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Effect of foliar spray of boron and zinc on flowering, fruit set and quality of olive (*Olea europaea* L.)

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Abstract
The present experiment entitled "Effect of foliar spray of boron and zinc on flowering, fruit set and quality of Olive (*Olea europaea* L.)" was conducted at Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, during the session 2023 - 2024. The experiment was laid out in randomized block design with three replications, and the study consists of twelve treatment combinations including control. Total 12 treatments were tested and in each treatment 3 plants of different cultivars namely Arbequina, Coratina and Koroneiki were selected for research purpose. Cultivar Koroneiki was found to be superior in respect of the parameters Days to flowering, Number of flowers per panicle, Flower drop percentage, Days from flowering to fruiting, Fruit set percentage, Fruit drop percentage, Fruit diameter, Fruit length, Fruit weight, Fruit yield per tree, Fruit yield per hectare, Oil content and TSS of fruit. Followed by cultivar Arbequina. The lowest readings were recorded in T_0 Control (Water Spray) on the cultivar Coratina and among all the three cultivars.
Increase flowering, fruit yield was might be due to the application of Zinc as Indian soils are deficient of zinc.

Keywords: Olive, zinc, boron, arbequina, coratina, Koroneiki

Introduction

The olive (*Olea europaea* L.) is an evergreen tree but requires chilling for fruiting. Olives are mostly grown for their oil, which is extracted from its fruits. Olive oil possesses numerous biological and medicinal values. The leading olive producing countries of the world includes Italy, Spain, Greece, Portugal etc. The area and production in the world id 8,6115,67 ha and 15,990,353 m. tones, respectively.

In India, olive cultivation restricted to the states of Jammu and Kashmir, Himachal Pradesh and Uttaranchal. In Himachal Pradesh, olives are grown on a limited scale in Kullu, Shimla, Solan and Sirmour districts. Olives trees have been designated as a draught tolerant plant. Therefore, its present plantations have been raised in draught prone and rainfed areas situated in mid hills of this state. The growth flush of olive trees in these areas is confirmed to a very short period of 2-3 months due to occurrence of monsoon rains. These areas experience mild and inadequate winter rains, which results in insufficient chilling of olive trees. Prevalence of such flower bud differentiation.

One of the major concern of olive growers in sub-tropical areas of monsoon type of climate is that yields are often irregular and uneconomical. Poor fruit growth of such trees during autumn season resulted in a poor flowering and consequently a poor set and yield was obtained. Such trees mostly remain baren for most of the years.

Foliar application of boron and zinc can help in increasing foliar zinc and boron level in olive trees, which further plays role in pollination, fertilization and increased fruit set of olive trees. Boron sprays given three days prior to anthesis tended to increase boron concentration in flowers and also increased fruits set (Delagado *et al*. 1994) [2]. Boron and Zinc application alone or in combination tended to decreases the production formation of shoot berries and therefore reduce the extent of fruit abscission during the period of initial and final fruit set. Pre bloom application in olive has increased the fruit set even when boron concentrations was not proper in needs (Hansen, 1991; Delgado *et al*. 1994) [5, 2].

Boron induces pollen tube growth resulted from its role on tryptophan synthesis as an auxin precursor biosynthesis. The main function of boron is related to cell wall strength and development, cell division, sugar transport and hormones development, RNA metabolism, respiration, indole acetic acid (IAA) metabolism and as part of the cell membranes. Lewis (1980) speculated that B may be required in stigma and styles to physiologically inactivate callus present in pollen tube walls that would otherwise elicit phytoalexin production to inhibit pollen tube growth. The boron requirement is much higher for reproductive growth period than for vegetative growth and increases flower production and retention, pollen tube elongation and germination, and seed and fruit development. Several investigators studied the effect of zinc and/or boron on fruit set, productivity and fruit quality in many plant species. Talaie *et al*. (2001) [25] showed that foliar spray of B and Zn decreased fruit drop and increased fruit quality in the „Zard‟ olive. Hassan *et al*. (2010) [26] found that boric acid treatments increased pollen germination than control and increased percentage of retained fruits in„ Picual ‟olive. Abd El-Migeed *et al*. (2015) [27] on„ Picual ‟olive reported that boric acid spray at 300 mgl-1 increased fruit length. Osman (1999) on olive found that boron treatments either as foliar or soil applications increased percentage of retained fruits. Khayyat *et al*. (2015) [28] reported that boric acid at 1500 mgl-1 on„ Shahany‟ date palm increased pulp weight, pulp/seed ratio; fruit length and diameter

Zinc activates many enzymes in metabolism, and is also an essential component of proteinases and peptidases enzyme system. The RNA and ribosome contents in the cells are greatly reduced under zinc deficiency. It enhances flowering, fruit size, growth and quality of fruits. Zinc deficiency in plant affects plant growth and causes severe yield losses particularly in calcareous soil of arid and semi-arid region. This zinc deficiency problem is normally fixed by using conventional zinc granular fertilizer. Mobility of metal in alkaline soil decreases in order of Cd> Ni> Zn> Mn> Cu> Pb. Hence the efficiency of soil applied granular fertilizer will be low and has great potential of accumulation of soil causing soil pollution and other environmental risk. To overcome this foliar spray of water-soluble zinc is being adapted for better recovery of applied zinc and meet the zinc demand of plant immediately. However, in foliar spray the problem is that acidic condition created after dissolving zinc in water, if not corrected properly by dissolving lime in water will cause scorching of foliage. To overcome this, basal application to soil followed by foliar spray has been recommended as most suitable method. (Prasad *et al.*, 2012) [24].

Materials and Methods

The present experiment was carried out during 2023-24 at Horticulture Farm of Department of Horticulture, SHUATS, Prayagraj. The experiment was conducted in Randomized Block Design (RBD), with 12+1 treatments, replicated thrice, the treatments were T_1 Control, T_1: $ZnSO_4$ 0.2%, T_2: $ZnSO_4$ 0.4%, T_3: $ZnSO_4$ 0.6%, T_4: $ZnSO_4$ 0.8%, T_5: Boron 0.2%, T_6: Boron 0.4%, T_7: Boron 0.6%, T_8: Boron 0.8%, T_9: $ZnSO_4$ 0.2% +Boron 0.2%, T_{10}: $ZnSO_4$ 0.4% +Boron 0.4%, T_{11}: $ZnSO_4$ 0.6% +Boron 0.6%, T_{12}:$ZnSO_4$ 0.8% +Boron 0.8%

Climatic condition in the experimental site

The area of Prayagraj district comes under subtropical belt in the south east of Utter Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46 °C- 48 °C and seldom falls as low as 4 °C- 5 °C. The relative humidity ranges between 20 to 94%. The average rainfall in this area is around 1013.4 mm annually. However, occasional precipitation is also not uncommon during winter months.

Results and Discussion

Chlorophyll Content

The data reveals that the plant height and plant spread of litchi increased significantly by the foliar application of Zinc and Boron under experimentation over the control which are summarized under Table 1. In Arbequina cultivar, maximum Chlorophyll content (54.61) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%) followed by treatments T_6 Boron 0.4% (52.31), minimum Chlorophyll content (46.91) was recorded under treatment T0 (Control).

In Coratina cultivar, maximum Chlorophyll content (55.61) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%) followed by treatments T_6 Boron 0.4% (53.31), minimum Chlorophyll content (47.91) was recorded under treatment T_0 (Control).

In Koroneiki cultivar, maximum Chlorophyll content (55.64) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%) followed by treatments T_6 Boron 0.4% (53.34), minimum Chlorophyll content (47.94) was recorded under treatment T_0 (Control).

Ali Salehi Sardoei *et al*. (2014) [9] reported that application of plant growth regulators in higher concentration had positive effects on leaf chlorophyll content of *Ficus benjamina, Schefflera arboricola* and *Dizigotheca elegantissima* foliage plants.

Table 1: Effect of Foliar spray of Zinc and Boron on Flowering, Fruit set and Quality of Olive

Treatment	Chlorophyll content			Duration of flowering			No of flower per Panicle		
	Arbequina	Coratina	Koroneiki	Arbequina	Coratina	Koroneiki	Arbequina	Coratina	Koroneiki
T_0	46.91	47.91	47.94	21.00	21.00	21.00	11.72	13.39	13.72
T_1	50.41	51.41	51.44	18.00	18.00	18.00	15.72	17.72	18.72
T_2	48.21	49.22	49.24	17.00	17.00	17.00	18.72	20.72	21.72
T_3	50.81	51.81	51.84	18.00	18.00	18.00	19.72	21.72	22.72
T_4	49.91	50.91	50.78	19.00	19.00	19.00	24.72	26.62	26.62
T_5	51.4	52.41	52.44	16.07	15.33	16.33	24.72	25.70	26.39
T_6	52.31	53.31	53.34	15.00	14.67	15.33	25.72	26.72	27.05
T_7	49.51	50.51	50.43	17.00	17.00	17.00	20.72	22.72	23.72
T_8	49.2	50.22	50.24	20.00	20.00	20.00	23.73	25.38	26.39
T_9	47.31	48.31	48.34	20.00	20.00	20.00	20.72	22.72	23.72
T_{10}	49.11	50.11	50.14	21.00	21.00	21.00	19.72	21.72	22.72

T_{11}	54.61	55.61	55.64	14.00	14.33	14.00	26.72	28.39	29.05
T_{12}	47.81	48.81	48.84	19.00	19.00	19.00	17.72	19.72	20.72
F test	S	S	S	S	S	S	S	S	S
S.Ed.(±)	0.03	0.30	0.49	0.03	0.30	0.49	0.03	0.04	0.91
CD@5%	0.05	0.61	1.00	0.05	0.61	1.00	0.05	0.08	1.88
CV	0.18	2.02	3.29	0.18	2.02	3.29	0.18	0.22	4.93

Treatment	Fruits per plant			Fruit length			Fruit diameter		
	Arbequina	Coratina	Koroneiki	Arbequina	Coratina	Koroneiki	Arbequina	Coratina	Koroneiki
T_0	77.00	78.00	68.33	15.70	16.06	16.03	7.00	8.00	9.02
T_1	111.67	112.67	98.67	17.70	17.83	18.21	9.13	10.00	11.00
T_2	130.67	131.67	112.67	19.00	19.02	19.00	12.00	13.13	14.01
T_3	138.67	139.67	120.67	16.70	17.06	17.14	10.00	11.10	12.00
T_4	132.67	133.67	123.33	16.77	16.83	17.08	9.20	10.00	11.27
T_5	176.67	177.67	157.33	21.30	20.84	21.06	13.00	14.00	15.00
T_6	176.87	177.97	163.00	21.70	21.83	22.18	14.13	15.00	16.00
T_7	140.67	141.67	122.67	17.70	17.93	18.11	12.00	13.20	14.30
T_8	169.67	170.67	145.67	19.74	19.93	20.24	12.00	13.00	14.00
T_9	140.67	141.67	122.67	18.70	19.01	19.10	11.00	12.00	13.00
T_{10}	141.67	142.67	123.67	20.70	21.07	21.21	8.50	9.23	10.01
T_{11}	200.67	201.67	184.00	22.80	22.93	23.15	15.00	16.13	17.00
T_{12}	136.67	137.67	115.67	19.70	19.97	20.19	11.00	12.00	13.00
F test	S	S	S	S	S	S	S	S	S
S.Ed.(±)	4.18	4.18	4.18	0.12	0.21	0.17	0.08	0.15	0.16
CD@5%	8.63	8.63	8.63	0.24	0.44	0.34	0.16	0.31	0.33
CV	3.55	3.53	3.51	0.75	1.36	1.05	0.83	1.53	1.51

Treatment	Fruit weight			Fruit Set%			Fruit drop%		
	Arbequina	Coratina	Koroneiki	Arbequina	Coratina	Koroneiki	Arbequina	Coratina	Koroneiki
T_0	1.10	1.11	1.10	55.83	48.76	48.52	44.17	51.24	51.48
T_1	1.13	1.15	1.14	69.27	62.00	59.21	30.73	38.00	40.79
T_2	1.17	1.19	1.18	68.03	61.94	59.53	31.97	38.06	40.47
T_3	1.12	1.13	1.13	68.53	62.67	60.34	31.47	37.33	39.66
T_4	1.19	1.21	1.20	61.62	54.68	54.06	38.38	45.32	45.94
T_5	1.11	1.23	1.22	69.61	64.77	65.13	30.39	35.23	34.87
T_6	1.21	1.24	1.23	72.55	67.28	65.95	27.45	32.72	34.05
T_7	1.19	1.21	1.20	66.16	60.76	58.61	33.84	39.24	41.39
T_8	1.14	1.16	1.15	64.26	65.49	63.37	35.74	34.51	36.63
T_9	1.16	1.18	1.17	66.16	60.76	58.61	33.84	39.24	41.39
T_{10}	1.19	1.21	1.20	70.01	64.01	61.62	29.99	35.99	38.38
T_{11}	1.23	1.25	1.24	73.13	69.18	67.93	26.87	30.82	32.07
T_{12}	1.15	1.17	1.16	68.44	68.04	65.22	31.56	31.96	34.78
F test	S	S	S	NS	S	S	NS	S	S
S.Ed.(±)	0.02	0.11	0.11	5.92	4.02	3.86	5.92	4.02	3.86
CD@5%	0.04	0.22	0.22	12.23	8.29	7.97	12.23	8.29	7.97
CV	0.48	0.33	0.52	10.80	7.89	7.81	22.12	13.07	12.02

Treatment	Oil content			TSS			pH		
	Arbequina	Coratina	Koroneiki	Arbequina	Coratina	Koroneiki	Arbequina	Coratina	Koroneiki
T_0	21.37	21.41	21.41	9.88	9.93	9.92	6.14	6.18	6.17
T_1	24.59	24.63	24.65	10.86	10.91	10.90	6.44	6.48	6.47
T_2	22.99	23.03	23.05	10.68	10.73	10.72	6.29	6.33	6.32
T_3	23.35	23.39	23.41	12.24	12.29	12.28	6.73	6.75	6.74
T_4	22.92	22.94	22.97	12.33	12.38	12.37	6.32	6.54	6.53
T_5	25.74	25.78	25.8	12.93	12.98	12.97	6.21	6.25	6.24
T_6	25.84	25.88	25.9	13.06	13.11	13.10	6.76	6.86	6.86
T_7	24.61	24.69	24.71	12.00	12.05	12.04	6.54	6.58	6.52
T_8	25.56	25.6	25.62	11.80	11.85	11.84	6.61	6.77	6.76
T_9	24.86	24.89	24.92	10.91	10.96	10.95	6.29	6.33	6.32
T_{10}	23.43	23.49	23.51	11.47	11.52	11.51	6.78	6.65	6.64
T_{11}	26.33	26.45	26.47	13.75	13.80	13.79	6.85	6.87	6.88
T_{12}	25.01	25.05	25.07	11.79	11.84	11.83	6.36	6.41	6.39
F test	S	S	S	S	S	S	S	S	S
S.Ed.(±)	0.01	0.01	0.01	0.02	0.02	0.02	0.04	0.02	0.03
CD@5%	0.03	0.02	0.02	0.04	0.04	0.04	0.07	0.05	0.05
CV	0.06	0.05	0.06	0.19	0.19	0.19	0.68	0.45	0.48

Duration of Flowering

The data on number of days to flower initiation of Olive as influenced by Foliar Application of zinc and boron are summarized in Table number 2. The data reveals that the duration of flowering in olive decreased significantly by the application of foliar application of zinc and boron under experimentation over the control. In Arbequina cultivar, minimum days to flowering (14.00) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%) maximum days to flowering (21.00) was recorded under treatment T_0 (Control).

In Coratina cultivar, minimum days to flowering (14.33) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), maximum days to flowering (21.00) was recorded under treatment T0 (Control).

In Koroneiki cultivar, minimum days to flowering (14.00) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), maximum days to flowering (21.00) was recorded under treatment T0 (Control).

This reduction in duration of flowering might be because of faster pollen tube growth with application of boron in combination with zinc, which might have reduced the time required for fertilization of ovary. The present findings are in line with the results obtained by Kumar and Sen (2004) who recorded minimum days taken to first picking with application of 45 kg/ha zinc sulphate in combination with 30 kg/ha borax in okra.

No of Flower Panicle/Plant

The data reveals that the No of flower panicle/plant of olive increased significantly by the foliar application of zinc and boron under experimentation over the control. In Arbequina cultivar, maximum flower per panicle (26.72) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum flower per panicle (11.72) was recorded under treatment T0 (Control).

In Coratina cultivar, maximum flower per panicle (28.39) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum flower per panicle (21.00) was recorded under treatment T_0 (Control).

In Koroneiki cultivar, maximum flower per panicle (29.05) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum flower per panicle (13.72) was recorded under treatment T_0 (Control).

No of Fruits/Plant

The data reveals that the No of fruit/plant of Olive increased significantly by the foliar application of zinc and boron under experimentation over the control. In Arbequina cultivar, maximum fruits per plant (200.67) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruits per plant (77.00) was recorded under treatment T_0 (Control).

In Coratina cultivar, maximum fruits per plant (201.67) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruits per plant (78.00) was recorded under treatment T_0 (Control).

In Koroneiki cultivar, maximum fruits per plant (184.00) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruits per plant (68.33) was recorded under treatment T_0 (Control).

Talaie and Taheri (2001) [25] who also found that boron and zinc sprays caused a significant increase in final fruit set of olives by decreasing the formation of shot berries and consequently the abscission of young fruits. Similar results with the application of zinc in combination with boron have been reported in almond by Sotomayor *et al.*, (2000) and Pandit *et al.* (2011).

Fruit Length (mm) fruit diameter

The data reveals that the fruit length of olive increased significantly by the foliar application of zinc and boron under experimentation over the control. In Arbequina cultivar, maximum fruit length (22.80 mm) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruits length (15.70 mm) was recorded under treatment T0 (Control).

In Coratina cultivar, maximum fruit length (22.93mm) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruit length (16.06) was recorded under treatment T_0 (Control).

In Koroneiki cultivar, maximum fruit length (23.15mm) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruit length (16.03 mm) was recorded under treatment T_0 (Control).

In Arbequina cultivar, maximum fruit diameter (15.00 mm) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruits diameter (7.00 mm) was recorded under treatment T_0 (Control).

In Coratina cultivar, maximum fruit diameter (16.13 mm) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruit diameter (8.00mm) was recorded under treatment T_0 (Control).

In Koroneiki cultivar, maximum fruit diameter (17.00mm) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruit diameter (9.02 mm) was recorded under treatment T_0 (Control).

Positive effect of zinc on fruit weight, size and volume as obtained in present investigation has also been reported by many workers in different fruit crops (Banik and Sen, 1997; in mango) [29], (Sharma *et al.*, 2003 in kagzi lime) [3] and (Wali *et al.*, 2005 in phalsa) [31]. Zinc is required to obtain good fruit size being the part of the carbonic anhydrous enzyme, present in the photosynthetic tissues and it is required for chlorophyll biosynthesis. Similarly, boron application also resulted in an increase of fruit weight, size and volume. The beneficial effect of boron on these parameters might be because of the role of boron in cell division and cell elongation.

Fruit Weight (g)

The data reveals that the fruit weight of Olive increased significantly by the foliar application of Zinc and Boron under experimentation over the control. In Arbequina cultivar, maximum fruit weight (1.23 g) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruit weight (1.10 g) was recorded under treatment T_0 (Control).

In Coratina cultivar, maximum fruit weight (1.25 g) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruit weight (1.11g) was recorded under treatment T_0 (Control).

In Koroneiki cultivar, maximum fruit weight (1.24 g) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruit weight (1.10 g) was recorded under treatment T_0 (Control).

In the present investigation, use of zinc and boron together might have acted synergistically with each other thereby improved the physical parameters of olive fruit. Similar results have been obtained by Banik and Sen (1997) who observed a significant increase in fruit weight with the application of zinc in combination with boron in mango whereas, also obtained maximum fruit size and fruit volume with foliar spray of zinc and boron in Blood Red cultivar of sweet orange.

Fruit set (%)

The data reveals that the fruit set% increased significantly by the foliar application of zinc and Boron under experimentation over the control. In Arbequina cultivar, maximum fruit set% (73.13%) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruit set% (55.83%) was recorded under treatment T0 (Control).

In Coratina cultivar, maximum fruit set% (69.18%) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruit set% (48.76%) was recorded under treatment T_0 (Control). In Koroneiki cultivar, maximum fruit set% (67.93%) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruit set% (48.52%) was recorded under treatment T_0 (Control). The application of zinc sulphate in combination with boric acid resulted in significant reduction of fruit drop of olive in the present investigation and the findings are in conformity with those of Taheri and Talaie (2001) [25] who concluded that foliar application of zinc sulphate and boric acid at 0.5%, one week before and at full bloom led to a considerable increase in fruit set and fruit retention.

Fruit drop (%)

The data reveals that the Fruit drop% decreased significantly by the foliar application of plant growth regulators and nano zinc under experimentation over the control. In Arbequina cultivar, maximum fruit drop% (26.87%) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruit drop% (44.17%) was recorded under treatment T_0 (Control).

In Coratina cultivar, maximum fruit drop% (30.82%) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruit drop% (51.24%) was recorded under treatment T_0 (Control).

In Koroneiki cultivar, maximum fruit drop% (32.07%) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum fruit drop% (51.48%) was recorded under treatment T_0 (Control). The application of zinc sulphate in combination with boric acid resulted in significant reduction of fruit drop of olive in the present investigation and the findings are in conformity with those of Taheri and Talaie (2001) [25] who concluded that foliar application of zinc sulphate and boric acid at 0.5%, one week before and at full bloom led to a considerable increase in fruit set and fruit retention.

Oil Content

The data reveals that Oil Content increased significantly by the foliar application of Zinc and Boron under experimentation over the control. In Arbequina cultivar, maximum Oil content (26.33) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum Oil content (44.17%) was recorded under treatment T_0 (Control).

In Coratina cultivar, maximum Oil content (26.45) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum Oil content (21.41) was recorded under treatment T_0 (Control).

In Koroneiki cultivar, maximum Oil content (26.47) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum Oil content (21.41) was recorded under treatment T_0 (Control).

TSS

The data reveals that TSS content increased significantly by the foliar application of Zinc and Boron under experimentation over the control. In Arbequina cultivar, maximum TSS (13.75%) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum TSS (9.88) was recorded under treatment T_0 (Control).

In Coratina cultivar, maximum TSS (13.80) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum TSS (9.93) was recorded under treatment T_0 (Control).

In Koroneiki cultivar, maximum TSS (13.79) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%), minimum TSS (9.92) was recorded under treatment T_0 (Control).

pH

The data reveals that pH increased significantly by the foliar application of Zinc and Boron under experimentation over the control. In Arbequina cultivar, maximum Ph (6.85) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%) followed by treatments T_6 Boron 0.4% (6.76), minimum Ph (6.14) was recorded under treatment T_0 (Control).

In Coratina cultivar, maximum Ph (6.87) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%) followed by treatments T_6 Boron 0.4% (6.86), minimum Ph (6.18) was recorded under treatment T_0 (Control).

In Koroneiki cultivar, maximum Ph (6.88) was observed under treatment T_{11} ($ZnSO_4$ 0.6% +Boron 0.6%) followed by treatments T_6 Boron 0.4% (6.86), minimum Ph (6.17) was recorded under treatment T_0 (Control).

Conclusion

Based on the above findings it can be concluded that lentil with the application of Zinc and Boron recorded highest growth character, minimum days to anthesis, highest flowering and fruiting.

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