Environment and Ecology 40 (3A) : 1325—1331, July—September 2022
ISSN 0970-0420

# Studies on the Influence of Micronutrients and Potassium Sulphate on the Yield and Quality of Khasi Mandarin in Meghalaya Through Foliar Application

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Received 22 April 2022, Accepted 19 June 2022, Published on 6 August 2022


## ABSTRACT

Khasi mandarin (*Citrus reticulata* Blanco) of family Rutaceae is a commercial and important fruit of Meghalaya. It is a nutrient responsive plant that requires proper nutrition to ensure its high productivity and quality. Thus, an experiment was taken up and conducted at Umling, Nongpoh, Ri Bhoi District of Meghalaya during 2018-2020 to evaluate the influence of foliar spray of micronutrients and potassium on the growth and quality of Khasi mandarin. It was carried out on 8-year-old fruit trees. The experiment was laid out in Randomized Block Design consisting of 12 treatments. Treatment details are $T_1$ (Control), $T_2$ (SOP 0.5%), $T_3$ (SOP 1.0%) $T_4$ ($ZnSO_4$ 0.5%), $T_5$ (Micronutrient mix 0.1%), $T_6$ (Micronutrient mix 0.2%) $T_7$ (SOP 0.5% + $ZnSO_4$ 0.5%), $T_8$ (SOP 1.0 % + $ZnSO_4$ 0.5%), $T_9$ (SOP 0.5% + Micronutrient mix 0.1%), $T_{10}$ (SOP 1.0% + Micronutrient mix 0.1%), $T_{11}$ (SOP 0.5% + Micronutrient mix 0.2%), $T_{12}$ (SOP 1.0% + Micronutrient mix 0.2%). The result of two years data indicated that $T_{10}$ gave higher fruit yield and yield attributes with highest sugar percentage and lowest value in acidity whereas, maximum ascorbic content, Beta -carotene and protein % was observed in $T_9$. The result suggested that application of $T_{10}$ (SOP 1.0% + Micronutrient mix 0.1%) is considered more efficacious in increasing the productivity and quality of Khasi mandarin.


**Keywords** Khasi mandarin, Potassium, Micronutrients, Yield, Quality.

## INTRODUCTION

Meghalaya is gifted with a suitable environment condition that is favorable for a diverse number of Citrus species. Khasi mandarin (*Citrus reticulata* Blanco) a popular fruit in Northeast India occupies the major part of the state with a cultivated area of 9.26 thousand hectare and a production of 44.02 MT (GoM 2019). It is mainly confine in the sub-mountainous region along the Indo-Bangladesh border of the state (Passah and Tripathi 2020). In 2014 Meghalaya achieved the GI tag for the fruit under the Geographical Indication of goods (Registration and protection) Act 1999 (Singh *et al.* 2016). Being a commercially important fruit, Khasi mandarin desires proper nutrient management to ensure its high economic productivity. Kumar *et al.* (2020) opined that 50% of the cost of cultivation

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comes from fertilizer application, as adequate supply of nutrients is an important part of orchard management. Citrus plant requires both macro and micro nutrients for its proper growth, and micronutrients like Zinc, Boron, Manganese and Copper plays an important part in the plant metabolism. Zinc is an important element that partake in the activation of almost 60 enzymes, it contributes in the synthesis of growth hormone which thereby directly increases the fruit yield and quality on its application (Shivanandam *et al*. 2007). Boron on the other hand has its role in cell division, cell elongation and accumulation of carbohydrates within the fruit (Bhatt *et al.* 2012). Foliar spray of these micronutrients enhances the uptake of macro nutrients in the plant tissues. It is more successful than soil application, since the absorption of nutrients by the leaves is faster than absorption by roots (Yadav *et al.* 2020). Earlier findings showed that foliar spray of zinc sulphate in combination with sulphate of potash resulted in potential increase in the fruit yield and quality of Kinnow mandarin (Ashraf *et al.* 2013). Application of potassium is known to have a keen effect on the fruit quality of the plant. It helps in the increase of protein content, starch, vitamin C and soluble solids of the fruit. Its deficiency causes granulation in citrus plant which is characterized by harder and dry juice sacs (Munshi *et al.* 1978 and Kumar *et al.* 2006). Therefore, proper and effective nutrient management should be taken into consideration to obtained a quality Khasi mandarin fruit that will promote and ensure a sustainable production in the state.

## MATERIALS AND METHODS

The investigation was carried out on 8-year-old mandarin trees on a private orchard located at Umling, Nongpoh, Ri Bhoi District of Meghalaya during 2018-2020. The experiment was laid out in Randomized Block Design consisting of 12 treatments and replicated three times. Treatment details are $T_1$ (Control), $T_2$ (SOP 0.5%), $T_3$ (SOP 1.0%) $T_4$ ($ZnSO_4$ 0.5%), $T_5$ (Micronutrient mix 0.1%), $T_6$ (Micronutrient mix 0.2%) $T_7$ (SOP 0.5% + $ZnSO_4$ 0.5%), $T_8$ (SOP 1.0 % + $ZnSO_4$ 0.5%), $T_9$ (SOP 0.5% + Micronutrient mix 0.1%), $T_{10}$ (SOP 1.0% + Micronutrient mix 0.1%), $T_{11}$ (SOP 0.5% + Micronutrient mix 0.2%), $T_{12}$ (SOP 1.0% + Micronutrient mix 0.2%). The foliar applications were applied two times, first applications was in March and another was applied in September.

TSS was found out using Hand refractometer, Total sugar and Reducing sugar by Lane and Eynon method (1923) and acidity of the fruit was analyzed using AOAC (2005). Ascorbic acid was analyse using 2,6- dichlorophenol indophenols (dye) titration method and β-carotene was recorded with the help of spectrophotometer at 452 nm as suggested by Rangana (2004). The protein content of the fruit was estimated using Lowry's method (Lowry *et al.* 1951). Analysis of variance was calculated following the method described by Gomez and Gomez (2010).

## RESULTS AND DISCUSSION

### Fruit yield parameters

The present investigation on the influenced of foliar application of micronutrients on yield and quality of Khasi mandarin depicted that all the treatments had a significant effect on the growth and quality characteristics of the fruit. Table 1 revealed that 1st year application of micronutrients gave the highest fruit set in $T_{10}$ (SOP 1.0% + Micronutrient mix 0.1%) with 26.09 % followed by $T_9$ (SOP 0.5% + Micronutrient mix 0.1%) with 19.88 %, and minimum value was seen in $T_1$ (Control) with 8.59 %. Also, in second year $T_{10}$ again showed highest fruit set % about 23.52 % followed by $T_6$ (Micronutrient mix 0.2%) (18.99 %) and lowest is $T_{12}$ (SOP 1.0% + Micronutrient mix 0.2%) (9.38 %). Maximum fruit weight for 2018 was seen in $T_8$ (169.07 g) (SOP 1.0 % + $ZnSO_4$ 0.5%) followed by $T_{10}$ (155.20 g), whereas in 2019 more fruit weight was seen in $T_5$ (Micronutrient mix 0.1%) (167.11 g) followed by $T_{10}$ (165.72 g) and minimum values was recorded by $T_1$ (Control) in both the years. As depicted in the table the number of fruits in the first year was more than that of second year and this might be due to the tendency of alternate bearing (GoI 2009 and Ladaniya 2008). More number of fruits was recorded by treatment $T_{10}$ with 298 and 166.67 for both 2018 and 2019 respectively. Highest yield per tree was seen in $T_8$ with 48.43 kg/tree which is at par with $T_{10}$ with 47.69 kg/tree and lowest value is recorded in $T_1$ (Control) with 5.81 kg/ tree during 2018. However, in 2019 highest fruit yield

**Table 1**. Effect of foliar spray on yield and yield attributes of Khasi mandarin. NS: Non significant.

| Treatment | Fruit set (%) | | Fruit weight (g) | | Fruit number | | Fruit yield (kg/tree) | |
|---|---|---|---|---|---|---|---|---|
| | 2018 | 2019 | 2018 | 2019 | 2018 | 2019 | 2018 | 2019 |
| 1 | 8.59 | 15.35 | 100.52 | 117.50 | 60.33 | 29.33 | 5.81 | 3.44 |
| 2 | 9.71 | 10.83 | 129.27 | 133.06 | 73.67 | 73.00 | 10.67 | 9.71 |
| 3 | 14.90 | 18.02 | 147.73 | 136.22 | 162.00 | 87.00 | 24.36 | 11.83 |
| 4 | 10.19 | 11.33 | 148.27 | 143.78 | 190.00 | 86.00 | 28.14 | 12.34 |
| 5 | 12.59 | 17.20 | 150.07 | 167.11 | 180.33 | 87.67 | 26.81 | 14.66 |
| 6 | 14.89 | 18.99 | 151.13 | 165.56 | 195.33 | 111.00 | 30.43 | 18.41 |
| 7 | 10.15 | 10.19 | 145.20 | 142.69 | 180.33 | 111.00 | 26.09 | 15.87 |
| 8 | 10.23 | 12.50 | 169.07 | 163.73 | 289.67 | 141.33 | 48.43 | 23.13 |
| 9 | 19.88 | 15.92 | 151.27 | 160.81 | 259.67 | 153.33 | 39.10 | 24.65 |
| 10 | 26.09 | 23.52 | 155.20 | 165.72 | 298.00 | 166.67 | 47.69 | 27.60 |
| 11 | 16.20 | 13.58 | 135.47 | 137.00 | 209.33 | 120.67 | 27.48 | 16.51 |
| 12 | 18.21 | 9.38 | 135.00 | 137.22 | 190.00 | 114.33 | 24.89 | 15.71 |
| SEm (±) | 1.19 | 1.23 | 4.70 | 3.51 | 5.87 | 4.33 | 1.83 | 1.29 |
| CD (0.05) | 3.50 | 3.61 | 13.77 | 10.30 | 17.21 | 12.71 | 5.38 | 3.78 |
| CV (%) | 14.45 | 14.46 | 5.68 | 4.12 | 5.33 | 7.03 | 11.21 | 13.80 |

was observed in $T_{10}$ (27.6) kg/tree which is at par with $T_9$ (24.65 kg/tree) and lowest was $T_1$ (3.44 kg/tree). Increase in fruit yield under foliar application of micronutrients had been reported by Zoremtluangi *et al.* (2019) in Khasi mandarin, Nithin Kumar *et al.* (2017) in mandarin orange under Lower Pulney Hills and Yadav *et al*. (2020) in Kagzi lime. Vijay *et al.* (2017) reported similar outcome in the rise of fruit yield with the application of $K_2SO_4$ in sweet orange and also Reetika *et al*. (2020) in Kinnow mandarin who reported that foliar spray of 1% urea + 1% $K_2SO_4$ + 0.5 % $ZnSO_4$ + 0.5% $FeSO_4$ + 0.2% Boric acid gave maximum value with respect to fruit yield and quality parameters. Higher fruit set may be due to the positive effect of boron, as it is an important mineral nutrient for pollen germination of a plant. Application of micronutrients mix through foliar spray build up the amount of boron in the leaves. Its presence is necessary for the formation of boron sorbitol complex, that aids in the synthesis of pectin material that is required for the cell wall of the pollen tube (Negi *et al*. 2011 and Karim *et al*. 2017). The increase in fruit yield might be attributed to the adequate supply of all the minor nutrients that is required by the plant. It creates a strong sink for the photosynthetic activity and enhance the synthesis of carbohydrates. Zinc is an essential element that is necessary for increasing the number of fruits. It helps in retaining more fruits on the plant by preventing the formation of abscission layer (Jat and Kacha 2014). Other reasons might also be due to potassium application, where it enhances the mobility of assimilates to the developing fruit and thus increases the fruit yield.

**Physical characteristics of fruit**

The data presented in Table 2 showed that there was no significant effect of foliar applications of micronutrients on the diameter and length of the fruit in both the years. In 2018, maximum fruit diameter was seen in $T_{10}$ (SOP 1.0% + Micronutrient mix 0.1%) (72.04 mm) and in second year it was in $T_9$ (Vermicompost 10 kg + Wood ash 2 kg) (72.48 mm). Whereas length of the fruit was seen highest in $T_3$ (SOP 1.0%) with 58.11 mm and in second year it was in $T_{10}$ with 59.16 mm. Juice content of the fruit during 2018 showed that maximum juice was recorded in $T_9$ with 54.39 % followed by $T_8$ with 50.63 %, and in 2019 highest values was recorded in $T_{10}$ with 52.22 % which is at par with $T_8$ with 49.63%. Peel weight of the fruit was observed to be lowest in $T_{12}$(SOP 1.0% + Micronutrient mix 0.2%) (18.31 g) which was followed by $T_9$ (SOP 0.5% + Micronutrient mix 0.1%) (22.90 g) and highest was seen in $T_2$ (SOP 0.5%) (31.04 g). In the second year $T_{12}$ again recorded the lowest peel weight with 20.33 g and $T_3$ (SOP 1.0%) the highest value of about 31 g. Significance difference in peel thickness of the fruit was not there and minimum peel thickness

**Table 2.** Physical parameters of the fruit under the influence of foliar application. NS: Non significant.

| Treatment | Fruit diameter (mm) | | Fruit length (mm) | | Juice content (%) | | Peel weight (g) | | Peel thickness (mm) | | Seed number | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2018 | 2019 | 2018 | 2019 | 2018 | 2019 | 2018 | 2019 | 2018 | 2019 | 2018 | 2019 |
| 1 | 57.00 | 62.56 | 48.15 | 52.01 | 38.85 | 45.92 | 28.26 | 28.67 | 2.17 | 2.23 | 17.00 | 14.67 |
| 2 | 67.26 | 67.84 | 51.95 | 57.41 | 46.03 | 39.04 | 31.04 | 29.33 | 2.35 | 2.42 | 13.00 | 12.33 |
| 3 | 69.09 | 67.58 | 58.11 | 57.85 | 47.99 | 48.30 | 29.00 | 31.00 | 2.33 | 2.39 | 23.00 | 22.33 |
| 4 | 67.72 | 68.48 | 55.96 | 57.13 | 48.25 | 49.01 | 23.37 | 24.67 | 2.03 | 2.10 | 14.00 | 12.33 |
| 5 | 65.69 | 69.43 | 55.03 | 56.86 | 45.86 | 48.96 | 24.48 | 30.67 | 1.90 | 2.08 | 21.33 | 21.00 |
| 6 | 68.91 | 71.15 | 53.73 | 57.31 | 42.59 | 47.66 | 26.01 | 28.33 | 2.32 | 2.19 | 13.67 | 15.00 |
| 7 | 64.21 | 69.88 | 53.71 | 57.84 | 48.51 | 48.38 | 26.70 | 29.67 | 2.43 | 2.22 | 17.33 | 18.67 |
| 8 | 68.92 | 71.12 | 56.35 | 59.13 | 50.63 | 49.63 | 30.69 | 27.33 | 2.20 | 1.96 | 16.67 | 16.33 |
| 9 | 65.21 | 72.48 | 52.75 | 58.67 | 54.39 | 47.56 | 22.90 | 25.67 | 1.72 | 1.97 | 20.00 | 19.67 |
| 10 | 72.04 | 71.43 | 57.46 | 59.16 | 48.01 | 52.22 | 25.56 | 29.33 | 2.04 | 2.26 | 19.33 | 18.67 |
| 11 | 64.40 | 64.68 | 52.60 | 53.68 | 41.13 | 47.29 | 26.33 | 24.00 | 2.51 | 2.27 | 18.33 | 15.67 |
| 12 | 63.78 | 66.56 | 50.69 | 54.94 | 47.78 | 46.70 | 18.31 | 20.33 | 1.88 | 2.35 | 20.67 | 19.67 |
| SEm (±) | NS | NS | NS | NS | 1.24 | 1.04 | 0.91 | 0.77 | NS | NS | 0.93 | 0.82 |
| CD (0.05) | NS | NS | NS | NS | 3.65 | 3.06 | 2.67 | 2.27 | NS | NS | 2.74 | 2.41 |
| CV (%) | NS | NS | NS | NS | 4.61 | 3.80 | 6.05 | 4.89 | NS | NS | 9.06 | 8.28 |

was observed in $T_9$ (1.72 mm) and maximum in $T_{11}$ (2.51 mm) during 2018, however in 2019 lowest was recorded in $T_8$ (SOP 1.0 % + $ZnSO_4$ 0.5%) (1.96 mm) and highest in $T_2$ (2.42 mm). There was significant effect in the number of seed and the results revealed that lesser seed rate of about 13 was recorded in $T_2$ (SOP 0.5%) for 2018 and 12.33 for both $T_2$ and $T_4$ for the year 2019. The findings are in accordance with that of Kazi *et al.* (2012) who reported that there is increase in the fruit girth of sweet orange with the application of multi-micronutrient either through soil or foliar spray. Nesreen Mohammed *et al.* (2018) had similar outcome in increase in the fruit volume and Juice percentage with application of micronutrients such as boron oxide 0.5 $cm^3$ / l (69.85 PPM) and ZnEDTA 0.05 g / l (49 ppm) + Fe EDTA 1 g / l (130 ppm) in lemon and Gurjar *et al.* (2015) in Kinnow mandarin with the application of 0.3% boric acid + 0.5% Zinc sulphate. The possible reasons for the improvement in the physical features of the fruit like fruit size and volume might be attributed to the influenced of micronutrients in photosynthesis. They activate a number of enzymes which leads to accumulation of more sugars and water in the expanded cells

**Table 3.** Effect of foliar application on the quality of Khasi mandarin. NS: Non significant.

| Treatment | TSS (°Brix) | | Total sugar (%) | | Reducing sugar (%) | | Acidity (%) | |
|---|---|---|---|---|---|---|---|---|
| | 2018 | 2019 | 2018 | 2019 | 2018 | 2019 | 2018 | 2019 |
| 1 | 9.31 | 9.87 | 5.26 | 6.10 | 2.83 | 2.75 | 0.92 | 0.97 |
| 2 | 9.87 | 10.27 | 6.27 | 6.53 | 3.09 | 2.82 | 0.77 | 0.85 |
| 3 | 9.93 | 10.57 | 6.38 | 6.84 | 3.43 | 3.16 | 0.68 | 0.72 |
| 4 | 10.13 | 10.53 | 6.53 | 6.62 | 3.35 | 3.01 | 0.70 | 0.81 |
| 5 | 10.23 | 10.07 | 6.27 | 6.76 | 3.45 | 3.35 | 0.85 | 0.85 |
| 6 | 10.40 | 10.47 | 6.58 | 6.92 | 3.40 | 3.36 | 0.77 | 0.83 |
| 7 | 10.07 | 10.27 | 5.42 | 5.99 | 3.14 | 2.88 | 0.92 | 0.97 |
| 8 | 10.03 | 10.27 | 6.34 | 7.23 | 3.00 | 3.10 | 0.72 | 0.83 |
| 9 | 10.67 | 11.07 | 6.15 | 6.89 | 3.37 | 3.08 | 0.78 | 0.90 |
| 10 | 10.60 | 11.13 | 6.78 | 7.62 | 3.67 | 3.49 | 0.58 | 0.72 |
| 11 | 10.10 | 10.40 | 6.10 | 6.14 | 3.07 | 3.00 | 0.85 | 0.96 |
| 12 | 10.20 | 10.87 | 6.11 | 6.18 | 3.11 | 3.16 | 0.82 | 0.93 |
| SEm (±) | 0.16 | 0.19 | 0.13 | 0.12 | 0.08 | 0.09 | 0.04 | 0.04 |
| CD (0.05) | 0.46 | 0.55 | 0.39 | 0.36 | 0.24 | 0.28 | 0.11 | 0.10 |
| CV | 2.67 | 3.09 | 3.72 | 3.18 | 4.30 | 5.26 | 8.66 | 7.05 |

**Table 4.** Influence of foliar application on the ascorbic acid, Beta-carotene and protein content of the fruit. NS: Non significant.

| Treatment | Ascorbic acid (mg/100ml) | | Beta-carotene (IU) | | Protein (%) | |
|---|---|---|---|---|---|---|
| | 1918 | 1919 | 1918 | 1919 | 1918 | 1919 |
| 1 | 26.58 | 34.75 | 1252.54 | 1040.20 | 2.45 | 2.67 |
| 2 | 31.73 | 33.23 | 1401.37 | 1204.60 | 2.53 | 3.21 |
| 3 | 31.01 | 35.81 | 1406.90 | 1555.24 | 2.92 | 3.60 |
| 4 | 33.26 | 34.67 | 1595.71 | 1488.20 | 3.11 | 3.66 |
| 5 | 35.42 | 38.91 | 1604.20 | 1425.91 | 2.92 | 3.65 |
| 6 | 35.31 | 37.46 | 1517.13 | 1637.03 | 3.05 | 3.58 |
| 7 | 32.75 | 33.24 | 1507.44 | 1500.50 | 3.12 | 3.58 |
| 8 | 33.42 | 36.67 | 1507.44 | 1554.30 | 3.21 | 3.71 |
| 9 | 37.26 | 40.37 | 1652.32 | 1514.80 | 2.73 | 3.40 |
| 10 | 35.87 | 33.37 | 1466.77 | 1634.20 | 3.28 | 3.60 |
| 11 | 34.61 | 33.74 | 1422.41 | 1332.84 | 2.73 | 3.15 |
| 12 | 34.11 | 32.32 | 1344.72 | 1252.636 | 2.90 | 3.34 |
| SEm (±) | 0.65 | 0.89 | 40.06 | 38.30 | 0.08 | 0.08 |
| CD (0.05) | 1.91 | 2.63 | 117.50 | 112.33 | 0.23 | 0.22 |
| CV (%) | 3.36 | 4.39 | 4.71 | 4.64 | 4.66 | 3.87 |

(Mohammed *et al.* 2018). Other reasons might be the positive effect of potassium in cell wall development as reported by Boman and Hebb (1998) in grapefruit. With the accelerated rate in fruit growth the juice percentage of the fruit increases as more metabolites are being diverted from leaves to the fruits. Application of micronutrients such as zinc also increases the amount of juice content by regulating the semi permeability of cell wall which help in the movement of more water in to the fruits (Sharma *et al*. 2003).

## Quality attributes of the fruit

The data in Table 3 revealed that in the year 2018, highest TSS of the fruit was observed in $T_9$ (SOP 0.5% + Micronutrient mix 0.1%) with 10.67 °Brix which was at par with $T_{10}$ (10.6 °Brix), $T_6$ (10.4 °Brix) and $T_5$ (10.23 °Brix). Whereas in second year higher TSS was recorded in $T_{10}$ (11.13 °Brix) which was at par with $T_9$ (11.07 °Brix) and $T_{12}$ (10.87 °Brix). For two consecutive years $T_{10}$ (SOP 1.0% + Micronutrient mix 0.1%) recorded the highest total sugar and reducing sugar which was about 6.78 % and 3.67 % respectively during 2018, and 7.62 % and 3.49 % during 2019. The lowest acidity in the first year was observed in $T_{10}$ of about 0.58 %, and again in second year with 0.72 %. As shown in Table 4. Ascorbic content of the fruit for both 2018 and 2019 recorded in $T_9$ was 37.26 and 40.37 mg/100g respectively which were the maximum values among other treatments. Highest β-carotene was observed in $T_9$ (1652.32 IU) in the first year and lowest was recorded in $T_1$(Control) (1252.54 IU). However, in second year maximum value was recorded in $T_6$ with 1637.03 IU and $T_1$ again being the lowest with 1040.20 IU. Protein content of the fruit was recorded highest in $T_{10}$ (3.28%) in the first year and $T_8$ (3.71%) in the second year. Similar findings were seen in the study conducted by Kazi *et al.* (2012) who reported betterment of fruit quality in sweet orange with application of multi-micronutrient, and Kacha *et al.* (2020) who observed increase in TSS and ascorbic acid with foliar application of multi-micronutrients grade IV 1.0 % compared to that of control in mango fruit. The rise in the beta carotene and TSS content might be due to the rapid rate of photosynthesis in the plant (Kulkarni 2004 and Lester *et al.* 2005). Copper is known to promote the photosynthetic activity, and combining it with Zn and B it improves the total sugar content of the fruit (Ullah *et al*. 2012). The decrease in the acidity of fruit might be attributed to the increase synthesis of nucleic acid. Kacha *et al.* (2020) reported that higher levels of ascorbic acid can possibly be due to the catalytic activity of micronutrients such as Zn, Fe and B that take part on its synthesis from its precursor glucose-6-phosphate. Other reasons for the increase in the quality of fruits may be due to foliar application of SOP, where potassium plays a major role in synthesis of carbohydrate, proteins and neutralization of organic acids. It activates the sucrose synthase enzyme which promotes the breakdown of starch into simple sugars (Mengel and Kirby, 1987). Therefore, foliar application of micronutrients promotes the uptake of macronutrients in the tissues and betters the quality of the fruit (Anees *et al.* 2011).

## CONCLUSION

The findings of two years data of foliar application of micronutrients and potassium was found to be effective and $T_{10}$ (SOP 1.0% + Micronutrient mix 0.1%) recorded more maximum value in fruit set, number of fruits per tree, yield, size of the fruit, juice percentage and fruit biochemical parameters such as TSS, sugars and lower acidity, and $T_9$ showed highest in Ascorbic acid content and Beta-carotene with lowest peel thickness. Therefore, application of $T_{10}$ (SOP 1.0% + Micronutrient mix 0.1%) through foliar spray was considered the best treatment in terms of yield and quality of Khasi mandarin fruit.

## ACKNOWLEDGEMENT

The authors are grateful to the Department of Horticulture of North Eastern Hill University, Meghalaya for providing necessary facilities for the successful conduct of the research.

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