AgriCos e-Newsletter
ISSN: 2582-7049
Volume: 02 Issue: 09 September 2021 Article No: 17

Importance of Micronutrients in Flower Crops

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SUMMARY

Flowers are the symbol of love, beauty and purity. Flowers have very high demand in the domestic and international market throughout the year. Flowers with the good qualitative characters fetch very high economic values. Generally, in the cut flower crops, the quality is most important for the vase life, postharvest quality and life of the flowers. Proper fertilization and nutrition is very important for the successful production of flower crops in open and under protected conditions. Optimum fertilization of micronutrients is very necessary for the quality cut flower production. Fertilization of macronutrients and micronutrients in combination control the plant growth in flower crops. Micronutrients are involved in the various metabolic and cellular functions in flower crops. Micronutrients viz., Boron (B), Chlorine (Cl), Copper (Cu), Iron (Fe), Zinc (Zn), Manganese (Mn), Molybdenum (Mo) and Nickel (Ni) paly vital role for the production of quality cut flowers and increase the yield of flowers by involving in oxidation reduction process, photosynthesis and energy transfer.

INTRODUCTION

Flowers are the god's wonderful gift to the nature and human being. Flowers are the symbol of love, beauty, purity and it expresses the human feelings through its colours. Flowers are associated with the human being from the ancient age. Floriculture is the art, science and knowledge about the production, cultivation including marketing, arranging flowers and foliage. The flowers like rose, carnation, gladiolus, tuberose, anthurium, gerbera and marigold have high demand in the market throughout the year. Also, the flowers are used as a cut flower for the preparation of bouquets, floral arrangements, floral decorations, arranging in vases have high demand in the domestic as well as in the international flower market and fetch a very high price, if they have quality. Quality is most important in respect of cut flowers. Micronutrients play an important role in the production of quality cut flower. The nutrients elements or fertilizers which are required comparatively in a small quantity is called as micronutrients. Micronutrients have high importance in the flower crops for quality cut flower production. The role of micronutrients are very important in the various metabolic processes, enzymes, carbohydrate metabolism, protein synthesis, cellular functions and other plant processes. The micronutrients Boron (B), Chlorine (Cl), Copper (Cu), Iron (Fe), Zinc (Zn) and Manganese (Mn) are most important for the better plant growth, flowering and quality flower production in commercial flower crops.

Role of micronutrients and their effect on growth, flowering, flower quality and yield of flower crops

Zinc

Zinc is the most important micronutrient which are generally used in the flower crops. Zinc is an important micronutrients for the formation and activity of chlorophyll and in the functioning of the several enzymes and growth hormones and auxin. Zinc is very effective plant nutrition for the plant hormones synthesis and balancing the intake of P and K inside the plant cells. Zinc play an important role as a component of enzymes for the synthesis of protein, production of energy and maintains the structural integrity of bio membranes. It is important for the seed development and its deficiency show delayed in maturity. Saini *et al.* (2015) reported that the foliar application of zinc 0.5% recorded maximum plant height at 90 DAT, plant spread N-S and E-W direction at flower bud initiation stage, N-S and E-|W direction at full bloom stage, number of primary branches and secondary branches at full bloom stage, leaf area, number of suckers plant^{-1}, fresh weight and dry weight in rose cv. Dallas. Bhaskarwar *et al.* (2017) studied the effect of Zinc sprays on growth and yield of rose cv. Centenary and revealed that the treatment of foliar spray of zinc 0.5% followed by Zinc 0.75% recorded significantly maximum vegetative growth viz. plant height, leaves branch^{-1}, stem diameter of plant, yield in respect of number of flowers plant^{-1} and quality in respect of diameter and length of flower bud, weight of flower and vase life of flower. The earlier flower bud initiation and 50% flowering is also registered in the same treatment.

Iron

Iron is also essential and important micronutrient in commercial flower crops. It is an essential for almost all the living organisms and plants because, it plays an important and critical role in the metabolic processes such as photosynthesis, chlorophyll synthesis, DNA synthesis, nitrogen fixation, respiration and uptake mechanisms. It also an active cofactor of many enzymes that are essential for the plant hormone synthesis such as 1-aminocyclopropane acid-1-carboxylic oxidase or abscisic acid, ethylene and lypogenase. It is also necessary for the reduction of nitrates and sulphates. It is involved in the numerous electron transfer chain. Deficiency of iron severely affects the plant growth and development and excess iron in the cell is toxic. Deficiency of iron may occur at high soil pH, free calcium carbonate, cool damp spring, low organic matter, low level of oxygen in soil, high temperature and high soil phosphorus, copper, manganese and zinc (Salem *et al*., 2019). Tayade *et al.* (2018) revealed that the early initiation of spike, days to opening of first floret, days to 50% flowering and days to first harvesting were recorded with the foliar application of 0.4 % $FeSO_4$ when compared to the control. Foliar spray of 0.4% $FeSO_4$ increased the quality parameters like length of spike, diameter of spike, length of rachis, length of floret, diameter of floret and vase life.

Boron

Boron is also important and essential micronutrient for the flower crops. It is essential for the plant growth, translocation of sugar, new cell division in meristematic tissue, starch, nitrogen, phosphorus certain important hormones, synthesis of amino acids, protein regulations of carbohydrates metabolism and development of phloem. In the absence of adequate supply of boron, the leaves of the plant may have thick coppery texture and sometimes curl and quite brittle. Boron deficiency is seen on the different parts of the plant such as internodes become nearly shorter and brittle leaves. Flowering is suppressed and flower often falls (Karuppaiah, 2019).

Copper

Copper is also important micronutrient for the flower crops for proper growth and quality of cut flower. Copper is essential for the many plant processes like mitochondrial respiration and photosynthesis, carbon and nitrogen metabolism, oxidative stress protection and is also required for the synthesis of cell wall. Copper increased the contents of chlorogenic acids, and the two flavone ingredients (cyanidenon and versulin) and improves quality.

Manganese

Manganese is important micronutrient which are necessary for the chlorophyll formation for photosynthesis, nitrate assimilation, respiration and for the activities of several enzymes. The range of manganese concentration in leaves is 10-15 ppm when deficient and in thousand ppm when it is toxic. The deficiency of manganese is shown on the younger leaves. Manganese availability is reduced in calcareous soil with high pH but it is often high in the acid soil. Light green mottle between the main veins is the deficiency symptoms. Application of manganese in the soil cannot be effective due to its immobilization in heavier soil or the over limed soil. Two to three foliar spray of 0.1% manganese sulphate can be recommended (Ganesh and Kannan, 2013).

Chlorine

Chlorine is exist in more than 130 organic compounds in plants. Most soils have sufficient levels of chlorine. Chlorine affects indirectly the growth of plants by stomatal regulation.

Molybdenum

Molybdenum is required for the assimilation of nitrates and for the atmospheric nitrogen fixation. Molybdenum functions in the enzyme nitrate reductase which is responsible for the reduction of nitrate to nitrite during assimilation of nitrogen in plants (Ganesh and Kannan, 2013).

Effect of micronutrients in combination on flower crops

Jagtap *et al.* (2012) studied the effect of micronutrients on growth and flowering of rose under polyhouse condition. and they noticed that the foliar application of 0.3 % $ZnSO_4$ + 0.3 % $MnSO_4$ + 0.3 $FeSO_4$ recorded

maximum number of branches, number of leaves shoot^{-1}, number of leaves plant^{-1} and flowering attributes like minimum days required for first flower bud initiation and increase the flower yield and quality. Patel *et al.* (2017) investigated the effect of application of micronutrient (Fe & Zn) on growth, flowering quality and yield of tuberose (*Polianthes tuberosa* L.) cv. Prajwal and reported that the interaction effect of zinc sulphate and iron sulphate on flower quality parameters of tuberose was found to be significant *viz.*, length of flower spike, rachis length, number of florets per spike and *in-situ* longevity of spike. Poornima *et al.* (2018) reported that the foliar application of $ZnSO_4$ (0.75 %) + Boric acid (0.5 %) + $FeSO_4$ (1.5 %) + $MgSO_4$ (0.5 %) + $MnSO_4$ (1 %) + CuSO4 (0.3 %) recorded increased flower diameter, flower stalk length. number of petals flower^{-1}, sensory evaluation score, shelf life, flower yield plant^{-1}, 100 flower weight, flower yield ha^{-1} in floribunda rose. Tayade *et al.* (2018) revealed that the combine foliar application of 0.4 % $ZnSO_4$ and 0.4 % $FeSO_4$ recorded significantly minimum days to initiation of first spike, days to opening of first pair of floret, days to 50% flowering and days to first harvesting and increased quality parameters like length of spike, diameter of spike, length of rachis, length of floret, diameter of floret and vase life in tuberose. Karuppaiah (2019) reported that the significantly increased plant height, number of side shoots plant^{-1}, number of leaves plant^{-1}, plant spread, leaf area, chlorophyll content and dry matter production and yield attributes, viz., number of spikes plant^{-1}, spike length, rachis length, number of flowers spike^{-1}, flower length, flower diameter, hundred flowers weight, flower yield plant^{-1}, flower yield plot^{-1}, flower yield hectare ha^{-1}, number of bulbs and bulblets and weight of bulbs and bulblets plant^{-1} and the quality characters such as shelf life and visual scoring were recorded with the treatment combination of 25 t ha^{-1} FYM + Recommended dose of 200:200:200 kg ha^{-1} NPK + Zinc sulphate @ 0.50 % + Borax @ 0.50 %.

CONCLUSION

In the highlights of the above scientific description we can conclude that the micronutrients are very important in flower crops for the plant growth and development. Its deficiency in the plant cause stunted growth. The micronutrients like iron, zinc, copper, boron, manganese etc. are very important for the plant growth, flowering, flower quality and flower yield of commercial flower crops when it is used individually or in combination with the other micronutrients.

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