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# Influence of foliar application of nutrients on growth, yield and quality of potato (*Solanum tuberosum* L.) under hill zone of Karnataka

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**Abstract**
A field experiment was conducted to know the "Influence of foliar application of nutrients on growth, yield and quality of potato (*Solanum tuberosum* L.)" at College of Horticulture, Mudigere during 2017-18. The results revealed that foliar applications of micronutrient mixture @ 5g/lit recorded significantly higher plant height (38.67 cm), number of leaves (108.20), number of stem (5.27), plant spread (47.57 cm), Leaf area index (3.34), fresh weight of leaf (30.99 g), fresh weight of stem (73.47 g), dry weight of leaf (7.06 g), dry weight of stem (11.54 g), dry weight of root (4.87 g), total dry matter production (23.47 g/plant) with respect to growth parameters. Yield and quality parameters *viz.* similar treatment recorded maximum number of tubers per plant (2.89), number of tubers per plot (86.70), yield per hectare (20.80 t/ha), tuber volume (124.98 cc), tuber weight (98.65 g),tuber circumference (14.90 cm) and total sugars (2.41%) as compared to control.

**Keywords:** Micronutrient, potato

## Introduction
Potato (*Solanum tuberosum* L.) is the world's fourth important food crop after wheat, rice and maize because of its great yield potential and high nutritive value. In Karnataka potato being one of the most important short duration cash crops. The average yield of potato in Karnataka state is much lower (14 t $ha^{-1}$) as compared to national average. At present, to fulfill the needs of increasing population, one of the possibilities is to increase the area as well as productivity. However, for increasing productivity and quality, nutrition is a key factor in production technology will have to be given emphasis, to produce higher yields of good quality tubers by evolving fertilizer schedules that are suited to specific agro-ecological situations. It is now established that, fertilizer is a kingpin in the process of improving yield and quality of any crop. The sources of nutrients especially that of major nutrients do have an effect on plant growth, yield and quality of the crop. In view of these facts, the study was under taken to know the effect of foliar application of nutrients on yield and quality of potato.

## Material and Methods
The soil of the experimental area was sandy loam having good physical and chemical properties and pH of the soil was 6.2. This experiment was undertaken to find out the best nutrient formulation to obtain good growth, yield and yield attributes in potato. The design followed was RCBD (Randomized Complete Block Design) with 12 treatments replicated thrice in a plots of 2 m x 1.8 m size with 60 x 20 cm spacing during *Kharif* 2017. The treatments included under the study were, $T_1$ (control) - RDF (FYM 25 t/ha + N:P:K at 100:75:100 kg/ha), $T_2$ - $T_1$ + Calcium nitrate 0.3%, $T_3$ - $T_1$ + Calcium nitrate 0.5%, $T_4$ - $T_1$+ Magnesium sulphate 0.3%, $T_5$ - $T_1$ + Magnesium sulphate 0.5%, $T_6$ - $T_1$ + Zinc sulphate 0.3%, $T_7$ - $T_1$ + Zinc sulphate 0.5%, $T_8$ - $T_1$ + Potassium schoenite 0.3%, $T_9$ - $T_1$ + Potassium schoenite 0.5%, $T_{10}$ - $T_1$ + Boron 0.1%, $T_{11}$-$T_1$ + Boron 0.2%, $T_{12}$ - $T_1$ + Micronutrient mixture 0.5% (Fe, Cu, Mo, Mn, B, Zn). Nutrient formulation were applied 15 and 30 days after sowing of tubers. Observations for growth parameters was recorded at 60 days after planting and mean data and mean of the five plants was used for analysis.

## Results and discussion

### Growth parameters

The results revealed that foliar application of Micronutrient mixture 0.5% ($T_{12}$) has shown the maximum plant height (38.67 cm), number of leaves (108.20), number of stem (5.27), plant spread (47.57 cm), Leaf area index (3.34),fresh weight of leaf (30.99 g), fresh weight of stem (73.47 g), dry weight of leaf (7.06 g), dry weight of stem (11.54 g), dry weight of root (4.87 g) and total dry matter production (23.47g/plant) as compared to control (table1.). The enhancement in growth parameters was due to the effective role of micronutrients in controlling various enzymes activities, photosynthetic pigments formation, cell division and producing certain biochemical growth promoting substances like auxins, cytokinins and gibberellin which consequently affecting plant growth. The findings are in line with Dod *et al*. (1989) [6] in capsicum, Deka and Shadeque (1991) [4] in french bean, Thakare *et al.* (2007) [12] and Kumar *et al.* (2008) [7] in potato and Sathya *et al*. (2010) [10] in tomato.

### Yield parameters and quality parameters

The results revealed that foliar application of Micronutrient mixture 0.5% ($T_{12}$) has shown the highest number of tubers per plant (2.89), number of tubers per plot (86.70), yield per hectare (20.80 t/ha), tuber volume (124.98 cc), tuber weight (98.65 g), tuber circumference (14.90 cm) and total sugars (2.41%) as compared to control (table 2). Increase in yield and yield attributes due to micronutrients application may be attributed to enhanced photosynthetic activity and increased production and accumulation of carbohydrates and favorable effect on vegetative growth which increased number of tubers per plant besides improving size. The enhanced yield and quality of tubers might be due to higher accumulation of photosynthates by vegetative parts and tubers. These findings are corroborated by Bose and Tripathi, (1996) [3], Smitha *et al*. (2008) [11], Basavarajeshwari *et al*. (2006) [2], Hamsaveni *et al*. (2003) and Parmar *et al*. (2016) [9] in tomato, Bari *et al*. (2001) [1], Thakare *et al.* (2007) [12], Mouasavi *et al.* (2007) [8], Devi *et al*. (2013) [5] in potato.

**Table 1:** Effect of foliar application of nutrients on growth parameters of potato

| Treatments | Plant height (cm) | Number of leaves per plant | Number of stems | Plant spread (cm) | Leaf area index | Fresh weight of leaf (g) | Fresh weight of stem (g) | Dry weight of leaf (g) | Dry weight of stem (g) | Dry weight of roots (g) | Total dry matter (g plant$^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 23.93 | 80.00 | 3.47 | 35.72 | 3.01 | 19.22 | 58.20 | 5.39 | 8.61 | 2.98 | 16.98 |
| T2 | 24.07 | 80.67 | 3.53 | 36.01 | 3.05 | 20.05 | 59.07 | 5.54 | 9.01 | 3.25 | 17.80 |
| T3 | 25.67 | 81.07 | 3.80 | 37.01 | 3.10 | 20.54 | 60.53 | 5.88 | 9.15 | 3.27 | 18.30 |
| T4 | 30.80 | 91.80 | 4.20 | 42.29 | 3.22 | 22.53 | 65.07 | 6.26 | 9.67 | 4.10 | 20.03 |
| T5 | 32.87 | 94.47 | 4.47 | 43.73 | 3.24 | 23.15 | 66.13 | 6.35 | 10.02 | 4.12 | 20.49 |
| T6 | 28.53 | 86.27 | 4.00 | 40.56 | 3.16 | 21.64 | 63.20 | 6.23 | 9.34 | 3.82 | 19.39 |
| T7 | 30.07 | 90.33 | 4.07 | 41.44 | 3.21 | 22.48 | 64.47 | 6.25 | 9.39 | 4.09 | 19.73 |
| T8 | 32.93 | 98.87 | 4.53 | 45.20 | 3.26 | 23.72 | 66.47 | 6.37 | 10.15 | 4.16 | 20.68 |
| T9 | 34.73 | 103.00 | 4.67 | 45.50 | 3.30 | 26.81 | 68.53 | 6.85 | 10.18 | 4.65 | 21.68 |
| T10 | 26.87 | 83.53 | 3.92 | 37.84 | 3.11 | 21.00 | 61.13 | 6.06 | 9.22 | 3.31 | 18.59 |
| T11 | 27.80 | 85.73 | 3.93 | 39.61 | 3.15 | 21.43 | 61.60 | 6.20 | 9.26 | 3.38 | 18.84 |
| T12 | 38.67 | 108.20 | 5.27 | 47.57 | 3.34 | 30.99 | 73.47 | 7.06 | 11.54 | 4.87 | 23.47 |
| S.Em± | 0.54 | 0.58 | 0.19 | 0.11 | 0.03 | 0.67 | 0.57 | 0.11 | 0.43 | 0.12 | 0.54 |
| CD @5% | 1.59 | 1.70 | 0.57 | 0.32 | 0.09 | 1.96 | 1.67 | 0.34 | 1.26 | 0.36 | 1.59 |

**Table 2:** Effect of foliar application of nutrients on yield and quality parameters of potato.

| Treatments | Number of tubers per plant | Number of tubers per plot | Yield per hectare (t) | Tuber volume (cc) | Tuber weight (g) | Tuber circumference (cm) | Total sugars (%) |
|---|---|---|---|---|---|---|---|
| T1 | 2.14 | 64.20 | 13.12 | 105.59 | 74.07 | 11.01 | 1.60 |
| T2 | 2.19 | 65.70 | 13.64 | 108.40 | 76.33 | 11.55 | 1.66 |
| T3 | 2.23 | 66.90 | 14.10 | 111.47 | 76.73 | 12.31 | 1.67 |
| T4 | 2.63 | 78.90 | 16.65 | 116.67 | 86.33 | 13.07 | 1.96 |
| T5 | 2.7 | 81.00 | 17.28 | 117.93 | 88.27 | 13.19 | 2.00 |
| T6 | 2.49 | 74.70 | 15.99 | 115.93 | 78.93 | 12.60 | 1.82 |
| T7 | 2.56 | 76.80 | 16.11 | 116.20 | 81.87 | 12.77 | 1.85 |
| T8 | 2.75 | 82.50 | 18.10 | 118.20 | 88.67 | 13.29 | 2.30 |
| T9 | 2.82 | 84.60 | 19.08 | 120.27 | 94.27 | 13.58 | 2.35 |
| T10 | 2.37 | 71.10 | 15.67 | 113.53 | 78.80 | 12.35 | 1.69 |
| T11 | 2.44 | 73.20 | 15.80 | 114.33 | 78.87 | 12.53 | 1.77 |
| T12 | 2.89 | 86.70 | 20.80 | 124.98 | 98.65 | 14.90 | 2.41 |
| S.Em± | 0.08 | 2.26 | 0.67 | 2.79 | 2.44 | 0.22 | 0.09 |
| CD @5% | 0.22 | 6.63 | 1.97 | 8.19 | 7.16 | 0.66 | 0.25 |

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