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FRUIT YIELD AND QUALITY OF PEACH (*Prunus persica* Batsch.) AS INFLUENCED BY DIFFERENTIAL APPLICATION OF ZINC

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ABSTRACT: The data revealed that fruit yield of peach increased with increasing application of zinc sulphate. The maximum fruit size (5.0 cm length and 4.9 cm breadth), fruit weight (89.00g), fruit yield per plant (58.25 kg) and yield per unit area (64.07 q/hectare) were observed with 800 g $ZnSO_4$ per plant as soil application followed by foliar spray (0.5%) whereas minimum yield was obtained without zinc application. Zinc application also improved total soluble solids (TSS) and TSS: acid ratio. However, acidity of fruits obtained from treated and untreated plants was not differ significantly but the highest acid content was observed in control plants, whereas lowest was in foliar application of 0.50 % $ZnSO_4$. Fruits were also more palatable in Zinc applied plants. The highest concentration of zinc (11.55 ppm) in leaves was observed at higher doses of soil zinc application and was in lowest in control plants.

Keywords: *Peach, yield, quality, zinc concentration.*

Peach (Prunus persica) is one of the important temperate fruit grown in Punjab. This fruit crop is popular due to rich source of vitamin-A, iron and proteins. Peach is generally consumed as fresh as well as in the form of squash in the North Indian Plains. Its kernel oil is utilized in the manufacturing of cosmetics and pharmaceutical products. Gangwar *et al.* (6) surveyed the economy of peach cultivation in North Indian Plains and revealed that investment in peach orchards has been found a profitable business. The internal rate of return (IRR) has been found to vary from 20.98 per cent to 23.80 per cent, depending on the size of peach orchards.

Cultivation of stone fruits especially peach, plums and apricot has become popular in the subtropical climates of the North Indian Plains during past few years. The cultivation of this crop in Punjab has been expanded to many folds and occupies an area of about 1476 hectare producing about 25236 tones of fruit annually (Anonymous, 2). Few studies on peach nutrition in Punjab have been conducted and these were limited to N, P, and K application. Foliar fertilization is effective method for the application of micronutrients like zinc to established fruit trees. One of the most critical periods when a zinc shortage may seriously impair tree performance is between bud break and fruit set. A zinc shortage at this time often results in poor growth of the leaves and new shoots, as well as abnormal development of pollen tubes, ultimately resulting in poor seed set in fruit crops. Later in the season, the effects of limited zinc are small fruit, poor yield and quality of fruits. Zinc is not readily mobile within the tree and applications must be thorough and timely for optimal response. Various methods of applying zinc are available; the most common being sprays of zinc sulphate and soil applications of zinc sulphate. The present investigations were conducted to observe the effect of different doses of soil and foliar applied Zn on fruit yield and quality of peach fruits.

MATERIALS AND METHODS

The experiment was carried out to find out the effect of zinc fertilization on the yield and fruit quality of peach at Punjab Agricultural University, Regional Station Bathinda in the year of 2011. The soil of the experimental field was calcareous, non saline and alkaline nature having pH 8.70 and electrical conductivity 0.21 ds m^{-1}. The soil was low in organic carbon (0.21 per cent), medium in available phosphorus (18 kg ha^{-1}) and was high in available K (495 kg ha^{-1}). The content of DTPA extractable Zn was 0.78 mg kg^{-1}. The experiment

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was laid out on 7 years old peach plants. The zinc was applied through zinc sulphate at the rate of 200g, 400g and 800g per plant as soil and 0.50 % $ZnSO_4$ (neutralized with calcium hydroxide) as foliar application. The experiment was conducted in randomized block design (RBD) with four replications.

The basal doses of N, P and K were applied at the rate of 450g, 125g and 500 g per tree, through urea, single super phosphate and muriate of potash, respectively. The foliar spray of 0.50 % zinc sulphate was applied in the month of March. The crop was harvested in the end of April and data on fruit yield and quality were recorded.

The physico-chemical characteristics of fruits were recorded in the months of April-May. The observations on physical characters of fruits and yield were noted in terms of fruit size, fruit weight, yield per plant and yield per hectare. Similarly, the quality characters of fruits were recorded in terms of palatability rating, total soluble solids, acidity and TSS acid ratio. Palatability rating was given on the basis sensory quality and appearance of fruits by the panel of five judges. Total soluble solid was determined by using hand refrectometer and acidity was calculated as per methods of AOAC (1).

For the estimation of zinc in leaves, the samples were collected from the plants in the month of May. The collected leaves were washed with diluted HCL, distilled and finally with double distilled water. The samples were digested in acids mixture for the determination of zinc and analyzed by atomic absorption spectrophotometer. The TSS was estimated by hand refrectrometer and the acidity was estimated by titrating the juice against 0.1 N NaOH solution.

RESULTS AND DISCUSSION

Effect on size and yield of fruits: Fruit size was significantly affected with different applications of $ZnSO_4$. Maximum fruit size in terms of length and breadth (fruit length 5.0 and fruit breadth 4.9 cm) was highest in each T_4 and T_5 and smallest fruits were obtained from plants kept as control (Table 1). The fruit size was significantly smaller in treatments with lower doses of $ZnSO_4$. The results of the experiment also indicated that fruit yield improved with the increasing application of zinc to plants. The yield increased from 45.25 kg per plant to 58.25 kg per plant. Maximum fruit yield of peach was observed with the application of 800g zinc sulphate per plant, whereas the minimum yield (45.25 kg per plant) was recorded in control. The application of $ZnSO_4$ at concentration of 400 and 800g per plant significantly improved fruit yield over control. The effect of foliar application of $ZnSO_4$ at the rate of 0.50 per cent on fruit yield was found statistically at pat with $ZnSO_4$ @ 800 g per plant as soil application and better than treatment T_1 and T_2. The fruit yield per unit area was also highest in highest dose of soil applied $ZnSO_4$, however it was statistically at par with foliar applied $ZnSO_4$ to plants. The similar results were also recorded by Chatzitheodorou *et al.*, (5) who observed that application of Zn through manure improve the yield of peach. Zinc sulphate applied to the soil at the rate of 200 g per tree increased fruit yield markedly (Thomidis *et al.* 7). Similarly, fruit weight was also improved with $ZnSO_4$ application. The increment in fruit weight with increasing doses of $ZnSO_4$ was recorded. The fruits of T_4 and T_5 were heaviest and the weight of fruit in control plant was lowest. It is evident from the results that application of zinc is necessary for obtaining good yield. The increase in fruit size and yield may be due to increase in the rate of photosynthesis and activity of carbonic anhydrous with zinc application in peach plants (Basiouny and Baggs, 3). Tiwari *et al.* (8) also found similar results and observed that foliar application of zinc at the rate of 0.4-0.5 per cent have was effective on improving yield of peach fruit.

Effect on quality: The effect of zinc application on fruit quality (Table 2) showed that the total soluble solids content of the fruits increased significantly in all the zinc treated plants than untreated plants. The highest total soluble solids was recorded in T_4 (11.14 %) followed by T_5 (11.00 %) and lowest total soluble solids (10.08 %)

Table 1: Effect of zinc application on the physical characters and yield of peach fruits.

Treatments ($ZnSO_4$)	Fruit length (cm)	Fruit breadth (cm)	Fruit weight (g)	Fruit yield per plant (kg)	Fruit yield per hectare (q)
Control T_1	4.45	4.4	76.00	45.25	49.77
200 g (SA) T_2	4.50	4.6	79.25	49.25	54.17
400 g (SA) T_3	4.8	4.6	82.25	52.50	57.75
800 g (SA) T_4	5.0	4.9	89.00	58.25	64.07
0.5% (FA) T_5	5.0	4.9	88.00	58.00	63.80
CD (P = 0.05)	0.02	0.02	1.80	6.12	4.05

SA: Soil application, FA : Foliar application.

Table 2. Effect of zinc application on the chemical characters of peach fruits and leaf Zn content.

Treatments ($ZnSO_4$)	TSS %	Acidity %	TSS/Acidity ratio	Palatability rating	Leaf Zn concentration (ppm)
Control T_1	10.08	0.84	12.07	7.8	7.64
200 g (SA) T_2	10.46	0.78	13.42	7.7	10.23
400 g (SA) T_3	10.85	0.78	13.92	8.0	10.35
800 g (SA) T_4	11.14	0.73	15.26	8.1	11.55
0.5% (FA) T_5	11.00	0.75	14.66	8.2	9.70
CD (P = 0.05)	0.52	NS	1.72	0.20	1.17

SA: Soil application, FA : Foliar application.

was in control plant. Similarly TSS/Acidity ratio was also highest in T_4 treatment followed by T_5 and lowest ratio was observed in control. However, the acidity was found to be in decreasing order with the increasing levels of zinc sulphate application. The decrease was observed from 0.84 to 0.73 % from control to 800g Zn application but the effect of zinc on acidity was observed non significant. This shows that in addition to increase in yield of fruit, zinc application had favourable effect in improving the quality of fruit by increasing TSS and reducing acidity in this study. The results are in association with the results of Lal *et al.* (4) who reported that total soluble solids (TSS) in the fruit was significantly higher with the soil application of zinc sulphate (0.5 kg tree ^{1}) as compared with all other treatments of zinc sulphate and the control in mango plants.

Leaf Zn concentration : The data (Table 2) revealed that the concentration of zinc in plant leaves increased with the soil or foliar application of zinc. The concentration of zinc in plant significantly increased in T_2, T_3 and T_4 treatments but the effect among these treatment was found non significant. Maximum concentration (11.55 ppm) was observed in T_4 treatment where zinc was applied through soil application @ 800g per plant, however, minimum concentration (7.64 ppm) was observed in control. In the present investigation data reveals that soil application of zinc contribute in the higher zinc content in plants as compared to foliar application. This may be due to continuous absorption of zinc from soil and its translocation to plant parts whereas foliar application of zinc on plant did not reach the concentration at the level than soil application. Thomidis *et al.* (7) also reported that foliar application of zinc sulphate

solution increased the Zn content of leaves and no toxicity was observed when applied in the month of May. Contrastingly, foliar application of 6 % zinc sulphate and soil application of zinc sulphate at the rate of 200 g per tree did not affect the Zn content of leaves when applied in the month of February.

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