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Growth and Yield Response of Chili Varieties to Foliar Spray of Zinc and Boron

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ABSTRACT

The aim of study was to assess the impact of foliar applications of zinc (Zn) and boron (B) at various concentrations, in addition to the recommended NPK fertilizers, on three chili varieties: Nagina, Sanam, and Longi. The treatment combining foliar Zn and B at 0.2% concentration with NPK fertilizers showed superior results, with plants reaching a height of 68.00 cm, flowering in 64.67 days, spreading to 64.33 cm, producing 15.33 branches per plant, 474.00 fruits per plant, with an average fruit length of 6.26 cm, fruit weight of 706.33 g per plant, and yielding 4243.90 kg/ha of fresh chili. The application of foliar boron alone at 0.2% concentration with NPK fertilizers ranked second, while foliar zinc alone at 0.2% concentration with NPK fertilizers ranked third in fruit yield performance. Among the varieties, Sanam exhibited superior traits compared to the others, with a plant height of 63.75 cm, flowering in 63.50 days, spreading to 65.08 cm, producing 15.67 branches per plant, 485.67 fruits per plant, with an average fruit length of 7.21 cm, fruit weight of 736.33 g per plant, and yielding 4418.00 kg/ha of fresh chili. Nagina and Longi ranked second and third, respectively. The application of foliar zinc and boron at 0.2% concentration alongside the recommended NPK fertilizers led to early flowering, improved fruiting, and higher yields compared to crops without foliar zinc and boron. Therefore, for a profitable chili harvest, cultivating the Sanam variety alongside foliar applications of zinc and boron at 0.2% concentration, in addition to the recommended NPK fertilizers, is recommended.

Keywords:

Chili (Capsium annuum L.), zinc, boron, micronutrients, NPK, foliar spray

1. Introduction

Chili (Capsicum annuum L.), renowned for its pungent and spicy flavor, holds a significant position as a vital spice in South Asian cuisine. Its vibrant color enhances the appeal of various dishes, particularly in curry recipes. As a commercial high-value spice crop, chili cultivation plays a crucial role in agricultural economies. In the year 2012-13, chili was cultivated across 62.5 thousand hectares, slightly less by 1.4 percent in comparison to the previous year's 63.6 thousand hectares. The chilies production during the year 2013-14 was 145.1 thousand tons against 147.2 thousand tons during the preceding year 2012-13, indicating a minor decrease which was associated with the decrease in the area. Similarly, during 2013-14, the yield per hectare was 2321.6 kg against 2314.46 kg per hectare during 2012-13 showing a minor increase of 0.31 percent over preceding year (GoP, 2014). The situation suggests that the chilies growers not only bringing more area under this crop, but they are using high yielding varieties and adopting improved chilies production technologies.

Crop productivity can suffer due to micronutrient deficiencies in the soil (Bose and Tripathi, 1996). Factors such as intensive cropping, erosion-induced loss of topsoil, micronutrient leaching, soil liming, and reduced farmyard manure application have exacerbated micronutrient deficiencies. Despite being required in small quantities, micronutrients are crucial for plant growth. The application of micronutrients may enhance growth characteristics by boosting photosynthetic and metabolic activities, thereby increasing several plant metabolites accountable for cell division and elongation (Hatwar et al., 2003). Studies have reported improved photosynthesis in the presence of zinc and boron, with zinc activating tryptophan synthesis, a precursor of indoleacetic acid (IAA), stimulating plant growth. Boron deficiency inhibits apical growth and development due to its effects on cell development, sugar formation, and translocation. Additionally, boron plays a vital role in flowering, fruiting processes, nitrogen metabolism, hormonal action, and cell division (Fageria et al., 2002).

Potassium, included in the nutrients, is considered a significant element known to enhance the color and shine of chili fruits (Ananthi et al., 2004). Chili is particularly responsive to micronutrient applications, which improve fruit composition and overall plant health, acting as catalysts in organic reactions within plants. Studies have shown that zinc and boron applications increase growth and seed yield in chili (Ranganathan and Perumal, 1995). Zinc deficiency can lead to reduced seed formation and subsequent yield reduction as it plays a crucial role in pollination and seed set processes. The symptoms of zinc deficiency, such as striped tissue development along leaf midribs, can persist throughout the growing season. Zinc fertilization can enhance crop yields, although its effectiveness depends on the application method (Maqsood et al., 2009; Silberbush, 2002).

Similarly, boron deficiency symptoms first appear on young leaves, manifesting as bronze-colored, hardened, malformed, and necrotic tissues, with subsequent stem corkiness and deformed capitula, leading to poor seed set (Blamey et al., 1987; Tarique and Mott, 2006). The demand for boron increases significantly during reproductive growth compared to vegetative growth (Gupta, 1993). Boron concentrations in soil and plants can fluctuate based on soil type, plant species, and environmental conditions. Both excess and deficiency of boron can significantly impact plant growth and production, due to the narrow margin between deficiency and toxicity in the soil-plant system (Tariq and Mott, 2007).

The present research aims to investigate the growth and yield responses of various chili varieties to foliar spray applications of zinc and boron at Tandojam.

2. Material and Method

The experiment took place in 2013 at the Horticulture orchard's experimental area of Sindh Agriculture University Tandojam. It followed a Randomized Complete Block Design with three replications and factorial arrangements, using plot sizes of 3m x 4m ($12m^2$). Before the chili planting season began, the experimental land was meticulously prepared. This involved two dry plowings, crushing clods, and leveling the land to remove weeds and ensure an even surface for

uniform irrigation. Standard practices were followed to create a suitable seedbed.

Ridges were spaced 60 cm apart, with 45 cm wide bunds separating sub-plots. Each block was divided into three beds, with 30 cm wide bunds between them.

The plots were measured at 3.0m x 3.5m (10.5 m²). Each bed had its
own irrigation channel. Seeds were sown for the nursery on February 10, 2013, and the seedlings were transplanted to one side of the ridges on March 25, 2013, when they were one and a half months old. The experiment tested three chili varieties against four treatments with varying concentrations of zinc and boron fertilizers. The described treatments are as follows:

Factor -A:	Varieties
V1	Nagina
V2	Sanum
V3	Longi
Factor- B:	**Zn-Boron levels**
M1	Control (soil applied NPK at recommended dose)
M2	Recommended NPK + 0.2% Zn (Foliar)
M3	Recommended NPK + 0.2% B (Foliar)
M4	Recommended NPK + 0.2% Zn + 0.2% B (Foliar)

Zinc was administered as ZnSO4 and boron as boric acid. All phosphorus (P) was provided as single super phosphate, and one-third of the nitrogen (N) in the form of urea was applied during sowing, with the remaining nitrogen applied in two splits during the first and second irrigations. Six irrigations were conducted at 15-day intervals, and weeding was managed with herbicides.

For observational data, five randomly selected and tagged plants from each plot were monitored for the subsequent traits: plant height (cm), days to flower emergence, plant spread (cm), number of branches per plant, number of fruits per plant, fruit length (cm), fresh fruit weight per plant (g), and fresh chili yield (kg/ha).

Intercultivation was followed by earthing up, and weeding was done once the crop was well-established.

Plant protection measures included three pesticide applications when pest populations neared economic injury levels. The Entomology Section of the Agriculture Research Institute, Tandojam, assisted with pest identification and spraying recommendations. Up to the final harvest, irrigation was applied as needed, and three insecticide (Dimethoate) sprays were used against fruit borers.

The recorded data were tabulated, and averages were calculated. Statistical analysis was performed using the Least Significant Differences (L.S.D.) test, based on methods by Gomez and Gomez (1984), with Stat-C software used for all statistical tests.

3. Results

Three chili varieties (Nagina, Sanam and Longi) were evaluated in the field during 2014 for their growth and yield performance against foliar application of zinc and boron at various concentrations in addition to suggested dose of NPK fertilizers. The treatments included Control (Soil applied NPK at recommended dose), The treatments included suggested NPK plus 0.2% Zn (foliar), recommended NPK plus 0.2% B (foliar), and recommended NPK plus 0.2% Zn and 0.2% B (foliar). The experimental crop was assessed for various traits including plant height (cm), days to flower emergence, plant spread (cm), number of branches per plant, number of fruits per plant, fruit length (cm), fresh fruit weight per plant (g), and fresh chili yield (kg/ha). Data for these traits are presented in Tables 1 to 8. The data were statistically analyzed for deriving analysis of variance and accordingly the results are interpreted for each trait here under:

3.1 Plant height (cm)

The effect of foliar application of zinc (Zn) and boron (B) at varied concentrations and recommended dose of NPK fertilizers was assessed on plant height of three rose varieties, and the data is presented in Table-1. The analysis of variance suggested significant (P<0.50) effect of zinc and boron foliar application concentrations as well as varieties on the plant height; while interactive effect of zinc and boron foliar applications × varieties was insignificant (P>0.05).

The chili plants of maximum height (68.00 cm) were recorded in plots given foliar Zn + B equally at 0.2% concentration additionally to suggested dose of NPK fertilizers; followed by foliar Zn at 0.2% concentration and foliar B at 0.2% concentration separately in addition to recommended dose of NPK fertilizers with average plant height of 65.22 cm and 64.67 cm, respectively. However, the shortest plant height of 63.33 cm was observed in the control group, where only the recommended dose of NPK fertilizers was applied and zinc and boron were not included. Among chili varieties, Longi produced plants of maximum height of 66.58 cm, followed by variety Nagina with 65.58 cm plant height; while the plants of minimum height of 63.75 cm were noted in plots sown with variety Sanam. Interactive effect of foliar Zn + B equally at 0.2% concentration + recommended dose of NPK × variety Longi generated longest plant height of 69.33 cm.

3.2 Days to flowering

The response of the crop, in terms of the number of days to initiate flowering, to foliar applications of zinc (Zn) and boron (B) at different concentrations, along with the recommended NPK fertilizer dose, was studied for three rose varieties. The data is presented in Table 2.. The analysis of variance demonstrated significant (P<0.50) effect of zinc and boron foliar application as well as varieties on the days to initiate flowering; while interactive effect of zinc and boron foliar applications × varieties was non-significant (P>0.05).

The chili crop given foliar Zn + B equally at 0.2% concentration in addition to recommended dose of NPK fertilizers took minimum days to initiate flowering (64.67); followed by foliar Zn at 0.2% concentration and foliar B at 0.2% concentration separately in addition to recommended dose of NPK fertilizers with 66.00 and 65.67 days to initiate flowering, respectively. However, delayed flowering (67.00 days) was observed in control plots where Zn and B were absent and only recommended dose of NPK fertilizers was applied. Among Sanam took minimum period to initiate flowering (63.50 days), followed by variety Nagina with 66.50 days to flowering; while variety Long took maximum days to flowering (67.50). Interactive effect of foliar Zn + B equally at 0.2% concentration + recommended dose of NPK × variety resulted early flowering in 62.33; while maximum delay in flowering was observed in variety Longi under control.

3.3 Plant spread (cm)

The results regarding the spread of chili plants influenced by different concentrations of foliar-applied zinc (Zn) and boron (B) alongside the recommended dose of NPK fertilizers are shown in Table 3. The analysis of variance showed that chili plant spread was significantly affected (P<0.50) by the concentrations of foliar-applied zinc and boron, as well as by the varieties. However, the interaction between zinc and boron applications and the varieties was not significant (P>0.05).

The maximum plant spread (64.33 cm) was observed in plots treated with both Zn and B at 0.2% concentration, in addition to the recommended NPK dose. This was followed by plots treated with B at 0.2% concentration and Zn at 0.2% concentration separately, which resulted in average plant spreads of 63.44 cm and 62.67 cm, respectively. The minimum plant spread of 60.11 cm was recorded in the control plots where only the recommended NPK fertilizers were applied, without Zn and B.

Among the varieties, Sanam showed the maximum plant spread of 65.08 cm, followed by Nagina with 62.92 cm, while the minimum spread of 59.92 cm was observed in plots with the Longi variety. The interaction of Zn and B at 0.2% concentration with the variety Sanam resulted in the highest plant spread of 66.67 cm, whereas the interaction of the control with the variety Longi resulted in the minimum plant spread of 53.33 cm. The LSD test indicated no significant difference (P>0.05) in plant spread between the

treatments of B at 0.2% and Zn + B at 0.2% concentration, in addition to NPK fertilizers.

3.4 Branches plant-1

The data regarding the number of branches per plant in different chili varieties, influenced by varying concentrations of foliar-applied zinc (Zn) and boron (B) along with the recommended dose of NPK fertilizers, are presented in Table 4. The analysis of variance indicated that the number of branches per plant was significantly affected ($P<0.50$) by different concentrations of foliar-applied zinc and boron, as well as by the varieties. However, the interaction between Zn and B foliar applications and the varieties was not significant ($P>0.05$).

The highest number of branches per plant (15.33) was observed in chili crops treated with foliar Zn and B equally at 0.2% concentration, in addition to the recommended dose of NPK fertilizers. This was followed by treatments with foliar B at 0.2% concentration and foliar Zn at 0.2% concentration separately, which resulted in 14.44 and 14.22 branches per plant, respectively. The lowest number of branches per plant (13.22) was found in the control group, which received only NPK fertilizers without Zn and B.

Among the varieties, Sanam had the highest number of branches per plant (15.67), followed by Longi with 13.67 branches per plant, while Nagina had the lowest number of branches per plant (13.58). The interaction of foliar Zn and B equally at 0.2% concentration with the variety Sanam resulted in the highest number of branches per plant (16.67), whereas the interaction of the control with the variety Nagina resulted in the lowest number of branches per plant (12.33). The LSD test indicated no significant difference ($P>0.05$) in the number of branches per plant between the treatments of foliar-applied B at 0.2% and foliar Zn at 0.2% concentration when applied separately, in addition to NPK fertilizers. Additionally, the varieties Longi and Nagina showed no significant difference ($P>0.05$) in the number of branches per plant.

3.5 Fruits plant-1

The results pertaining to number of fruits plant-1 of chili varieties as affected by varying concentrations of foliar applied zinc (Zn) and boron (B) + NPK fertilizers are shown in Table-5. The analysis of variance indicated that the number of fruits plant-1 was significantly influenced ($P<0.50$) by different concentrations of foliar applied Zn and B and varieties; while the treatment interaction Zn and B foliar applications × varieties was non-significant ($P>0.05$) for this trait.

The number of fruits plant-1 were highest (474.00) in crop fertilized with foliar Zn + B equally at 0.2% concentration + NPK fertilizers; followed by foliar Zn at 0.2% concentration and foliar B at 0.2% concentration separately in addition to recommended NPK fertilizers with 449.00 and 439.44 fruits plant-1, respectively. However, the minimum fruits plant-1 of 412.78 was observed in control where no Zn and B were given and the crop received only NPK fertilizers. In case of chili varieties, Sanam produced maximum fruits plant-1 of 485.67, followed by variety Nagina with 475.42 fruits plant-1; while the lowest number of fruits plant-1 (370.33) were obtained in variety Nagina. Interactive effect of foliar Zn + B equally at 0.2% concentration + recommended NPK × variety Sanam resulted in a maximum fruits plant-1 of 516.67, and the interaction of control × variety Longi resulted in lowest number of fruits plant-1 (352.00). LSD test described that the differences in fruits plant-1 between foliar B (0.2%) and foliar Zn (0.2%) when applied separately in addition to NPK fertilizers were non-significant ($P>0.05$). The varieties Sanam and Nagina also had non-significant differences ($P>0.05$) for fruits plant-1.

3.6 Fruit length (cm)

The effect of different concentrations of foliar-applied zinc (Zn) and boron (B), additionally suggested rate of NPK fertilizers, was investigated, with the results shown in Table 6. The analysis of variance showed that chili fruit length was significantly influenced ($P<0.50$) by the various concentrations of foliar-applied Zn and B, the different varieties, and the interaction between Zn and B foliar applications and the varieties ($P<0.05$).

The longest fruit length (6.26 cm) was recorded in plots treated with foliar Zn and B equally at 0.2% concentration, along with the recommended dose of NPK fertilizers. This was followed by treatments with foliar B at 0.2% concentration and foliar Zn at 0.2% concentration separately, which resulted in average fruit lengths of 5.74 cm and 5.67 cm, respectively. The shortest fruit length (5.18 cm) was observed in the control plots, which received only the recommended NPK fertilizers without any Zn or B. Among varieties,

Sanam produced fruits of maximum length (7.21 cm), followed by variety Longi with 7.09 cm fruit length; while the fruits of minimum length of 2.82 cm were noted in plots sown with variety Nagina. Interactive effect of foliar Zn + B equally at 0.2% concentration + recommended NPK × variety Sanam resulted in a maximum fruit length of 7.90 cm, and interaction of control × variety Nagina resulted in minimum fruit length of 2.43 cm.

3.7 Fruit yield plant-1(g)

The findings concerning the fruit yield per plant of chili varieties, influenced by different concentrations of foliar-applied zinc (Zn) and boron (B) in conjunction with NPK fertilizers, are outlined in Table 7. The analysis of variance indicated a significant impact ($P<0.50$) of varying concentrations of foliar-applied Zn and B, as well as the different varieties, on fruit yield per plant. However, the interaction between foliar-applied Zn and B and the varieties was not significant ($P>0.05$) for this trait.

It is evident from the results that fruit yield plant-1 was maximum (706.33 g) in crop fertilized with foliar Zn + B equally at 0.2% concentration + recommended rate of NPK fertilizers; followed by foliar Zn at 0.2% concentration and foliar B at 0.2% concentration separately in addition to recommended NPK fertilizers with 678.89 g and 668.44 g fruit yield plant-1, respectively. However, the lowest fruit yield plant-1 of 621.44 g was noted in control where no Zn and B were given and the crop received only NPK fertilizers at recommended rate. Among varieties, Sanam produced maximum fruit yield plant-1 of 736.33 g, followed by variety Nagina with 638.42 g fruit yield plant-1; while the lowest fruit yield plant-1 (631.58 g) were obtained in variety Longi. Interactive effect of foliar Zn + B at 0.2% concentration + recommended NPK × variety Sanam resulted in a maximum fruit yield plant-1 of 783.33 g, and the interaction of control × variety Longi resulted in lowest fruit yield plant-1 (579.67). LSD test described that the differences in fruit yield plant-1 between foliar B (0.2%) and foliar Zn (0.2%) when applied separately in addition to NPK fertilizers were non-significant ($P>0.05$). The varieties Longi and Nagina also had non-significant differences ($P>0.05$) for fruit yield plant-1.

3.8 Fruit yield (kg ha^{-1})

The effect of foliar applied zinc (Zn) and boron (B) at different concentrations in addition to NPK fertilizers on the fruit yield ha^{-1} of three chili varieties was assessed and the results are presented in Table-8The analysis of variance revealed a significant impact ($P<0.50$) of foliar-applied Zn and B, as well as varieties, on fruit yield per hectare. However, the interactive effect of foliar-applied Zn and B with varieties was not significant ($P>0.05$) for fruit yield per hectare.

The results showed that fruit yield ha^{-1} was highest (4243.90 kg) in crop fertilized with foliar Zn + B equally at 0.2% concentration + recommended rate of NPK fertilizers; followed by foliar B at 0.2% concentration and foliar Zn at 0.2% concentration separately in addition to recommended NPK fertilizers with 4073.30 kg and 4010.70 kg fruit yield ha^{-1}, respectively. However, the lowest fruit yield ha^{-1} of 3728.70 kg was obtained in control where no Zn and B were given and the crop only fertilized with NPK fertilizers at recommended dose. In varieties, Sanam produced highest fruit yield ha^{-1} of 4418.00 kg, followed by variety Nagina with 3830.50 kg fruit yield ha^{-1}; while the lowest fruit yield ha^{-1} (3793.90 kg) was obtained in variety Longi. Interactive effect of foliar Zn + B at 0.2% concentration + recommended NPK × variety Sanam produced maximum fruit yield ha^{-1} of 4700.00 kg, and the interaction of control × variety Nagina resulted in lowest fruit yield ha^{-1} (3478.0). LSD test described that the differences in fruit yield ha^{-1} between foliar B (0.2%) and foliar Zn (0.2%) applied separately in addition to NPK fertilizers were non-significant ($P>0.05$). The varieties Longi and Nagina also had non-significant differences ($P>0.05$) for fruit yield ha^{-1}.

4. Discussion

Application of micronutrients as foliar spray on fruits and vegetables as well as on other major crops is gaining popularity among the farmers. Foliar fertilizers immediately deliver nutrients to the tissues and organs of the crop (Jiskani, 2005). The study showed that chili fertilized with foliar Zn + B equally at 0.2% concentration + NPK fertilizers proved to be superior over rest of the treatments. The crop supplied with foliar boron alone at 0.2% concentration + NPK fertilizers ranked second; and foliar application of zinc alone at 0.2% concentration + NPK fertilizers ranked third in fruit yield performance; while control (NPK without Zn and B) remained the lowest. Among varieties, Sanam proved to be superior while Nagina

and Longi ranked second and third. The chili fertilized with foliar applied Zinc and Boron at 0.2% concentration in addition to recommended dose of NPK fertilizers got early flowering, improved fruiting bodies and produced higher fruit yields as compared to the crop without foliar Zinc and foliar Boron. Moreover, chili variety Sanam proved to be superior in fruit yield than Nagian and Longi. Hence for achieving profitable crop harvest, chili variety Sanam may preferably be cultivated and supplied with zinc and boron at 0.2% concentration in addition to recommended dose of NPK fertilizers. Jiudith et al. (2005) from England, along with Maheswari et al. (2003), Yadav et al. (2003), Bhatt and Srivastava (2006), and Hatwar et al. (2006) from India, have all reported positive outcomes when zinc was applied as a foliar spray on chili. Studies by Abu-Sarra et al. (2009) show that applying zinc sulfate as a foliar spray can fix zinc deficiency in chilies. Comparing these results with the current study reveals that soils in many regions, including Pakistan, often lack zinc and boron. Therefore, to achieve optimal chili yields, farmers are advised to incorporate foliar sprays of zinc and boron alongside the recommended NPK fertilizers, ensuring healthier chili plants for high-quality production. Additionally, under conditions of water stress, foliar application of these nutrients has shown to yield even more beneficial results.

Table 1. Plant height (cm) of chili varieties as influenced by foliar application of zinc and boron at different concentrations.

Treatments	Varieties			Mean
	Nagina	Sanam	Longi	
Control (Soil applied NPK at recommended dose)	63.66	61.67	64.67	63.33 d
Recommended NPK + 0.2% Zn (Foliar)	65.33	64.00	66.33	65.22 b
Recommended NPK + 0.2% B (Foliar)	65.00	63.00	66.00	64.67 c
Recommended NPK + 0.2% Zn + 0.2% B (Foliar)	68.33	66.33	69.33	68.00 a
Mean	65.58 b	63.75 c	66.58 a	-

Note: Means followed by similar letters do not differ significantly according to DMR Test.

	Treatments (T)	Varieties (V)	T×V
S.E.±	0.3169	0.2745	0.5490
LSD 0.05	0.6573	0.5692	-
LSD 0.01	0.8934	0.7737	-

Table 2. Days to flowering of chili varieties as influenced by foliar application of zinc and boron at different concentrations.

Treatments	Varieties	Mean

	Nagina	Sanam	Longi	
Control (Soil applied NPK at recommended dose)	67.67	64.67	68.67	67.00 a
Recommended NPK + 0.2% Zn (Foliar)	66.67	63.67	67.66	66.00 b
Recommended NPK + 0.2% B (Foliar)	66.33	63.34	67.33	65.67 c
Recommended NPK + 0.2% Zn + 0.2% B (Foliar)	65.33	62.33	66.33	64.67 d
Mean	66.50 b	63.50 c	67.50 a	-

Note: Means followed by similar letters do not differ significantly according to DMR Test.

	Treatments (T)	Varieties (V)	T×V
S.E.±	0.2843	0.2462	0.4924
LSD 0.05	0.5895	0.5106	-
LSD 0.01	0.8013	0.6939	-

Table 3. Spread of plant (cm) of chili varieties as influenced by foliar application of zinc and boron at different concentrations.

Treatments	Varieties			Mean
	Nagina	Sanam	Longi	
Control (Soil applied NPK at recommended dose)	60.33	62.66	57.33	60.11 a
Recommended NPK + 0.2% Zn (Foliar)	63.00	65.00	60.00	62.67 c
Recommended NPK + 0.2% B (Foliar)	63.67	66.00	60.67	63.44 b
Recommended NPK + 0.2% Zn + 0.2% B (Foliar)	64.67	66.67	61.66	64.33 b
Mean	62.92 b	65.08 a	59.92 c	-

Note: Means followed by similar letters do not differ significantly according to DMR Test.

	Treatments (T)	Varieties (V)	T×V
S.E.±	0.5053	0.4376	0.8752
LSD 0.05	1.0479	0.9076	-

LSD 0.01	1.4243	1.2335	-

Table 4: Branches plant^{-1} of chili varieties as influenced by foliar application of zinc and boron at different concentrations.

Treatments	Varieties			Mean
	Nagina	Sanam	Longi	
Control (Soil applied NPK at recommended dose)	12.33	14.66	12.66	13.22 c
Recommended NPK + 0.2% Zn (Foliar)	13.33	15.66	13.67	14.22 b
Recommended NPK + 0.2% B (Foliar)	14.00	15.66	13.67	14.44 b
Recommended NPK + 0.2% Zn + 0.2% B (Foliar)	14.67	16.67	14.67	15.33 a
Mean	13.58 b	15.67 a	13.67 b	-

Note: Means followed by similar letters do not differ significantly according to DMR Test.

	Treatments (T)	Varieties (V)	T×V
S.E.±	0.3006	0.2603	0.5206
LSD 0.05	0.6234	0.5398	-
LSD 0.01	0.8473	0.7337	-

Table 5: Fruits plant^{-1} of chili varieties as influenced by foliar application of zinc and boron at different concentrations.

Treatments	Varieties			Mean
	Nagina	Sanam	Longi	
Control (Soil applied NPK at recommended dose)	431.67	454.67	352.00	412.78 c
Recommended NPK + 0.2% Zn (Foliar)	466.67	485.67	366.00	439.44 b
Recommended NPK + 0.2% B (Foliar)	490.00	485.67	371.33	449.00 b
Recommended NPK + 0.2% Zn + 0.2% B (Foliar)	513.33	516.67	39200	474.00 a
Mean	475.42 a	485.67 a	370.33 b	-

Note: Means followed by similar letters do not differ significantly according to DMR Test.

	Treatments (T)	Varieties (V)	T×V
S.E.±	8.4114	7.2845	14.569
LSD 0.05	17.444	15.107	-
LSD 0.01	23.710	20.533	-

Table 6: Fruit length (cm) of chili varieties as influenced by foliar application of zinc and boron at different concentrations.

Treatments	Varieties			Mean
	Nagina	Sanam	Longi	
Control (Soil applied NPK at recommended dose)	2.43	6.60	6.50	5.18 d
Recommended NPK + 0.2% Zn (Foliar)	2.77	7.17	7.07	5.67 c
Recommended NPK + 0.2% B (Foliar)	2.93	7.20	7.10	5.74 b
Recommended NPK + 0.2% Zn + 0.2% B (Foliar)	3.16	7.90	7.70	6.26 a
Mean	2.82 c	7.21 a	7.09 b	-

Note: Means followed by similar letters do not differ significantly according to DMR Test.

	Treatments (T)	Varieties (V)	T×V
S.E.±	0.0456	0.0395	0.0790
LSD 0.05	0.0946	0.0819	0.1639
LSD 0.01	0.1286	0.1114	0.2228

Table 7: Fruit yield plant (g) of chili varieties as influenced by foliar application of zinc and boron at different concentrations.

Treatments	Varieties			Mean
	Nagina	Sanam	Longi	
Control (Soil applied NPK at recommended dose)	579.67	689.33	595.33	621.44 c
Recommended NPK + 0.2% Zn (Foliar)	626.67	736.33	642.33	668.44 b

Recommended NPK + 0.2% B (Foliar)	358.00	736.33	642.33	678.89 b
Recommended NPK + 0.2% Zn + 0.2% B (Foliar)	689.33	783.33	646.33	706.33 a
Mean	638.42 b	736.33 a	631.58 b	-

Note: Means followed by similar letters do not differ significantly according to DMR Test.

	Treatments (T)	Varieties (V)	T×V
S.E.±	13.712	11.875	23.751
LSD 0.05	28.438	24.628	-
LSD 0.01	38.652	33.474	-

Table 8: Fresh fruit yield (kg ha^{-1}) of chili varieties as influenced by foliar application of zinc and boron at different concentrations.

Treatments	Varieties			Mean
	Nagina	Sanam	Longi	
Control (Soil applied NPK at recommended dose)	3478.0	4136.0	3572.0	3728.7 c
Recommended NPK + 0.2% Zn (Foliar)	3760.0	4418.0	3854.0	4010.7 b
Recommended NPK + 0.2% B (Foliar)	3948.0	4418.0	3854.0	4073.3 b
Recommended NPK + 0.2% Zn + 0.2% B (Foliar)	4136.0	4700.0	3895.7	4243.90 a
Mean	3830.5 b	4418.0 a	3793.9 b	-

Note: Means followed by similar letters do not differ significantly according to DMR Test.

	Treatments (T)	Varieties (V)	T×V
S.E.±	82.260	71.239	142.48
LSD 0.05	170.60	147.74	-
LSD 0.01	200.81	231.87	-

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