leaf tip, and calyx scorch are all signs of calcium scarcity.
- **Management:** The best soil pH range for carnation production is between 6 and 7, which can be achieved by incorporation of lime. Calcium insufficiency manifests when pH goes below 5.
- 5. Magnesium:** Chlorosis that extends downward from the leaf tips to the centre of the leaf is a sign of magnesium insufficiency. Interveinal discoloration in older leaves is a typical sign of magnesium inadequacy. Visual diagnosis of this impairment is challenging since it matches the symptoms of poor lighting or warm night time temperatures. An overall decline in the plant's vitality and strength is the sign. Flowering stems deteriorate and can no longer hold the flower heads. Magnesium deficits could result from excessive potassium application to the soil.
- **Management:** Deficiency can be corrected by applying Epsom salts @ 225 gm/100 sq. ft.

- 6. Boron:** Carnation boron deficiency manifests as calyx splitting, buds abortion, smaller flowers, and decreased flower yield. Reduced internodes, clubbiness, deformed flower buds, and "witch's broom" symptoms are caused by foliar boron levels of 20 to 25 ppm or below.
- **Management:** Boron is applied at a rate of 1/2 ounce per square foot of bench space to rectify the deficiency. There is no requirement to apply boron separately when complete fertilisers which contain boron are typically applied on a regular basis.

#### **Toxicity symptoms:**

- 1. Copper:** There have been reports of copper toxicity, especially following long-term usage of copper-containing fungicides. The symptoms of toxicity include cracks on the stem and flower buds.

➤ **Management:** Lime or dolomite can be used to raise the pH of the soil, and organic matter can be added to lower the quantity of copper in the soil.
- 2. Boron:** The crop may tolerate toxicity from boron relatively well. However, boron concentrations more than 3000-5000 ppm have been discovered to be harmful to plants, which manifests as symptoms of leaf tip burn.

➤ **Management:** Check the pH of the soil; it should be neutral; if not, it should be neutralized so that the plant can continue to grow strong because at neutral pH, more nutrients are available. After that, analyze the levels of boron and calcium in the soil. When boron levels are high and calcium levels are low, calcium-containing fertilizers are applied to the soil to lower the boron levels. Organic matter should not be used since it incorporates boron when break down and boosts the soil's ability to store boron.
- 3. Chlorine:** Chlorine is frequently harmful. Excess chlorine causes necrotic region at the tips of all leaves, giving them a burnt appearance. Carnations are delicate to chloride, thus wherever feasible, fertilizers should be applied in the sulphate form.

➤ **Management:** Adjust the pH of the soil to neutral, and it should drain well. Because chlorine is rapidly leached out of soil, repeated watering can be used to treat transient toxicity.



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