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Effect of Sulphur Deficiency on Gerbera Grown on Cocopeat Under Polyhouse Conditions

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Abstract

The results of the experiment revealed that due to sulphur deficiency newly emerging younger leaves became yellow and chlorotic. As deficiency increases leaves became yellowish white and chlorosis was clear. The roots of gerbera plant became small as compared to all nutrients treatment. Flower colour changes from orange to light orange (from Indian orange to nasturtium orange) from 155 days onwards upto last harvest.

Keywords: Gerbera; Sulphur; Cocopeat; Deficiency symptoms.

INTRODUCTION

Gerbera is an important commercial flower crop grown throughout the world in a wide range of climatic conditions. Gerbera rank 4th among the cut flowers demand (*Sujatha*[5], et. al., 2002). Maharashtra is one of the pioneer state for protected flower cultivation. In Maharashtra, the area under polyhouse for production was 600 hectares in the year 2010. Out of that more than 100 hectares area is being adopted for gerbera cultivation with 1476 lakh flowers per year with a productivity of 250 flowers/m^2 (Anonymous[1] 2010). The area under protected gerbera cultivation is mostly confined in Pune, Satara, Kolhapur and Nashik etc. This crop is having lot of scope for export. The success of gerbera cultivation under polyhouse depends largely on nutrient management apart from other factors. There is very little information available about correct diagnosis of particular nutrient deficiency in crop plants. The criterion of essentiality given by *Arnon and Stout*[2] (1939), states that 17 essential nutrient elements required for plant to complete their life cycle. Out of 17 essential elements sulphur is important for plant to complete their life cycle. Sulphur has been described as the fourth major nutrient after nitrogen, phosphorous and potassium. It is an essential secondary plant nutrient that plays a vital role in synthesis of chlorophyll. It ranks in the importance with nitrogen and phosphorous in the formation of protein and is involved in the metabolic and enzymatic processes of all living cells. Sulphur is constituent of amino acids like methionine, cystein, cysteine (which are also important component of proteins), enzymes, vitamins, lipoic acid and acetyl CoA. It is also essential to study the effect of

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deficient nutrient on movement or accumulation of other nutrients. Depending upon the crops, plants having less than 0.1% sulphur – content suffer from sulphur deficiency. Crop plants having N:S ratio more than 16:1 also can be suspected to be deficient in sulphur. Sulphur deficiencies first appear on the younger growths as sulphur is immobile in plants. The fading of normal green colour of the young leaves followed by chlorosis is the most common deficiency symptom. Young leaves are light green with light colour veins. Yellow leaves and stunted growth. In general, deficiency of sulphur begins with yellowing of leaves, veins are paler than interveinal portion, leaves become small. Unlike nitrogen deficiency sulphur deficiency first appear on the younger leaves and persist even after nitrogen application. Gerbera growing farmers facing problems to rectify the deficiency symptoms of various nutrients under polyhouse condition. The success of gerbera cultivation under polyhouse depends largely on nutrient management apart from other factors. Therefore it is necessary to know the effect of sulphur deficiency on yield and dry matter of Gerbera.

MATERIAL AND METHODS

The present investigation on "Diagnosis of sulphur and copper deficiency on gerbera grown on cocopeat under polyhouse conditions" was undertaken during 2013-2014 at the Hi-Tech Floriculture and Vegetable Project, College of Agriculture, Pune on gerbera cv. Goliath in a factorial completely randomized block design with three replications. There were sixteen (15 + 1) treatment combinations with 3 main treatment (Nutrient combination) and 5 subtreatments (harvesting days). Main teratments consist of T_1 treatment combinations were supplied with all nutrients solution, T_2 treatment combinations were supplied with all nutrients without sulphur solution and T_3 treatment combinations were supplied with all nutrients without copper solution. Subtreatments includes harvesting at 115, 130, 145, 160, 175 days after planting. Fertigation through drippers was started after 21 days after planting and this was continued up to 100 days after planting to all plants. All nutrients fertigation was given upto 100 days. There after the treatments were started and fertigation was given through saline bottles @ 500ml per each plant per alternate day as per the treatments. It was carried out by following tank A and tank B stock solutions. Tank "A" for all nutrients, without sulphur, without copper were prepared in 25 litres stock solution and stored in cans, whole tank "B" for all nutrients, without sulphur, without copper were also prepared 25 litres stock solution, it was also stored in cans. Twenty five litres of tank "A" and tank "B" solutions were prepared. The solution was diluted from both the tanks (10 ml from tank A + 10 ml from tank B prepared volume 1 litre adjusted pH 5.0-6.1, EC 1.2-1.4 dSm-1) and 500 ml given per plant/alternate day. The dose of nitrogen 200, phosphorous 60 and potassium 260 mg/plant/alternate day before flowering was applied. After flowering, to meet the demand of the crop the dose was incresed for nitrogen 350, phosphorous 60 and potassium 300 mg/plant/ alternate day. All nutrients were given toplants upto 100 days and treatments were started after 100 days. These fertigations through saline bottles were continued up to 175 days after planting i.e., till the final harvest on every alternate day. Cocopeat used for experimental purpose is acidic in nature (pH 5.70) and having very high water holding capacity (81.0%). It contains all the nutrients in limited quantities but rich in iron. The cocopeat contains 0.61% sulphur initially. The cocopeat also have high CEC and is responsible for holding the nutrients added in growth media. Amongst the micro nutrients, comparatively higher values of iron than that of zinc, manganese and copper were found in cocopeat. The data recorded was statistically analysed using factorial complete randomized design for each treatment by the methods described by *Panse and Sukhatme*[4] (1985).

RESULTS AND DISCUSSION

Table 1: Days required for initiation and location of deficiency (with photographs)

Nutrient	Location and plant part on which deficiency appeared	Days at which deficiency appeared	Symptoms
Sulphur	Top and newly emerged young leaves	124 days after planting	Leaves became yellow and chlorotic. As deficiency increases leaves became yellowish white and chlorosis was clear.
	Roots	145 days after planting	Roots became short and thin
	Flowers	155 days after planting	Flower colour changes from orange to light orange (from Indian orange to nasturtium orange)

Sulphur curtailed from nutrient solution, due to that deficiency appeared on leaves, roots and flowers. It might be due to sulphur has important role in formation of chlorophyll, the green substance in leaves that permits photosynthesis and plants produce starch, sugars, fats, vitamins and other vital compounds through photosynthesis. Similar results for sulphur deficiency on leaves and roots were reported by *Tewari*[6] et al.(2010) and *Juszczuk* and *Ostaszewaska*[3] (2011) respectively.

Plate 1: Initiation and development of sulphur deficiency symptoms on leaves

All nutrients (T_1)

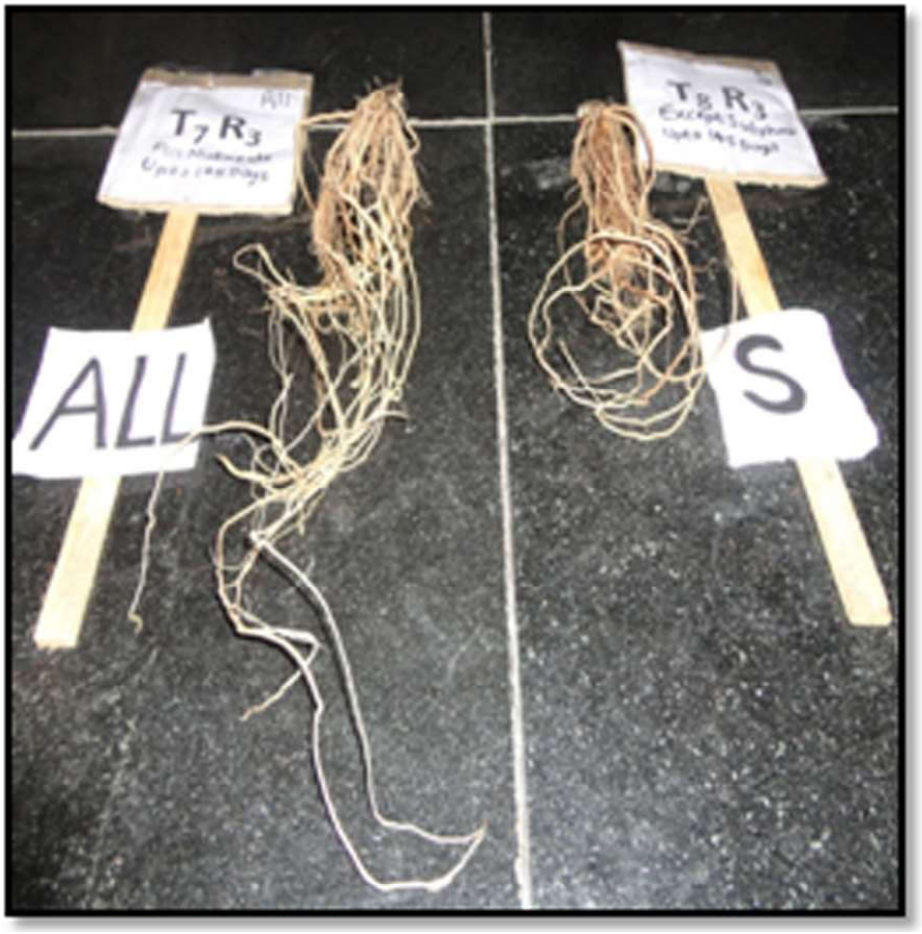
Without S at 124 DAP (T_2)

Without S at 130 DAP(T_2)

Without S at 145 DAP (T_2)

Without S at 175DAP(T_2)

Plate 2 : Comparison between all nutrients and without sulphur roots



All nutrients (T_7) Withoutsulphur (T_8) at 145 DAP

Plate 3: Comparison between all nutrients and without sulphur flower at 155 DAP

All nutrients (T_1) Without sulphur (T_2) at 155 DAP

CONCLUSION

The results of the experiment revealed that due to sulphur deficiency newly emerging younger leaves became yellow and chlorotic. As deficiency increases leaves became yellowish white and chlorosis was clear. The roots of gerbera plant became small as compared to all nutrients treatment. Flower colour changes from orange to light orange (from Indian orange to nasturtium orange) from 155 days onwards upto last harvest.

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