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EFFECT OF FOLIAR APPLICATION OF ZINC AND BORON ON YIELD AND FRUIT QUALITY OF LITCHI CV. DEHRADUN

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ABSTRACT

The present investigation was conducted in the litchi orchard of Sh. S.S. ParmarNangal, Pathankot and in the laboratory of department of horticulture, Khalsa College, Amritsar in the year 2015 to assess the effect of foliar application of zinc sulphate and boron both at the concentrations of 0.3 %, 0.6% and 0.9% on the yield and quality of litchi cv. Dehradun. The results of the study indicated that the application of boron 0.9% resulted in maximum fruit weight (22.17 g), fruit size (4.31 x 3.71 cm), pulp weight (17.22 g) and fruit yield per tree (116.74 kg). Minimum stone weight (3.03g) was recorded in the treatment of boron 0.3% while maximum stone weight (3.71 g) was observed in the plants under control.

INTRODUCTION

Litchi (*Litchi chinensis*Sonn.) occupies prime place of importance amongst the fruit crops. It is a popular fruit of family Sapindaceae (Haq *et al.,* 2013). It is an arillate fruit with sweet, translucent and juicy flesh. The fruit is rich in sugars, minerals and vitamins (Marisa, 2006) and can be processed into juice, wine, pickles, jam, jelly, ice cream and yoghurt (Huang *et al*., 2005). Litchi is known for its excellent quality, juicy fruit, slightly sour and sweet taste, characteristic pleasant flavor, attractive colour and nutritional value. It comes to the market in the months of May- June when the market is full of other fresh fruits. But, inspite of the availability of different types of fruit in the market, the demand for fresh litchi is always very high due to its unique taste, flavour and colour (Hossain *et al*., 2014). However, to stay in the global market, which is turning more and more competitive day by day, it is of paramount importance to maintain high standard in the quality of fruits produced, besides imparting fascinating appearance to them and providing longer shelf life. Zinc plays a vital role in the metabolic activities of plants.

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It is a activator of enzymes like dehydrogenase (Pyridine nucleotide, glucose-6, phosphodiesterase, carbonic anhydrase etc). It synthesis tryptophane, a precursor of IAA (Kumar *et al* 2009). Boron, is necessary for hormone metabolism, photosynthetic activities, cellular differentiation and water absorption in plant parts. It leads to lesser flower production and sterility if deficit in Litchi plants. Application of boron increases yield and fruit quality (Ruby *et al*. 2001). Therefore, the present study was designed to determine the influence of foliar application of boron and zinc on thefruit yield and quality of litchi.

MATERIALS AND METHODS

The study on the effect of foliar application of zinc and boron on yield and fruit quality of litchi cv. Dehradun was conducted in the litchi orchard of Sh. S.S. Parmar Nangal, Pathankot and analysis was done in the laboratory of department of horticulture, Khalsa College, Amritsar in the year 2015. $ZnSO_4$ and Borax both at 0.3%, 0.6% and 0.9% were sprayed on new growth flushes before flower initiation. The variety of litchi used for experimentation was Dehradun. The sprays were tested in Randomized Block Design replicated thrice. The litchi trees were 7.50m apart in both directions i.e. between the rows and within the rows having an average height of 7.3 m.

RESULTS AND DISCUSSION

The maximum fruit weight (22.17 g) was noted with boron (0.9%) followed by (21.52 g) with zinc sulphate 0.6% and lowest (19.02 g) in control. The reasons for the increase in fruit weight may perhaps be due to rapid expansion in the size of cells or it be due tothe fact that foliar application of zinc and boron increased fruit weight eventually by maintaining lighter levels of auxins in various parts of the fruits which helped in increasing the fruit growth (Haq *et al*. 2013). The treatment of boron 0.9% registered the maximum fruit size (4.31 x 3.71 cm) followed by boron 0.6%with (4.25 x 3.64 cm) while minimum fruit size (3.50x3.20 cm) was recorded under control. The increase in the size of fruits was due to the rapid fruit development and the greater mobilization of food materials from the site of production to storage organs under the influence of applied nutrients.

maximum pulp stone ratio (5.38) was recorded in the fruits harvested from plants treated with boron 0.3% followed by 0.6% with (5.34) and 0.9% with (5.15) respectively. The minimum pulp /stone ratio (4.03) was observed in untreated fruits. It pertains to the fact that application of boron enhanced the pulp weight and reduced the stone weight which as a consequence gave high pulp/stone ratio. These findings are in line with the findings of Awasthi *et al*., (1999) and Brahmachari *et al.,* (1997) in litchi. The fruits sprayed with boron 0.9% registered the maximum fruit yield (116.74 kg/plant) followed by (114.37 kg/plant) with ZnSO4 (0.9%) and lowest fruits yield (90.81 kg/plant) was noticed in the fruits harvested from untreated plants(Table-2). The increase in the fruit yield was due to the accumulation of sugars and other soluble solids in the fruits. The results of the present investigation get support in the works of Kumar *et al*. (2009) and Dixit *et al*.(2013) respectively.

Table 1. Effect of foliar application of zinc and boron on physical characteristics of litchi cv. Dehradun

Treatments	Fruit size (lxb) cm		Fruit weight (g)	Pulp weight (g)	Stone Weight (g)	Pulp/Stone ratio
	length	breadth				
T_1-$ZnSO_4$(0.3%)	3.56	3.35	20.54	15.17	3.29	4.61
T_2 - $ZnSO_4$(0.6%)	3.68	3.39	21.52	15.49	3.56	4.35
T_3- $ZnSO_4$(0.9%)	3.92	3.46	21.18	15.79	3.57	4.42
T_4- Boron (0.3%)	4.02	3.55	21.05	16.33	3.03	5.38
T_5- Boron (0.6%)	4.25	3.64	21.37	16.84	3.15	5.34
T_6- Boron(0.9%)	4.31	3.71	22.17	17.22	3.34	5.15
T_7- Control	3.50	3.20	19.02	14.98	3.71	4.03
Mean	3.89	3.47	20.98	15.97	3.38	4.75
CD at 5% level	NS	NS	0.645	0.404	0.125	NS

Table 2. Effect of foliar application of zinc and boron on fruit yield of litchi cv. Dehradun

Treatments	Fruit yield/tree (Kg)
T_1-$ZnSO_4$(0.3%)	104.83
T_2-$ZnSO_4$(0.6%)	111.22
T_3-$ZnSO_4$(0.9%)	114.37
T_4- Boron (0.3%)	102.26
T_5- Boron (0.6%)	111.31
T_6-Boron (0.9%)	116.74
T_7- Control	90.81
Mean	107.36
CD at 5% level	1.607

A similar increase in size of fruits by treatment of boron in litchi had also been reported by Stino *et al.,* 2011 and Dixit *et al.,* 2013). The pulp weight was the highest (17.22 g) from the plants treated with boron 0.9% followed by the treatment of boron 0.6% with (16.84g). Thetreatment of $ZnSO_4$0.9% produced pulp weight of (15.49g). All the treatments significantly increased the pulp weight as compared to control (14.98 g). The pulp weight depends on the fruit and seed size (Li *et al.,* 2001) but is affected by the plant nutrition (Kazuhiro *et al*., 2004). Minimum stone weight (3.03g) was recorded in the treatment of boron 0.3% followed by (3.15g) with 0.6% boron and (3.29g) with $ZnSO_4$ 0.3%.

The maximum stone weight (3.71g) was observed in the fruits harvested from untreated plants. Boron produced fruits with smaller stone.This may be due to their involvement in IAA metabolism which reduce stone size. The decrease in stone weight may be due to the fact that auxins induced parthenocarpic effect to some extent there by resulting lesser stone weight (Singh *etal.* 2001). Pulp / stone ratio is the ratio between the weight of pulp and weight of stone. The

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