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# Effect of zinc on growth and seed yield of bottle gourd and their residual effect on succeeding carrot crop

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## ABSTRACT

**A field experiment was conducted to study the effect of Zinc on growth and seed yield of bottle gourd and their residual effect on succeeding carrot crop. Different zinc levels (0 kg, 2.5 kg, 5.0 kg and 7.5 kg ha$^{-1)}$ as soil application found significant influenced the growth, seed yield, nutrient content and yield of succeeding carrot crop. It was recorded that 5.0 kg zinc ha$^{-1}$and 7.5 kg zinc ha$^{-1}$ were found best on vine length, fruit girth, number of fruits per plant, seed yield of bottle gourd, zinc content, protein content and growth and yield of succeeding carrot crop.**

**Key words**: Bottle gourd, zinc growth, seed yield and seed quality.

## INTRODUCTION

Bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] is one of the most important vegetable crops gaining importance due to high yielding potential, steady market price through out the season and export potential. It is good source of protein, carbohydrates, vitamins and minerals and used for different preparations. It has also medicinal properties (Singh and Joshi, 10). It is well demented that the growth and yield of bottle gourd are greatly influenced by wide range of nutrients. Zinc is important micronutrient and is obviously taken up by plants in the ionic form ($Zn^{++}$). The main function of zinc in plants is a metal activator of enzymes like dehydrogenase, proteinase and peptigenase. It is essential for synthesis of tryptophane, a precursor of indole acetic acid (IAA), which is essential for cell division and other metabolic processes.for oxidation-reduction synthesis of tryptophan for growth yield and quality of the crop. Therefore, it is hypothesized that yield of crops can be enhanced to great extent by application of zinc. With this in view, the present investigation was undertaken to find out the suitable dose in bottle gourd and in succeeding carrot crop.

## MATERIALS AND METHODS

The field experiment was conduced during *kharif* and *rabi* season of 2004-05 and 2005-06 at Agricultural Research Station Durgapura, Jaipur. The soil of experimental field was sandy loam having available N (149.9 kg/ha), P (27.4 kg/ha), K (190.5 kg/ha) and pH of 7.7. The treatments comprised four levels of zinc i.e.,0 kg zinc ($Zn_o$), 2.5 kg zinc ($Zn_1$), 5.0 kg zinc ($Zn_2$) and 7.5 kg zinc ($Zn_3$) which were tried in a randomized block design and replicated thrice. The recommended dose of N.P.K. @ 80: 40: 60 kg ha$^{-1}$ was applied uniformly in also the plots. The distance was kept 2.5 meters from row to row and 75 cm plant distance in 6.75 m x 2.5 m plot size. The zinc was applied as per treatment combination through zinc sulphate as soil application one month before sowing of seeds. Inter cultural operations were done according to package and practices.

The data on growth and seed yield attributing characters (vine length, number of primary branches, no. of nodes per plant, fruit length and girth, fruit per plant, No of seeds per fruit and seed yield) and protein and zinc content were evaluated. Zinc content was determined by atomic absorption spectrophotometer. The samples were digested by triacid mixture (Lindsay and Norwell, 7). After harvest of bottle gourd, the beds were prepared at the original place of each plot. Carrot cv. Deshi Red was sown at 30 cm row spacing. A uniform dose of 25 kg $N_2$, 20 kg $P_2O_5$ and 20 kg $K_2O$ per hectare through urea, single super phosphate and muriate of potash, respectively was applied. When carrot roots attained of the marketable stage of maturity, they were dug out with a spade. The root length and girth and yield of carrots were weighed. The pooled data of two years were recorded and subjected to statistical analysis.

## RESULTS AND DISCUSSION

The data revealed that different zinc levels influenced the parameters of bottle gourd as presented

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in Table 1. It clearly indicated that significant vine length, maximum numbers of primary branches per vine, number of nodes per plant were recorded under 5.0 kg zinc $ha^{-1}$. At higher level of zinc 7.5 kg $ha^{-1}$, vine growth was increased but remained at par with zinc 5.0 kg $ha^{-1}$. It might be due to that zinc is also an essential component of enzymes responsible for assimilation of nitrogen help in chlorophyll formation and plays an important role in nitrogen metabolism. Zinc also enhances the absorption of essential elements viz, increasing the cation exchange capacity of roots. The above findings are in close agreement with the findings of Alphonse and Saad (1), Madhusudhan and Shakila (6) in cucumber.

The above data table also revealed that fertilization with zinc at the rate of 7.5 kg $ha^{-1}$ significantly increased the fruit length and girth, number of fruits per vine, number of seeds per fruit and seed yield per ha. However, it was statistically at par with 5.0 kg zinc $ha^{-1}$ in respect to fruit length and girth and number of seeds per fruits. The increased yield and yield attributes with the application of zinc is might be due to increased supply of available zinc to plant growth. Zinc also helped in translocation of constituents from one part to other due to translocation and storage of food material from leaves to fruits and seeds (Phor *et al.,* 9). Nandini and Potty (7) reported that yield of bitter gourd (*Momordica charantia* L.) increased by 33.3% with application of zinc over control.

The zinc content and protein content in seed increased significantly with application of zinc at 7.5 kg $ha^{-1}$. However, this treatment was statistically at par with zinc 5.0 kg $ha^{-1}$ and 2.5 kg $ha^{-1}$ with respect to protein content in seed (Table 2). The beneficial role of zinc in increasing the cation-exchange capacity of roots helped in increasing absorption of nutrients from soil and stimulatory effect on most of physiological and metabolic processes of the plant. The maximum macro and micro nutrient (zinc) content in fruit of cucumber was recorded with application of zinc (Doming and Bertling, 4). Similar results were reported in cauliflower by Balyan and Singh (2), Patnaik *et al*. (8) in tomato and Bhupal *et al*. (3) in brinjal.

Application of zinc to the preceding bottle gourd crop had a significant effect on yield of succeeding carrot crop as per Table 2. The length and width of root and yield of succeeding carrot crop were recorded higher with the result of residual effect of zinc 7.5 kg $ha^{-1}$ applied to bottle gourd crop. It might be due to recovery of applied zinc during one season is not more then 10 to15 per cent so it remains in soil for successive crop. It was recorded that application of zinc had a significant residual

**Table 1.** Effect of zinc on pooled mean growth and yield characters of bottle gourd.

| Characters | Zinc application per ha | | | | |
|---|---|---|---|---|---|
| | 0 kg Zn | 2.5 kg Zn | 5.0 kg Zn | 7.5 kg Zn | CD 5% |
| Vine length (cm) | 433.5 | 475.1 | 495.1 | 502.2 | 15.0 |
| No. of primary branches | 9.38 | 9.72 | 10.02 | 10.44 | 0.38 |
| No. of nodes per plant | 18.36 | 19.12 | 19.62 | 20.04 | 0.65 |
| Fruit length (cm) | 37.32 | 39.54 | 40.17 | 41.07 | 1.72 |
| Fruit girth (cm) | 23.04 | 24.57 | 24.78 | 25.60 | 0.93 |
| No. of fruits per plant | 2.29 | 2.56 | 2.75 | 2.95 | 0.103 |
| No. of seeds per fruit | 429.17 | 437.65 | 457.48 | 461.40 | 13.25 |
| Seed yield per ha (kg) | 705.11 | 812.42 | 916.71 | 991.16 | 43.47 |

**Table 2.** Effect of zinc on pooled mean nutrient contents of bottle gourd seed, growth and yield of succeeding carrot crop.

| Characters | Zinc application per ha | | | | |
|---|---|---|---|---|---|
| | 0 kg Zn | 2.5 kg Zn | 5.0 kg Zn | 7.5 kg Zn | CD 5% |
| Zinc content of seed (ppm) | 32.71 | 33.46 | 35.00 | 38.11 | 0.63 |
| Protein content of seed (%) | 18.84 | 19.06 | 19.21 | 19.29 | 0.23 |
| Length of roots (cm) | 12.30 | 14.25 | 15.50 | 16.30 | 1.12 |
| Width of roots (cm) | 24.40 | 26.55 | 29.80 | 34.25 | 2.78 |
| Yield of roots (qt. $ha^{-1}$) | 238.98 | 244.70 | 253.18 | 271.24 | 7.08 |

effect on the yield of succeeding tomato and okra crop (Taya *et al*., 11).

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