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Influence of foliar application of nutrients on total yield per annum and leaf nutrient status of Guava (*Psidium guajava*) cv. L-49

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Abstract

A field experiment was carried out in the Experimental Orchard of Department of Horticulture, CCS Haryana Agricultural University, Hisar during 2016-17, to study the effect of foliar sprays of ZnSO₄ (0.50, 0.75 and 1.00%), FeSO₄ (0.2, 0.4 and 0.6%), K₂SO₄ (0.5, 1.0 and 1.5%) and Urea (1.0, 1.5 and 2.0%) along with control (water spray) before flowering and after fruit set, during rainy and winter seasons, on total yield and leaf nutrient status of guava (*Psidium guajava* L.) cv. L-49. The findings of the experiment revealed that the foliar application of various nutrients significantly influenced the total yield and leaf nutrient status of the plants over control. Total yield per tree per annum was recorded to be maximum (62.07 kg/tree) under ZnSO₄ @1.00 per cent, which was significantly higher than all other treatments except ZnSO₄ @0.75 per cent (61.39 kg/tree), while the minimum (50.46 kg/tree) was recorded under control. Maximum N content (1.78%) was obtained with the spray of Urea @2.0 per cent that was closely followed by Urea @1.5 per cent (1.76%), while the minimum (1.57%) was obtained under K₂SO₄ @1.0 per cent. Maximum P (0.23%) and K content (1.79%) were obtained with K₂SO₄ @1.5 per cent, which was closely followed K₂SO₄ @1.0 per cent by (0.22% P and 1.77% K) whereas, minimum P content (0.15%) was recorded under Urea @1.5 and 2.0 per cent and minimum K content (1.63%) was recorded under Urea @1.0 per cent and FeSO₄ @0.2 per cent. Maximum Zn content (48.02 ppm) was obtained with the spray of ZnSO₄ @1.00 per cent, which was closely followed by ZnSO₄ @0.75 per cent (46.87 ppm) and the minimum (31.12 ppm) was obtained under control. Maximum Fe content (179.1 ppm) was obtained with the spray of FeSO₄ @0.6 per cent that was closely followed by FeSO₄ @0.4 per cent (177.3 ppm), while the minimum was obtained under Urea @2.0 per cent (153.1 ppm) followed by Urea @1.5 per cent (154.9 ppm).

Keywords: Guava, foliar application, urea, leaf nutrient, yield

Introduction

Fruit crops occupy a central role in the world of agriculture. Guava is one of the most important tropical/ sub-tropical fruit, because of its high nutritive value and possibilities of cultivation even under adverse conditions. This belongs to the family Myrtaceae with basic chromosome number n = 11. It was introduced by the Portuguese in India during 17th century. In India, guava covers total area of 268.2 thousand hectares, with an annual production of 3667.9 thousand MT. The average productivity of guava is 13.7MT/ha. Haryana has 11.2 thousand hectare area and 152.2 thousand metric tonnes production under guava cultivation with a productivity of 13.59 MT/ha (Anonymous, 2016)^[2]. The major guava producing districts of Haryana are Hisar, Sirsa, Fatehabad, Jind, Jhajjar, Sonapat, Karnal, Yamuna Nagar, Mewat and Ambala (Saxena and Gandhi, 2015)^[8]. As guava tree produce fruits round the year, the maximum growth of the plants needs an optimum availability of all macro and micro - nutrients. If the nutritional balance is disturbed due to insufficient or excess of essential elements during the active growth period, disorder of growth manifestations will occur and special symptoms will develop on sooner or later. Guava is generally cultivated in poor soil due to which it suffers from different nutrients deficiency, that results in the loss of quality and storage life of this important fruit crop. The foliar application of micronutrients plays vital role in improving the quality and comparatively more effective for rapid recovery of plants under high pH conditions. The foliar feeding of fruit trees has gained much importance in recent years, as nutrients applied through soil are needed in higher quantities due to leaching losses and also due to unavailability to the plant because of complex soil reaction.

Regular foliar spray of micronutrients is beneficial to increase fruit yield.

Based on this fact, several workers have tried to study the effect of foliar feeding of nutrients to meet their immediate requirement in the growth and development of fruit with success upto certain extent. The present investigation was therefore, undertaken during 2016-2017 to evaluate the effect of foliar application of nutrients on the total yield per annum and leaf nutrient status of guava cv. Sardar.

Material methods

The present investigation entitled, “Studies on influence of foliar application of nutrients on growth, yield and quality of guava (*Psidium guajava* L.) cv. L-49” was carried out in the Department of Horticulture, CCS Haryana Agricultural University, Hisar during 2016-17. The experiment comprising of ZnSO_4 (0.50, 0.75 and 1.00%), FeSO_4 (0.2, 0.4 and 0.6%), K_2SO_4 (0.5, 1.0 and 1.5%) and Urea (1.0, 1.5 and 2.0%) along with control (water spray) were laid out in randomized block design on 4 year old guava plants cv. L-49 planted at 6 x 6 m apart. The observations on total yield and leaf nutrient content status of guava plants were taken as per standard procedures.

Leaf sample analysis: For nutrient analysis oven dried plant material from each tagged plant was grinded separately with grinder. Nitrogen (Colorimetric or Nessler’s reagent method,

Lindner, 1944)^[6], phosphorus (Vanadomolybdo-phosphoric acid yellow colour method, Koeing and Johnson, 1942)^[5], potassium (Flame photometer), Zn and Fe (Using atomic absorption spectrophotometer) contents in sample were analyzed. The important findings of the investigation were recorded.

Selection of variety

The present study was conducted on cultivar 'Lucknow-49', also known as 'Sardar Guava'. It is a chance seedling selection from 'Allahabad Safeda' at Pune. L-49 is a semi-dwarf tree of 2.3 to 3.4 m height with heavy bearing habit, vigorous and heavy branching with long flat crown (Gaur *et al.*, 2014)^[4].

Results and discussion

Total yield

Data pertaining to total yield per tree per annum is depicted in table 1. A perusal of the data shows that the effect of foliar application of nutrients on total yield per tree per annum of guava cv. L-49 was found significant. Total yield per tree per annum was recorded to be maximum (62.07 kg/tree) under ZnSO_4 @1.00 per cent, which was significantly higher than all other treatments except ZnSO_4 @0.75 per cent (61.39 kg/tree), while the minimum (50.46 kg/tree) was recorded under control.

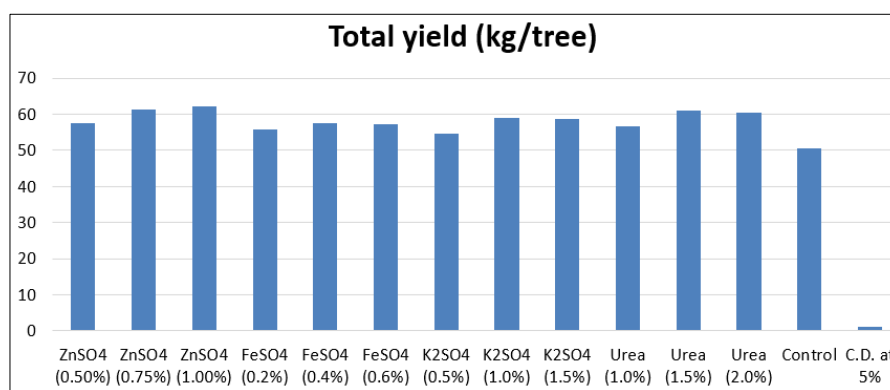


Fig 1: Bar chart showing total yield (kg/tree) for various nutrient treatments (ZnSO_4 , FeSO_4 , K_2SO_4 , Urea) at different concentrations compared to a control.

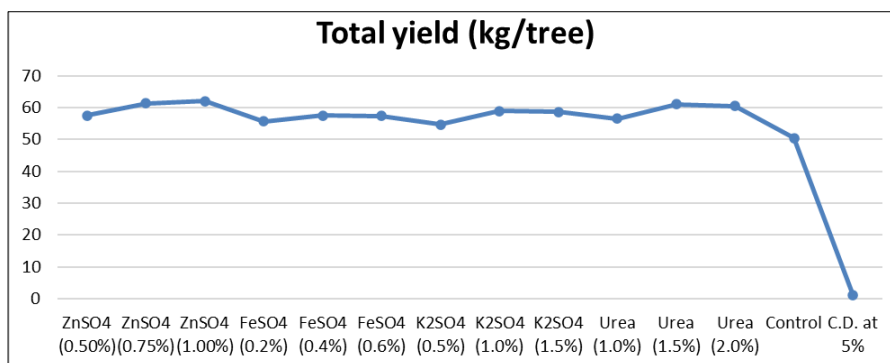


Fig 2: Line chart showing total yield (kg/tree) for nutrient treatments (ZnSO_4 , FeSO_4 , K_2SO_4 , Urea) at different concentrations compared to a control.

Nutrient analysis

The data concerning the leaf sample analysis for N, P, K, Zn and Fe are shown in Table 1. A brief appraisal of the data clearly indicates that all the treatments were found significant in altering the leaf N, P, K, Zn and Fe content over control. Maximum N content (1.78%) was obtained with the spray of Urea @2.0 per cent that was closely followed by Urea @1.5

per cent (1.76%), while the minimum (1.57%) was obtained under K_2SO_4 @1.0 per cent. Maximum P (0.23%) and K content (1.79%) were obtained with K_2SO_4 @1.5 per cent, which was closely followed by K_2SO_4 @1.0 per cent (0.22% P and 1.77% K) whereas, minimum P content (0.15%) was recorded under Urea @1.5 and 2.0 per cent and minimum K content (1.63%) was recorded under Urea @1.0 per cent and

FeSO₄ @0.2 per cent. Maximum Zn content (48.02 ppm) was obtained with the spray of ZnSO₄ @1.00 per cent, which was closely followed by ZnSO₄ @0.75 per cent (46.87 ppm) and the minimum (31.12 ppm) was obtained under control. Maximum Fe content (179.1 ppm) was obtained with the spray of FeSO₄ @0.6 per cent that was closely followed by FeSO₄ @0.4 per cent (177.3 ppm), while the minimum was obtained under Urea @2.0 per cent (153.1 ppm) followed by Urea @1.5 per cent (154.9 ppm). This increase in leaf N, Zn and Fe content might be due to the fact that application of urea, zinc sulphate and ferrous sulphate improved the concentration of these in plant tissue. Reduced P and K with foliar sprays of urea may be due to luxuriant growth and yield leading to higher biomass production which counter balanced

the content of these elements, i.e. dilution effect (Dalal *et al.*, 2011)^[3]. These results are further supported by the findings of Dalal *et al.*, (2011)^[3] who reported that maximum leaf N (2.64%) content was obtained with spray of urea @2.0 per cent and minimum (2.18%) with K₂SO₄ @1.0 per cent, the maximum P (0.272%) and K (1.16%) contents with K₂SO₄ @1.0 per cent and minimum (0.203 and 0.85%) with Urea @2.0 per cent spray, respectively, maximum zinc (180.26 ppm) with ZnSO₄ @0.5 per cent and maximum iron (184.32 ppm) with ZnSO₄ @0.5 per cent sprays, respectively in ber leaves. Similar results were earlier reported by Prasad *et al.*, (2017)^[7] in Kinnow mandarin and Ahmad Khan *et al.*, (2012)^[1] in Feutell's Early (*Citrus reticulata* Blanco.) tree.

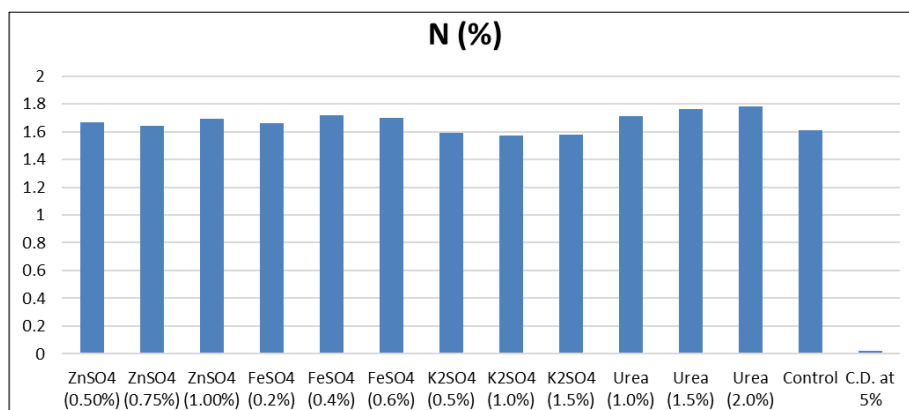


Fig 3: Bar chart showing nitrogen percentage (N %) for various nutrient treatments (ZnSO₄, FeSO₄, K₂SO₄, Urea) at different concentrations compared to a control.

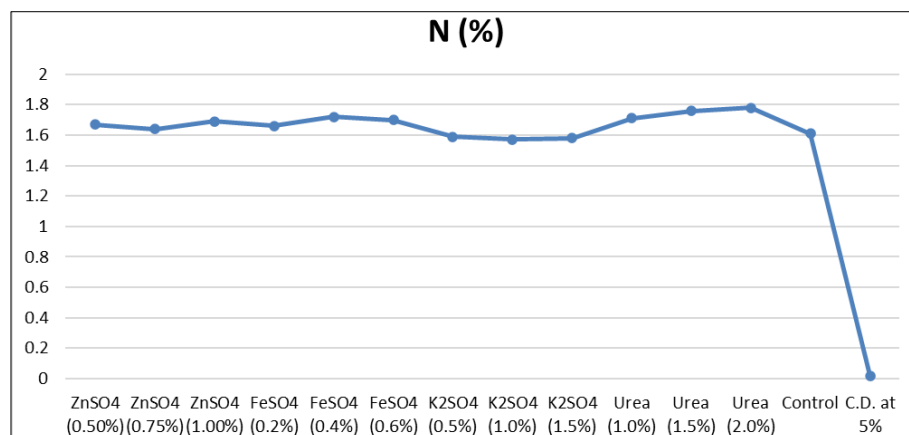


Fig 4: Line chart showing nitrogen percentage (N %) for nutrient treatments (ZnSO₄, FeSO₄, K₂SO₄, Urea) at different concentrations compared to a control.

Table 1: Effect of foliar application of different nutrients on total yield and leaf nutrient content of guava (*Psidium guajava* L.) cv. L-49

Treatment	Total yield (kg/tree)	N (%)	P (%)	K (%)	Zn (ppm)	Fe (ppm)
ZnSO ₄ (0.50%)	57.45	1.67	0.18	1.69	42.41	165.2
ZnSO ₄ (0.75%)	61.39	1.64	0.16	1.67	46.87	160.7
ZnSO ₄ (1.00%)	62.07	1.69	0.17	1.65	48.02	162.3
FeSO ₄ (0.2%)	55.64	1.66	0.18	1.63	34.27	172.8
FeSO ₄ (0.4%)	57.48	1.72	0.18	1.64	39.15	177.3
FeSO ₄ (0.6%)	57.32	1.70	0.17	1.66	38.79	179.1
K ₂ SO ₄ (0.5%)	54.68	1.59	0.20	1.73	34.67	161.3
K ₂ SO ₄ (1.0%)	58.89	1.57	0.22	1.77	34.12	157.2
K ₂ SO ₄ (1.5%)	58.58	1.58	0.23	1.79	32.87	158.4
Urea (1.0%)	56.53	1.71	0.16	1.63	35.31	157.6
Urea (1.5%)	61.11	1.76	0.15	1.65	41.16	154.9
Urea (2.0%)	60.46	1.78	0.15	1.68	39.89	153.1
Control	50.46	1.61	0.18	1.69	31.12	166.4
C.D. at 5%	0.98	0.02	0.01	0.02	1.32	2.34

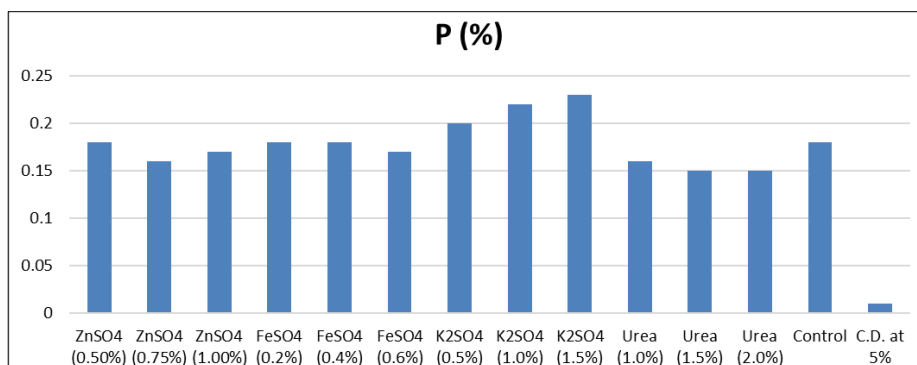


Fig 5: Bar chart showing phosphorus percentage (P %) for various nutrient treatments (ZnSO₄, FeSO₄, K₂SO₄, Urea) at different concentrations compared to a control.

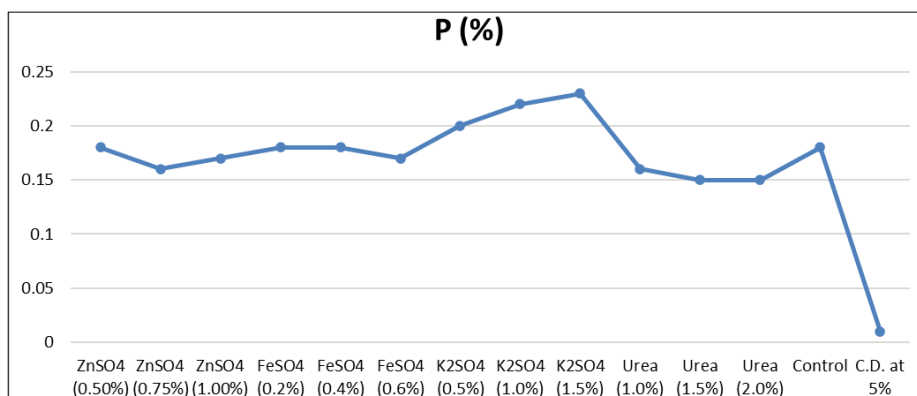


Fig 6: Line chart showing phosphorus percentage (P %) for nutrient treatments (ZnSO₄, FeSO₄, K₂SO₄, Urea) at different concentrations compared to a control.

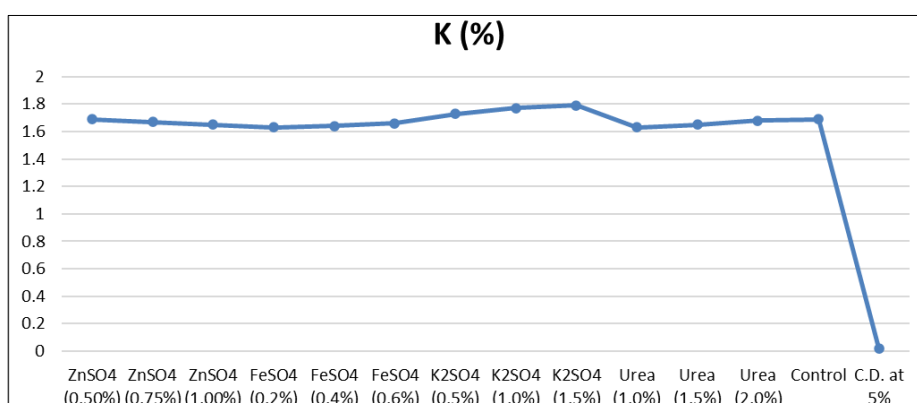


Fig 7: Line chart showing potassium percentage (K %) for nutrient treatments (ZnSO₄, FeSO₄, K₂SO₄, Urea) at different concentrations compared to a control.

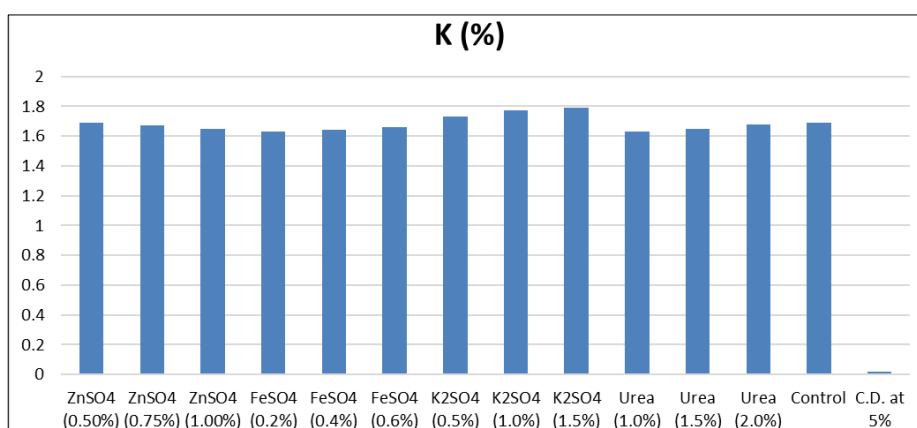


Fig 8: Bar chart showing potassium percentage (K %) for various nutrient treatments (ZnSO₄, FeSO₄, K₂SO₄, Urea) at different concentrations compared to a control.

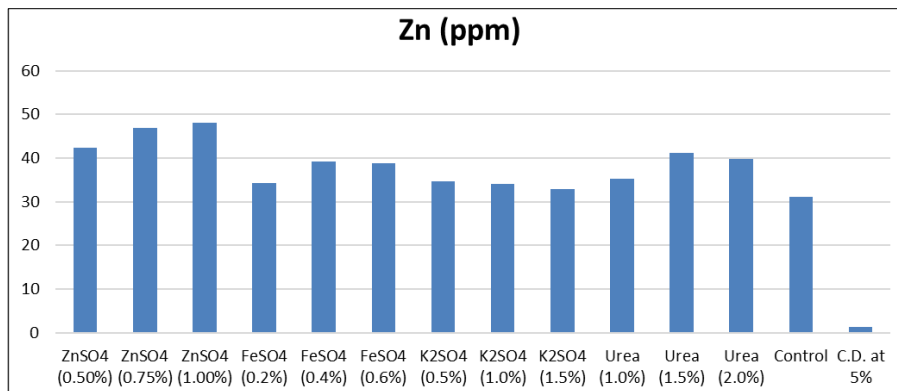


Fig 9: Bar chart showing zinc levels (Zn in ppm) for nutrient treatments (ZnSO₄, FeSO₄, K₂SO₄, Urea) at different concentrations compared to a control.

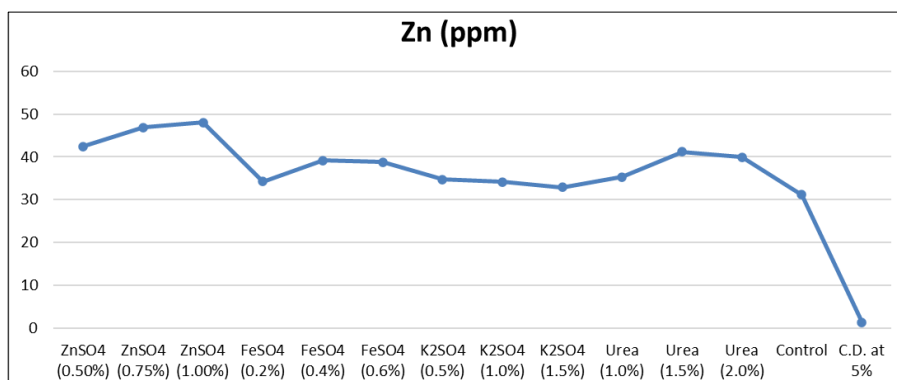


Fig 10: Line chart showing zinc levels (Zn in ppm) for nutrient treatments (ZnSO₄, FeSO₄, K₂SO₄, Urea) at different concentrations compared to a control.

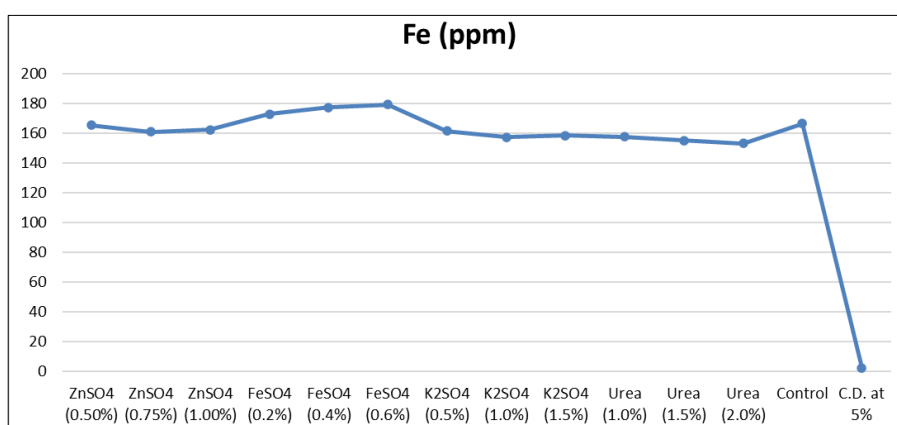


Fig 11: Line chart showing iron levels (Fe in ppm) for nutrient treatments (ZnSO₄, FeSO₄, K₂SO₄, Urea) at different concentrations compared to a control.

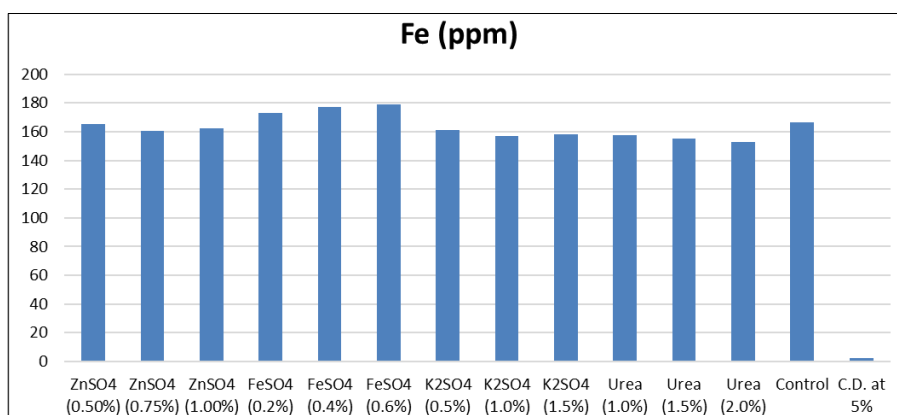


Fig 12: Bar chart showing iron levels (Fe in ppm) for various nutrient treatments (ZnSO₄, FeSO₄, K₂SO₄, Urea) at different concentrations compared to a control.

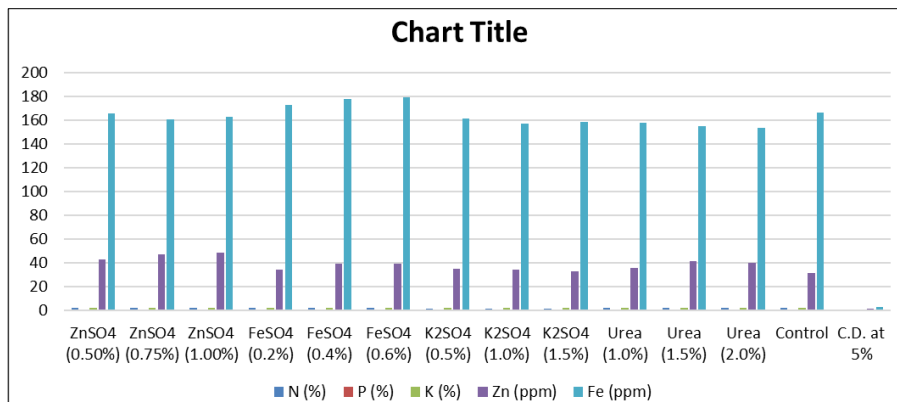


Fig 13: Grouped bar chart showing N (%), P (%), K (%), Zn (ppm), and Fe (ppm) values across various nutrient treatments and concentrations compared to a control.

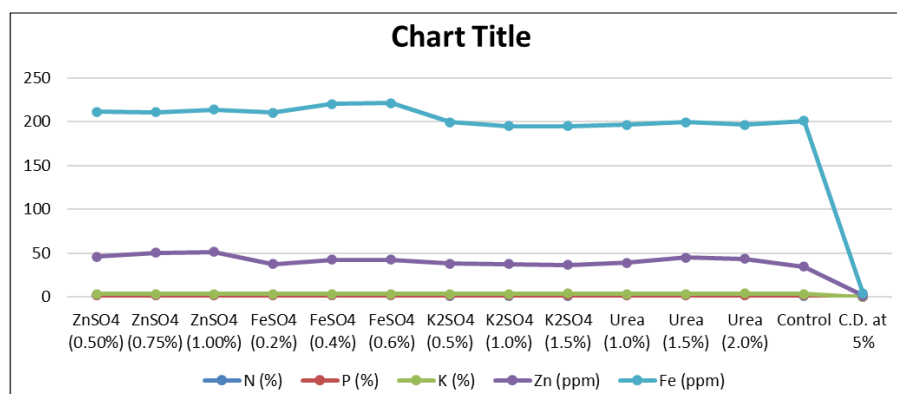


Fig 14: Line graph comparing N (%), P (%), K (%), Zn (ppm), and Fe (ppm) values across various nutrient treatments and concentrations against a control.

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