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Effect of micro nutrient on growth and yield of bottle gourd (*Lagenaria siceraria* L.)

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Abstract

The present investigation entitled “Effect of micronutrients on growth and yield of bottle gourd (*Lagenaria siceraria* L.)” was carried out during the year of 2023-24 Kharfi season 2023-24, at Department of Horticulture, Chandra Bhanu Gupta Agriculture PG College, Lucknow (UP). The different levels of micro-nutrients (T₀: control-water spray, T₁: ZnSO₄ 0.25%, T₂: ZnSO₄ 0.5%, T₃: ZnSO₄ 0.75%, T₄: boric acid 0.2%, T₅: Boric acid 0.3% and T₆: boric acid 0.4%) were used. The experimental results revealed that the maximum length of vine (410.10cm) and maximum length of internode (15.20cm) was recorded with application of boric acid 0.2%. While number of branches per plant was highest with boric acid 0.4%. In respect of flowering, minimum days to first male flower (48.8) and female flower (60.0) were noticed with treatment T₂ (ZnSO₄ 0.5%). However, number of fruit per vine (5.9), average fruit weight (703.20g), fruit yield per plot (24.80kg) and per hectare (298.3q) were found to be maximum with the application of ZnSO₄ 0.75% (T₃).

Keywords: *Lagenaria siceraria*, micro nutrient, micronutrients, bottle gourd, application

Introduction

Bottle gourd (*Lagenaria siceraria* L.) belongs to the family Cucurbitaceae and originated from Africa (Chakravarty, 1982)^[7]. The genus of bottle gourd *Lagenaria* is derived from the word ‘*lagena*’ meaning the bottle (Minocha, 2015)^[12]. It is also known by some common names like *calabash*, *moraka*, *segwana* and *iselwa* (Anonymous, 2016)^[4]. The tropical regions are most suited for this plant and widely cultivated in India, Sri Lanka, Indonesia, Malaysia, Philippines, China along with Tropical Africa and South America. In India, the major states under its cultivation are Bihar, Madhya Pradesh, Chhattisgarh, Uttar Pradesh, Orissa, Punjab, Telangana, Andhra Pradesh, Jammu & Kashmir, Rajasthan, Tripura, Delhi, Karnataka, Meghalaya, Tamil Nadu, Kerala, Jharkhand, Sikkim, Haryana and Assam (Anonymous, 2015)^[3]. It is used to for the treatment of jaundice, diabetes, ulcer, piles, colitis, insanity and hypertension. It is important in case of treatment for congestive cardiac failure (CCF) and skin diseases (Minocha, 2015)^[12]. The important preparations are *Kofta* and *Petha*.

Bottle gourd is a monoecious and annual plant with trailing or climbing vine. Flowers are stalked, *i.e.*, female flower stalks shorter than male. These are solitary, unisexual and axillary. The staminate and pistillate flowers occurring in various arrangements and present separately on the same plant (Desai *et al.*, 2011)^[9]. Sex of flowers is influenced by temperature and temperature resulted into staminate flowers (male) whereas low temperature favours the pistillate flowers (female). The long day with high light intensity favours the staminate flower production and resulting into lesser production in term yield per unit area. Micro nutrients play an important role in vegetative growth and reproductive growth. The simplest and most effective methods *i.e.* foliar application of micronutrients can be considered to carry the necessary nutrients to plants to a sufficient level. The balanced doses of these micronutrients have a potential to increase the growth characteristics and quality of the crop to match the national and international standards.

The use of leaves of zinc and boron has a beneficial role in improving the production and quality of plants due to their involvement as a stimulant of various enzymes and other active physical molecules (Alloway, 2018)^[2]. However, the combination of iron, boron and molybdenum soils is more than the needs of plants but these nutrients cannot be easily absorbed by plants.

Materials and Methods

A field investigation entitled “Effect of micro nutrient on growth and yield of bottle gourd (*Lagenaria siceraria* L.)” was conducted at Shradhdhey Bhagwati Singh Agricultural farm of C.B.G Agriculture PG College, Bakshi Ka Talab, Lucknow (Uttar Pradesh) during the year 2023-2024. The soil of experimental field was loamy sandy in the texture and slightly alkaline in reaction with EC in safe range. The experiment was laid out in randomized block design with seven treatments and three replications.

The observations were made on main vine length (cm), number of branches per vine, days to first male flower, days to first female flower, node to first male flower, node to first female flower), days to first picking, number of fruits per vine, fruit diameter (cm), fruit length (cm), average fruit weight (g), fruit yield per plot and fruit yield per hectare (q).

Results and Discussion

Growth and Flowering parameters

The various concentration of micro nutrients significantly influenced the main vine length (cm) and number of branches per plant of bottle gourd plants. The maximum vine length (410.10 cm) and internodal length (15.20 cm) at final harvest were recorded under the treatment T₄ i.e. application of Boric acid @ 0.2% while the number of branches per plant maximum (12.20) was recorded when the crop was treated with Boric acid 0.4% (T₆), however, the minimum vine length (374.0 cm), number of branches per vine (10.10) and internodal length (13.20 cm) were recorded with control. This favorable effect of boron on

vine length, number of branches and internodal length of bottle gourd might be due to the stimulating influence of boron enhancing the rate of absorption of N, P and K and other nutrients. Moreover, boron took part in sugar translocation which might have helped to the increase height of plants. This is in accordance with the findings of Saha *et al.* (2010) [15] in sprouting broccoli. An increment in plant height may be due to contribution of boron, zinc and molybdenum in cell division and meristematic growth of the tissue. Boron, Mo and Zn reported to increase the plant height of cabbage. Similar result was showed by Agarwal *et al.* (2010).

A significantly minimum number of days to appearance of first male flower (48.8 days) and to appearance of first female flowers (60.00 days) were recorded with the application of ZnSO₄ @ 0.75% (T₃). However, it was statistical at par with the treatment T₁, and T₆ while the maximum number of days 54.10 and 63.60 days to first male and female flowers, respectively were appeared under the control (Table 1). It might be because of increase in RNA and DAN contents in the reproductive tissues in presence of zinc resultantly enhance the flower bud initiation (Bose and Tripathi, 1996) [6] and feeding of micronutrients might be due to enhanced photosynthetic and other metabolic activities which lead to increase in various plant metabolites responsible for cell division and elongation as opined by Hatwar *et al.* (2003) [10]. These findings are in agreement with the results of earlier workers Narayanamma *et al.* (2009) in bitter gourd and Rab and Haq (2012) in tomato [13, 14].

Table 1: Effect of micro nutrients on growth and flowering patterns of bottle gourd

Treatments	Main vine length (cm)	Number of branches/vine	Length of internodes (cm)	Days to first male flower	Days to first female flower
T ₀ -(Control)	374.00	10.10	13.20	54.10	63.60
T ₁ -ZnSO ₄ 0.25%	384.60	11.20	15.10	51.60	62.20
T ₂ -ZnSO ₄ 0.50%	380.70	12.01	14.60	53.30	61.40
T ₃ -ZnSO ₄ 0.75%	374.20	12.20	14.10	48.80	60.00
T ₄ -Boric Acid 0.2%	410.10	10.40	15.20	49.20	60.20
T ₅ -Boric Acid 0.3%	406.20	11.20	14.60	51.60	62.20
T ₆ -Boric Acid 0.4%	394.50	12.30	13.70	52.20	62.10
SE(m) ±	3.97	0.45	0.41	0.85	0.63
CD (P=0.05)	12.38	1.40	1.30	2.67	1.97

Table 2: Effect of micronutrients on yield parameters in bottle gourd

Treatments	Number of fruits per vine	Average fruit weight (g)	Fruit yield per plot (kg)	Fruit yield per hectare (q)
T ₀ -(Control)	3.60	646.60	21.50	259.40
T ₁ -ZnSO ₄ 0.25%	5.20	653.20	23.60	282.50
T ₂ -ZnSO ₄ 0.50%	5.60	683.40	24.10	289.70
T ₃ -ZnSO ₄ 0.75%	5.90	703.20	24.80	298.30
T ₄ -Boric Acid 0.2%	4.60	646.60	23.70	285.50
T ₅ -Boric Acid 0.3%	4.20	670.10	22.60	272.30
T ₆ -Boric Acid 0.4%	4.10	693.10	22.20	268.10
SE(m) ±	0.25	5.03	0.61	5.27
CD (P=0.05)	0.78	15.68	1.90	16.43

Yield parameters

The fruit yield traits like number of fruit per vine, fruit length, fruit diameter (cm), average fruit weight (g), fruit yield per plot and per hectare were significantly influenced by spray of various concentration of different micro nutrients (Table 2).

The spraying of various concentrations of different micronutrients significantly increased the fruit yield and

yield attributing characters such as number of fruits per vine, fruit length, fruit diameter (cm) and average fruit weight (g). The best results with the maximum number of fruits per vine, fruit length, fruit diameter (cm), average fruit weight (g) and fruit yield per plot and per hectare were obtained when the crop was sprayed with ZnSO₄ @ 0.75% (T₃) due to higher number of female flowers, higher number of fruits, more average fruit weight and higher fruit yield per

vine which might be due to an increased rate of photosynthetic activity to build-up sufficient food stock, accelerated transport, efficient utilization photosynthetic products for developing female flowers, fruits and more fruit weight, ultimately leading to higher yield. These results corroborate the finding of Arora *et al.* (1994) [5] in long melon, Kshirsagar *et al.* (1995) in cucumber and Das and Das (1996) in pumpkin [8, 11].

Thus application of micronutrients showed significant variations for all growth and yield attributes of bottle gourd. Among all the treatments, application of (T₃) ZnSO₄ @ 0.75% was rated as the best treatment in terms of growth and yield. Hence, with the aim to get more yield three foliar spray of ZnSO₄ @ 0.75% can be recommended for commercial cultivation of bottle gourd.

Conclusion

The study clearly demonstrates that the foliar application of micronutrients significantly influences the growth and yield attributes of bottle gourd. Among the treatments, the application of ZnSO₄ at 0.75% (T₃) produced the most promising results, enhancing vine growth, reducing the days to flowering, and increasing fruit number, size, and overall yield. The positive response to ZnSO₄ may be attributed to its role in enzymatic activity, reproductive development, and improved nutrient assimilation. Boric acid treatments also showed beneficial effects on vegetative growth. Therefore, for optimal commercial production, three foliar applications of ZnSO₄ at 0.75% concentration are recommended to maximize yield and improve fruit quality in bottle gourd cultivation.

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