Effect of Zinc-Urea Foliar Application on Yield Parameters of Fodder Maize (*Zea mays* L.)

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ABSTRACT

Background: Fodder maize is a demanding crop that requires a lot of minerals to meet its nutritional demands, the misuse of chemical fertilizers has decreased the fertility of the soil. Nevertheless, using large amounts of fundamental nutrients should not adversely affect the soil's health. In light of these considerations, the current study was directed to identify the most effective management strategy to increase fodder maize growth in Punjab conditions.

Methods: The experimental site was Eastern India, which falls under the zone of Northern Plain of agro-climatic zones of Punjab. The experiment consisted of three replications and was set up using a randomized block design (RBD). Two different treatment levels of urea (1% and 2%) and two different treatment levels of zinc (0.25% and 0.50%), together with recommended dose of fertilizer (RDF) and an absolute control, were applied to the fodder maize crop. These treatments were employed and organized into nine distinct treatment combinations.

Result: The best results were found at 65 DAS from the treatment of T_9 (RDF + 2% urea + 0.50% zinc), the plant height (104.11 cm), leaf length (71.16 cm), root volume (39.17 cm^3), fresh weight (299.32 g), number of leaves (12.67), internode distance (6.78 cm), chlorophyll content (64.18 $\mu mol.m^{-2}$) and stem girth (3.02 cm), respectively.

Key words: Fodder growth, Fodder maize, Fodder productivity, Urea, Zinc.

INTRODUCTION

Fodder maize (*Zea mays* L.) is a crucial forage crop widely cultivated for its rapid growth, high biomass yield and excellent palatability for livestock. It plays a vital role in sustaining dairy and livestock productivity, particularly in regions with intensive animal husbandry. Improving the growth parameters of fodder maize, such as plant height, leaf width, number of leaves, stem girth and other parameters, not only enhances fodder yield but also boosts the nutritional quality essential for animal health.

Recent agricultural advancements emphasize the integration of improved agronomic practices, management of soil fertility and the suse of bio-stimulants to optimize fodder maize yield. Factors such as nutrient application, seed variety, scheduling of irrigation and plant population density have shown significant influence on the growth and development of fodder maize. Livestock is the primary source of income for the vast majority of rural residents in India, where 75% of farmers are small and marginal holdings (Khamkar, 2016). Based on the global average, the productivity of the Indian cattle is lower (Anonymous, 2020).

According to Bhaumik *et al.* (2025), nitrogen (N) is crucial for crop productivity and a shortage of it is one of the main factors restricting the output of fodder yield. Vegetative growth and development of any crops depend heavily on nitrogen and forages are harvested for their vegetative biomass (Fallah *et al.,* 2024). Nitrogen must be present in sufficient amounts to promote increased vegetative growth (Shiade *et al.,* 2024). In the majority of Indian soils, zinc micronutrient deficiencies seem to be the most common (Morton *et al.,* 2023). Zinc is essential for maintaining the structural and functional integrity of biological membranes, facilitating protein synthesis and gene expression and supporting physiological processes in all living systems (Marin de Jesus *et al.,* 2024).

Therefore, the current study was carried out to examine the mixed effect of different dosages of urea and zinc and

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to ascertain their suitable dose for improving the yield and growth parameters of fodder maize. An experimental study in the field was conducted at the agricultural research farm, Department of Agronomy, School of Agriculture, Lovely Professional University, Phagwara, Punjab during the Rabi season in 2023-24 to examine the impact of foliar application of zinc and urea on the growth parameters of fodder maize (*Zea mays* L.). The primary thing of this experimental trial was to prove how foliar treatments of zinc and urea affected the growth parameters of the fodder maize crop.

MATERIALS AND METHODS

The experimental work was directed at Agricultural Research Farm, Department of Agronomy, School of Agriculture, Lovely Professional University, Phagwara, Punjab during *Rabi* season in 2023-24, which lies in the zone of Northern Plain between 75.69°E and 31.24°N. The field's climate comes under the Agro-ecological sub-region (Northern Plain, hot sub-humid eco region, Punjab) and agro-climatic zone (Trans Gangetic Plain region). The area comes under the semi-arid zone with an annual rainfall of 600 mm. The soil of the empirical field had pH 8.4, electrical conductivity 0.410 mmhos cm^{-1}, 0.45% organic carbon and 0.776% organic matter. Available nitrogen, phosphorus and potassium were 322.56, 25.10 and 70.56 kg ha^{-1}. The empirical design was conducted in randomize block design (RBD) with three replications and nine treatments (T_1: Absolute control; T_2: RDF + 0.25% Zinc; T_3: RDF + 0.50% Zinc; T_4: RDF + 1% Urea; T_5: RDF + 1% Urea + 0.25% Zinc; T_6: RDF + 1% Urea + 0.50% Zinc; T_7: RDF + 2% Urea; T_8: RDF + 2% Urea + 0.25% Zinc; T_9: RDF + 2% Urea + 0.50% Zinc). The recommended dose of fertilizers (RDF) were applied @ 60 kg nitrogen ha^{-1}, 40 kg phosphorus ha^{-1} and 20 kg potassium ha^{-1} through urea, Di-ammonium phosphate (DAP) and Muriate of potash (MOP). Zinc was supplied through the zinc oxide suspension concentrate (39.5% Zn). The half dose of nitrogen and full dose of phosphorus and potassium were applied as basal dose and the other half of nitrogen was applied as two split doses at 25 days after sowing (DAS) and 45 DAS in granular form. Percentage of zinc and urea were applied as two foliar sprays at 30 DAS and 50 DAS. In this case, nitrogen was supplied by urea as per the recommendation of fodder maize and the percentage of urea was applied by mixing with water. That means nitrogen in the form of urea was applied in both solid and liquid form. We used the hybrid fodder maize seed which belongs to the variety of Laxmi® 207 with a seed rate of 40 kg ha^{-1}.

Periodic observations were made from each net plot, consisting of five randomly selected plants, in order to impact various treatments on crop development and production. Observations were made regularly on days 25, 45 and 65 DAS. The height of the five plants were observed periodically from each net plot from the base of the plant to the fully opened top leaf and expressed in cm. The leaf length of the five plants were observed periodically from each net plot by using a measuring scale. The leaf width of the five plants were observed periodically from each net plot by using a measuring scale. The number of green and functional leaves per plant was recorded by counting the fully opened green leaves of randomly selected five tagged plants and the average was worked out. The chlorophyll index of green leaves per plant was by using the SPAD meter from randomly selected five tagged plants and the average was worked out. The chlorophyll index is expressed in µmol m^{-2}. The girth measured at the ground level of the stem using vernier calipers was taken periodically at 25, 45 and 65 DAS. It is expressed in centimeters (cm). The volume of root of the plants were measured by the water displacement technique at 65 DAS and expressed by the unit of cubic centimeters (cm^3). The fresh weight of the plant was taken periodically at 25, 45 and 65 DAS by the cutting of the above part on the ground and weighting of five healthy plant from each plot and the average was worked out. The fresh weight is expressed by gram per plant. The distance of the internodes was measured by the measuring scale per plant was recorded by counting between the fully opened green leaves of randomly selected five tagged plants and the average was worked out.

The analysis of variance (ANOVA) technique was used for analyzing the experimental data for randomized block design (RBD). Least significant differences (LSD) and Duncan test were used for various parameters to see the significant differences among treatment mean at 0.05 probability level by using SPSS software.

RESULTS AND DISCUSSION

The environmental and physiological elements that influence growth and production functions must be investigated and fully comprehended. Furthermore, various agronomic methods contribute to crop output increases. In the group of each the elements that influence crop production, nutrient management study area for busting crop productivity and fodder maize quality. This manuscripts presents and discusses the results on growth parameters by the influences of recommended dose of fertilizer (RDF) + urea + zinc, as well as statistical conclusions, in tables. The results have also been depicted graphically, wherever it is required and necessary.

Plant height (cm)

Data represented in Table 1 expressed at 45 and 65 DAS, the treatments showed a significant impact on height of the plants of fodder rabi maize at 5% significant level. At 25 DAS, the higher height of plant was seen in T_4 (32.11 cm), followed by T_3, T_6, T_7, T_9, T_8 and T_2 (32.00, 31.78, 31.44, 31.22, 30.78 and 30.22 cm, respectively) as compared to the absolute control condition (T_1: 27.84 cm). Because of, up to 25 days only RDF was applied in all treatments except absolute control. But at 45 and 65 DAS, the higher plant height was seen in T_9 condition (72.00 and 104.11 cm, respectively) over to the other treatments and absolute control condition (48.33 and 56.22 cm, respectively). At 65 DAS, the numerical difference between T_9 and T_1 (absolute control) was 47.89 cm, emphasizing the effectiveness of using T_9 treatment in promoting plant height. This result indicates the significance of incorporating zinc and urea with RDF for maximizing the height of plant. "Because" of enhancement of auxin synthesis, internode distance and vegetative growth by the application of urea and zinc. Similar result also expressed by Boltro *et al.* (2022) whose reported, the height of the fodder maize plant was significantly affected with the application of nitrogenous fertilizers, Paul *et al.* (2019) found contrary report and concluded that different levels of nitrogen affect the plant height of fodder maize crops. The tallest height of the plant was obtained by applying zinc sulphate, ferrous sulphate and RDF by Adesh *et al.* (2021), similar result also expressed by Ramakrishna *et al*. (2022).

Leaf length (cm)

Data demonstrated in Fig 1 expressed that at 25, 45 and 65 DAS, the significant effect was showed by the treatments on the leaf length of fodder *rabi* maize at 5% significant level. At 25 DAS, the higher length of leaf was seen in T_7 (22.56 cm), followed by T_4, T_9, T_6, T_4, T_2 and T_8 (22.04, 21.67, 21.46, 22.07, 20.99 and 20.33 cm, respectively) as compared to the control condition (T_1: 18.39 cm). Because of this, up to 25 days, only RDF was applied in all treatments except the absolute control. But at 45 and 65 DAS, the higher leaf length was seen in T_9 condition (58.53 and 71.16 cm, respectively) over the other treatments and control conditions (39.46 and 44.20 cm, respectively). Due to enhancement of nitrogen and zinc concentration in the leaves part of the plant, increase the cell division and cell multiplication in the leaves. Similar result also founded by Sewhag *et al.* (2022) and Namakka *et al.* (2022) concluded that leaf length increases by the application of nitrogenous fertilizer.

Leaf width

Data represented in Table 2 stated that at 25, 45 and 65 DAS, the significant effect was showed by the treatments on the leaf width of fodder *rabi* maize at 5% significant level. At 25 DAS, the highest leave width was seen in T_4 (2.76 cm), followed by T_7, T_9, T_6, T_3, T_2, T_5 and T_8 (2.72, 2.67, 2.66, 2.59,

Table 1: Effects of urea and zinc application on plant height at 25, 45 and 65 DAS.

Treatments	Plant height (cm)		
	25 DAS	45 DAS	65 DAS
T_1: Absolute control	27.84c±1.00	48.33e±1.00	56.22f±1.00
T_2: RDF + 0.25% zinc	30.22b±0.06	55.22d±0.06	80.00e±1.00
T_3: RDF + 0.50% zinc	32.00a±0.10	56.07d±0.06	84.17cd±0.18
T_4: RDF + 1% urea	32.11a±0.10	56.67d±0.06	82.56d±0.08
T_5: RDF + 1% urea + 0.25% zinc	30.28b±0.06	58.44c±0.08	84.78c±0.18
T_6: RDF + 1% urea + 0.50% zinc	31.78ab±0.10	58.89c±0.08	87.33b±0.89
T_7: RDF + 2% urea	31.44ab±0.10	59.78bc±0.10	83.56cd±0.19
T_8: RDF + 2% urea + 0.25% zinc	30.78ab±0.10	60.98b±0.10	87.44b±0.89
T_9: RDF + 2% urea + 0.50% zinc	31.22ab±0.10	72.00a±1.00	104.11a±1.00
SEm (±)	0.399	0.519	0.583
SEd (±)	0.565	0.735	0.825
CD at 5%	1.198	1.557	1.749

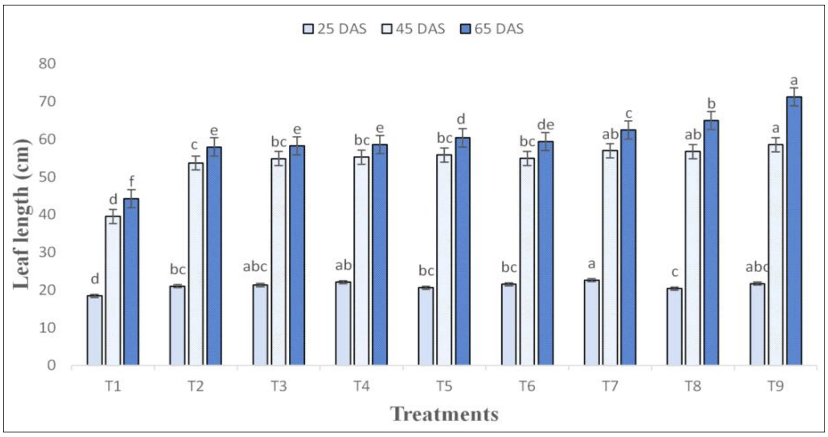

Fig 1: Effects of urea and zinc application on leaf length at 25, 45 and 65 DAS.

2.58, 2.55 and 2.54 cm, respectively) as compared to the absolute control condition (T_1: 2.29 cm). Because of, up to 25 days only RDF was applied in all treatments except the absolute control. But at 45 DAS, the higher leave width was seen in T_9 condition (6.60 cm) as compared to other treatments and absolute control conditions (4.39 cm). At 65 DAS, the higher leave width was seen in T_3 (7.27 cm) as compared to other treatments and absolute control conditions (5.29 cm). Due to enhancement of nitrogen and zinc concentration in the leaves part of plant, increase the cell division and cell multiplication in the leaves. Similar result also founded by Sewhag *et al.* (2022) and Alhammad *et al.* (2023) concluded that leaf width increases by the application of nitrogenous fertilizer.

Number of leaves

Data demonstrated in Fig 2 stated that at 25, 45 and 65 DAS, the treatments showed a non-significant effect on the leaves number of fodder *rabi* maize at 5% significant level. At 25 DAS, all treatments showed same number of leaves (8.00) except T_1 (absolute control) (6.67). However, after the application of different agronomics measurements, the plant showed the non-significant number of leaves except T_2 and T_9 at 45 and 65 DAS. The higher number of leaves were counted in the case of treatment T_9 (10.67 and 12.67, respectively) as compared to absolute control and other treatments. Because of urea supports the production of protein synthesis and zinc contributes to the proper functioning of enzymes involved in various metabolic and physiological processes, including those related to the development of leaves number. According to Hani *et al.* (2006), leaves number did not influence significantly by the increasing nitrogen levels.

Chlorophyll index (µmol m^{-2})

Data represented in Table 3 revealed at 25, 45 and 65 DAS, the significant effect by the treatments were showed on the chlorophyll index of fodder rabi maize at 5% significant level. At 25 DAS, the higher chlorophyll index (58.36 µmol m^{-2}) was marked in case of treatment T_4 and the lowest chlorophyll index (39.33 µmol m^{-2}) was marked in case of control T_1. But during this time other treatments showed nearly equal chlorophyll index (Table 4). At 45 and 65 DAS, the best treatment for increased chlorophyll index

Table 2: Effects of urea and zinc application on the leaf width at 25, 45 and 65 DAS.

Treatments	Leaf width (cm)		
	25 DAS	45 DAS	65 DAS
T_1: Absolute control	2.29b±0.06	4.39e±1.00	5.29d±1.00
T_2: RDF + 0.25% zinc	2.58ab±0.27	5.40d±0.20	6.52c±0.07
T_3: RDF + 0.50% zinc	2.59ab±0.27	5.42d±0.20	7.27a±0.19
T_4: RDF + 1% urea	2.76a±0.27	5.55cd±0.05	6.63bc±0.06
T_5: RDF + 1% urea + 0.25% zinc	2.55ab±0.27	5.73bcd±0.05	6.91abc±0.19
T_6: RDF + 1% urea + 0.50% zinc	2.66ab±0.27	5.61cd±0.05	7.07abc±0.19
T_7: RDF + 2% urea	2.72a±0.27	6.05bc±0.05	6.66bc±0.06
T_8: RDF + 2% urea + 0.25% zinc	2.54ab±0.27	6.23ab±0.11	6.89abc±0.19
T_9: RDF + 2% urea + 0.50% zinc	2.67ab±0.27	6.60a±0.11	7.18ab±0.19
SEm (±)	0.107	0.136	0.178
SEd (±)	0.151	0.192	0.252
CD at 5%	0.319	0.407	0.535

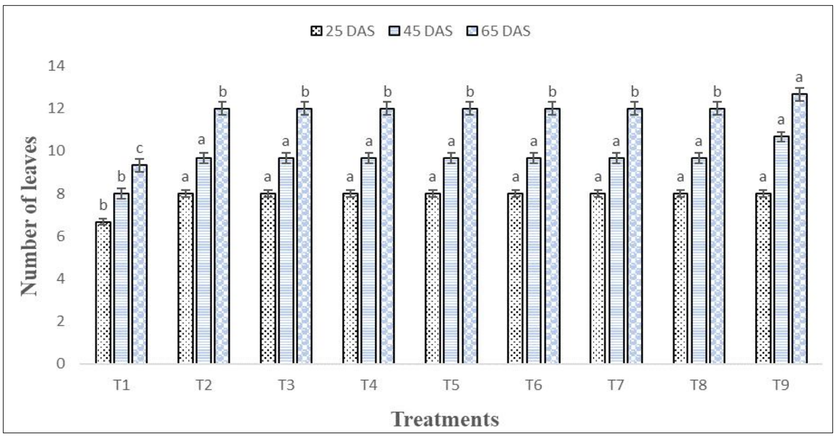

Fig 2: Effects of urea and zinc application on number of leaves at 25, 45 and 65 DAS.

in this experiment was T_9. T_9 consistently showed higher chlorophyll index values at 45 and 65 DAS compared to other treatments. At 65 DAS, higher chlorophyll index value of 64.18 µmol.m^{-2}, which was significantly higher than the least treatment, T_1 absolute control, with a chlorophyll index value of 39.97 µmol m^{-2}. The numerical difference between T_9 and T_1 was 24.21 µmol.m^{-2}, strengthening the effectiveness of chlorophyll index. This result highlights the significance of incorporating urea and zinc with RDF for maximizing chlorophyll index. Similar study also demonstrated by Xie *et al.* (2006) and Liu *et al.* (2016).

Stem girth (mm)

Data represented in Fig 3 expressed that at 25, 45 and 65 DAS, the treatments showed a significant effect on the stem girth of fodder rabi maize at 5% significant level. At 25 DAS, all treatments were showing nearly equal value of stem girth and the lowest stem girth (0.73 cm) was noted in case of absolute control T_1. At 45 and 65 DAS, the best treatment for increased stem girth in this experiment was T_9. T_9 consistently showed higher stem girth values at 45 and 65 DAS compared to other treatments. At 65 DAS, higher stem girth value of 3.02 cm, which was significantly higher than the least treatment, T_1 absolute control, with a stem girth value of 1.91 cm. The numerical difference between T_9 and T_1 was 1.11 cm, strengthening the effectiveness of stem girth. This result highlights the significance of incorporating urea and zinc with RDF for maximizing stem girth. Similar result also obtained by Jamil *et al.* (2015), whose demonstrated that 47% higher girth of the stem was obtained by the combined application of nitrogen and zinc over control condition.

Root volume (cm^3)

Data demonstrated in Table 4 recorded at 25, 45 and 65 DAS, the significant effect by the application of different treatments were showed on the volume of root of fodder *rabi* maize at 5% significant level. At 25 DAS, all treatments showed nearly equal values of root volume except T_1 (absolute control). The lowest root volume (2.00 cm^3) was noted in the case of the control condition. At 45 and 65 DAS, the best treatment for increased root volume in this experiment was T_9. T_9 consistently showed higher root volume values at 45 and 65 DAS compared to other

Table 3: Effects of urea and zinc application on chlorophyll index at 25, 45 and 65 DAS.

Treatments	Chlorophyll index (µmol m^{-2})		
	25 DAS	45 DAS	65 DAS
T_1: Absolute control	39.33c±1.00	39.62e±1.00	39.97e±1.00
T_2: RDF + 0.25% zinc	55.66b±0.17	54.84d±1.00	56.51d±1.00
T_3: RDF + 0.50% zinc	56.06ab±0.17	57.73c±0.08	58.39c±1.00
T_4: RDF + 1% urea	58.36a±0.06	60.18ab±0.06	61.51b±0.06
T_5: RDF + 1% urea + 0.25% zinc	55.89ab±0.06	59.47bc±0.08	60.67b±0.06
T_6: RDF + 1% urea + 0.50% zinc	55.97ab±0.06	58.73bc±0.08	60.47b±0.06
T_7: RDF + 2% urea	56.07ab±0.06	59.87ab±0.06	61.61b±0.06
T_8: RDF + 2% urea + 0.25% zinc	56.37ab±0.06	60.58ab±0.086	62.20b±0.06
T_9: RDF + 2% urea + 0.50% zinc	57.43ab±0.06	61.81a±0.08	64.18a±1.00
SEm (±)	0.797	0.556	0.562
SEd (±)	1.126	0.786	0.794
CD at 5%	2.388	1.667	1.684

Table 4: Effects of urea and zinc application on root volume at 25, 45 and 65 DAS.

Treatments	Root volume (cm^3)		
	25 DAS	45 DAS	65 DAS
T_1: Absolute control	2.00b±1.00	7.00g±1.00	16e±1.00
T_2: RDF + 0.25% zinc	2.70a±0.20	9.33f±1.00	23.33d±0.21
T_3: RDF + 0.50% zinc	2.90a±0.20	11.33e±0.13	27c±0.07
T_4: RDF + 1% urea	2.87a±0.20	12.17de±0.13	22.17d±0.21
T_5: RDF + 1% urea + 0.25% zinc	2.93a±0.20	13.00cd±0.09	25.50c±0.07
T_6: RDF + 1% urea + 0.50% zinc	2.83a±0.20	14.00c±0.09	30.50b±0.05
T_7: RDF + 2% urea	2.88a±0.20	13.33c±0.09	27.33c±0.07
T_8: RDF + 2% urea + 0.25% zinc	2.73a±0.20	16.00b±1.00	32.33b±0.05
T_9: RDF + 2% urea + 0.50% zinc	2.77a±0.20	18.33a±1.00	39.17a±1.00
SEm (±)	0.099	0.358	0.652
SEd (±)	0.141	0.507	0.922
CD at 5%	0.298	1.075	1.955

treatments. At 45 and 65 DAS, higher root volume value of 18.33 cm^3 and 39.17 cm^3, respectively, which was significantly higher than the least treatment, T_1 control, with a root volume value of 7.00 cm^3 and 16.00 cm^3, respectively. The numerical difference between T_9 and T_1 was 23.17 cm^3, strengthening the effectiveness of influencing the volume of root. This result highlights the significance of incorporating urea and zinc with RDF for maximizing root volume.

Fresh weight (g)

Data represented in the Table 5 recorded that at 25, 45 and 65 DAS, the treatments showed the significant impact on the fresh weight of fodder *rabi* maize at 5% significant level. At 25 DAS, all treatments showed nearly equal values of fresh weight except T_1 (absolute control). The lower fresh weight (17.48 g) was noted in the case of the absolute control condition. At 45 DAS, T_9 showed a fresh weight of 134.54 g, which was the higher than all other treatments. At 65 DAS, T_9 exhibited a fresh weight of 299.32 g, again surpassing all other treatments. The significance difference between T_9 and the least performing treatments, absolute control (T_1) was 17.48 g, 32.56 g and 93.83 g at 25, 45 and 65 DAS respectively. Above mentioned result indicate that T_9 is the most valuable and effective treatment for influencing plant growth and enhancing fresh weight over the other treatments. However, the spraying of urea and zinc along with appropriate nutrient management strategies, can be effective approach to improve growth of the crop and side by side crop productivity and sustainability (Dass *et al*., 2022).

Internode distance (cm)

Data represented in Fig 4 revealed at 65 DAS, the treatments showed a significant effect on the internode distance of fodder rabi maize at 5% significant level. From this study, the greatest distance of internode (6.78 cm) was noted in case of treatment T_9 over other treatments and absolute control (T_1) condition. The absolute control group (T_1) exhibited moderate growth, with an internode distance 1.01 cm at 65 DAS. Whereas, treatment T_2 and T_3, RDF along with various concentrations of Zinc, showed progressively higher internode distance reaching in the case of T_3 demonstrating the greatest growth of 4.32 cm at 65 DAS. Treatments from T_4 to T_6, RDF + 1% urea along

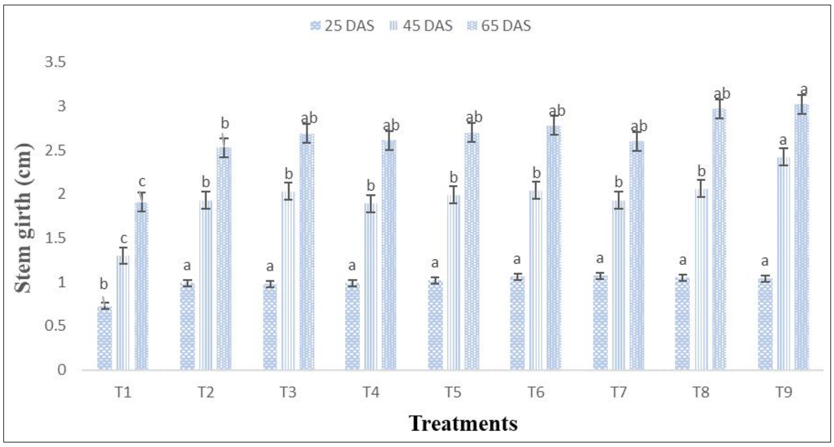

Fig 3: Effects of urea and zinc application on stem girth at 25, 45 and 65 DAS.

Table 5: Effects of urea and zinc application on fresh weight at 25, 45 and 65 DAS.

Treatments	Fresh weight (g)		
	25 DAS	45 DAS	65 DAS
T_1: Absolute control	17.48c±1.00	32.56g±1.00	93.83i±1.00
T_2: RDF + 0.25% zinc	20.40b±0.07	93.53f±0.06	190.79h±1.00
T_3: RDF + 0.50% zinc	21.46a±0.40	95.83f±0.06	203.78g±1.00
T_4: RDF + 1% urea	21.40a±0.40	98.55e±1.00	213.78f±1.00
T_5: RDF + 1% urea + 0.25% zinc	21.43a±0.40	108.18d±1.00	221.92e±1.00
T_6: RDF + 1% urea + 0.50% zinc	21.23ab±0.07	114.13c±1.00	236.99d±1.00
T_7: RDF + 2% urea	21.12ab±0.07	119.16b±0.63	260.10c±1.00
T_8: RDF + 2% urea + 0.25% zinc	21.07ab±0.07	119.72b±0.63	273.28b±1.00
T_9: RDF + 2% urea + 0.50% zinc	21.23ab±0.07	134.54a±1.00	299.32a±1.00
SEm (±)	0.259	0.774	1.188
SEd (±)	0.367	1.094	1.681
CD at 5%	0.778	2.319	3.563

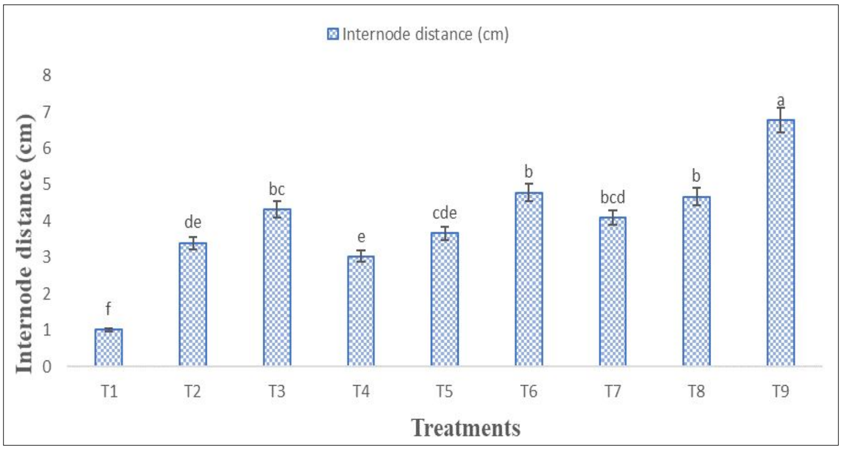

Fig 4: Effects of urea and zinc application on internode distance at 65 DAS.

with various concentrations of zinc, resulted in progressively higher internode distance reaching in the case of T_6 demonstrating the greatest distance of 4.78 cm at 65 DAS. Treatments T_7 to T_9, which received RDF + 2% urea along with various concentrations of zinc, also showed increased leaf area compared to absolute control and other treatments, with T_9 (RDF + 1% urea + 0.50% Zinc) recording the highest leaf area of 6.78 cm at 65 DAS. Adequate nitrogen availability generally enhanced vegetative growth, cell division and cell elongation, including the elongation of internodes. These results were showing by Patel *et al.* (2017); Ali and Muhammad (2017) in accordance. Zinc also plays an important function in several physiological processes within plants, including hormone regulation, enzyme activation and protein synthesis. In this way, both nitrogen and zinc can influence the internode distance of the fodder maize plant (Begum *et al.,* 2018).

CONCLUSION

From the present study, it is concluded that application of RDF + 2% Urea + 0.50% Zinc improves the growth parameters of fodder maize. Exploring the synergistic effects of combining urea and zinc foliar application. All growth parameters of various treatments were noted, while the combination treatment with urea and zinc followed by RDF resulted in enhanced the growth of the plants. Treatment T_9, RDF + 2% urea + 0.50% zinc in promoting plant growth. This result highlights the significance of incorporating urea and zinc with RDF for maximizing plant growth. Because of, increased of auxin synthesis, vegetative growth and internode distance by the application of urea and zinc.

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Disclaimers

The views and conclusions expressed in this article are solely those of the authors and do not necessarily represent the views of their affiliated institutions. The authors are responsible for the accuracy and completeness of the information provided, but do not accept any liability for any direct or indirect losses resulting from the use of this content.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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