A pot experiment entitled “Effect of different levels of potassium and zinc on the growth, yield & nutrient uptake by tomato (Lycopersicon esculentum Mill.) in pot experiment” was conducted the Department of Agricultural Chemistry and Soil Science, College of Agriculture, Junagadh Agricultural University, Junagadh during rabi season of the year 2016-17. The investigation was carried out with four levels each of potassium viz., 0, 20, 40 and 80 kg K_2O ha^{-1} and three levels of zinc viz., 0, 5 and 10 kg ZnSO_4 ha^{-1} in Factorial Completely Randomized Design repeated three times.

The weather conditions were favourable for crop growth and no severe attack of insect and disease was observed during course of investigation.

Apart from the biometric observations related to yield of tomato, growth & yield attributes studies were also made on quality.

The experimental findings in detail and their effect related description have been given in the previous IV chapter. The salient features of findings are summarized as below.

5.1 EFFECT OF POTASSIUM
1. Application of potassium @ 80 kg K_2O ha^{-1} resulted in significantly higher plant height (67.70 cm), plant spread (34.46 cm) and numbers of primary branches per plant (6.07) obtained at harvest.
2. The yield attributing characters viz., length of fruit, diameter of fruit, average weight of fruit, number of fruits per cluster and number of fruits per plant were significantly influenced due to varying levels of potassium. Length of fruit (5.29 cm), diameter of fruit (5.30 cm), average weight of fruit (51.57 g), dry weight of fruit (67.56 g), number of fruits per cluster (3.71) and number of fruits per plant (33.78) was obtained higher under application of potassium @ 80 kg K_2O ha^{-1}.
3. Significantly, the higher fruit yield per plant (1438.89 g plant^{-1}) and stalk yield per plant (14.21 g plant^{-1}) were achieved under treatment K_3 (80 kg K_2O ha^{-1}).
4. The quality characters titratable acidity and total soluble solids were also significantly influenced due to varying levels of potassium. Acidity (0.51 %) and
total soluble solids (5.69 °Brix) was obtained higher under application of 80 kg K₂O ha⁻¹.

5. The concentration of potassium recorded significantly higher in fruit and stalk at harvest with the values of 3.48 % and 3.32 % at potassium applied @ 80 kg K₂O ha⁻¹ at harvest. The concentration of nitrogen and phosphorus was found significantly higher in fruits with values of 2.99 % and 0.44 % at potassium applied @ 80 kg K₂O ha⁻¹ at harvest. The concentration of nitrogen, sulphur and micro-nutrient in stalk at harvest did not influenced by potassium application.

6. The uptake of nitrogen, phosphorus, potassium, sulphur and micro-nutrient by fruits of tomato was increased with increasing potassium rate at harvest. The application of potassium @ 80 kg K₂O ha⁻¹ showed significantly higher value of nitrogen (2024.15 mg plant⁻¹) and phosphorus (296.12 mg plant⁻¹) uptake by fruit. Similar trend was observed for the uptake of potassium (2348.72 mg plant⁻¹) and sulphur (685.82 mg plant⁻¹) by fruit. Similar trend was observed for the uptake of micro-nutrient like iron (43.33 mg plant⁻¹), manganese (6.30 mg plant⁻¹), zinc (3.13 mg plant⁻¹) and copper (1.06 mg plant⁻¹) uptake by fruit with the application of 80 kg K₂O ha⁻¹.

7. The uptake of nitrogen, phosphorus, potassium, sulphur and micro-nutrient by stalk was increased with increasing in potassium level at harvest. The application of potassium @ 80 kg K₂O ha⁻¹ showed significantly higher value of nitrogen (352.56 mg plant⁻¹) and phosphorus (54.68 mg plant⁻¹) uptake by stalk at harvest, but remained at par with application of 40 kg K₂O ha⁻¹ (346.01 mg plant⁻¹) over control with respect to N uptake. Similar trend was observed for the uptake of potassium (472.42 mg plant⁻¹) and sulphur (137.56 mg plant⁻¹) uptake by stalk at harvest. Similar trend was observed for the uptake of micro-nutrient like iron (4.10 mg plant⁻¹), manganese (0.89 mg plant⁻¹), zinc (0.93 mg plant⁻¹) and copper (0.40 mg plant⁻¹) by stalk with the application of 80 kg K₂O ha⁻¹.

8. The available potassium in soil significantly influenced by potassium application at various levels. The available potassium was recorded significantly higher with the application of 80 kg K₂O ha⁻¹ with respective value of 246.42 kg ha⁻¹ over that of control while, the availability of N, P₂O₅, S as well as soil pH and EC were not influenced by K application after harvest of tomato.
5.2 EFFECT OF ZINC

1. Application of zinc @ 10 kg ZnSO$_4$ ha$^{-1}$ resulted in significantly higher plant height (63.72 cm), plant spread (33.22 cm) and numbers of branches per plant (4.17) obtained at harvest.

2. The yield attributing characters viz., length of fruit, diameter of fruit, average weight of fruit, number of fruits per cluster and number of fruits per plant were significantly influenced due to varying levels of zinc. Length of fruit (4.87 cm), diameter of fruit (4.83 cm), average weight of fruit (50.23 g), dry weight of fruit (62.26 g), number of fruits per cluster (3.11) and number of fruits per plant (28.13) was obtained higher under application of zinc @ 10 kg ZnSO$_4$ ha$^{-1}$, but application of 5 kg ZnSO$_4$ ha$^{-1}$ was remained at par with application of 10 kg ZnSO$_4$ ha$^{-1}$ over control with respect to diameter of fruit, average weight of fruit, dry weight of fruit and number of fruits per plant.

3. Significantly, the higher fruit yield per plant (1295.75 g plant$^{-1}$) and stalk yield per plant (13.64 g plant$^{-1}$) was achieved under treatment Z$_2$ 10 kg ZnSO$_4$ ha$^{-1}$. However, treatment of 5 kg ZnSO$_4$ ha$^{-1}$ was remained at par with treatment of 10 kg ZnSO$_4$ ha$^{-1}$.

4. The quality characters viz., acidity and total soluble solids were also significantly influenced due to varying levels of zinc. Acidity (0.48 %) and total soluble solids (5.04 ⁰Brix) was obtained higher under application of 10 kg ZnSO$_4$ ha$^{-1}$, but it was remained at par with application of 5 kg ZnSO$_4$ ha$^{-1}$ over control with respect to TSS.

5. The concentration of zinc recorded significantly higher in fruit at harvest with the value of 49.73 ppm at zinc applied @ 10 kg ZnSO$_4$ ha$^{-1}$, but it was remained at par with application of 5 kg ZnSO$_4$ ha$^{-1}$ over control and in stalk with the value of 69.59 ppm at zinc applied @ 10 kg ZnSO$_4$ ha$^{-1}$. The concentration of N and S recorded significantly highest in fruit with values of 2.85 % and 1.09 % at zinc applied @ 10 kg ZnSO$_4$ ha$^{-1}$ at harvest. The concentration of N and S recorded significantly highest in stalk at harvest with values of 2.56 % and 1.05 % at zinc applied @ 10 kg ZnSO$_4$ ha$^{-1}$. The concentration of phosphorus, potassium and micro-nutrient in stalk at harvest did not influenced by zinc application.
6. The uptake of nitrogen, phosphorus, potassium, sulphur and micro-nutrient by fruit were increased with application of zinc. The application of zinc @ 10 kg ZnSO$_4$ ha$^{-1}$ showed significantly higher value of nitrogen (1781.27 mg plant$^{-1}$), potassium (2024.13 mg plant$^{-1}$) and sulphur (677.04 mg plant$^{-1}$) uptake by fruits. While, significantly higher phosphorus (242.13 mg plant$^{-1}$) uptake by fruits and application of 10 kg ZnSO$_4$ ha$^{-1}$ was remained at par with 5 kg ZnSO$_4$ ha$^{-1}$. Similar trend was observed for the uptake of micro-nutrient like iron (39.89 mg plant$^{-1}$), manganese (5.84 mg plant$^{-1}$), zinc (3.09 mg plant$^{-1}$) and copper (0.96 mg plant$^{-1}$) uptake by fruit with the application of 10 kg ZnSO$_4$ ha$^{-1}$. However, application of 5 kg ZnSO$_4$ ha$^{-1}$ was remained at par with application of 10 kg ZnSO$_4$ ha$^{-1}$ with respect to Fe, Mn and Cu.

7. The uptake of nitrogen, phosphorus, potassium, sulphur and micro-nutrient by stalk was increased with application of zinc at harvest. The application of zinc @ 10 kg ZnSO$_4$ ha$^{-1}$ showed significantly highest value of nitrogen (349.36 mg plant$^{-1}$), phosphorus (47.68 mg plant$^{-1}$), potassium (424.28 mg plant$^{-1}$) and sulphur (142.95 mg plant$^{-1}$) uptake by stalk at harvest, respectively and phosphorus uptake (46.59 mg plant$^{-1}$) by stalk was remained at par with application of 5 kg ZnSO$_4$ ha$^{-1}$. Similar trend was observed for the uptake of micro-nutrient like iron (3.91 mg plant$^{-1}$), manganese (0.84 mg plant$^{-1}$), zinc (0.95 mg plant$^{-1}$) and copper (0.38 mg plant$^{-1}$) uptake by stalk with the application of 10 kg ZnSO$_4$ ha$^{-1}$, but remained at par with application of 5 kg ZnSO$_4$ ha$^{-1}$ with respect to iron, manganese and copper uptake by stalk.

8. The available zinc in soil after harvest of crop significantly influenced by zinc application. The available zinc and sulphur were recorded significantly higher under the application of 10 kg ZnSO$_4$ ha$^{-1}$ with respective value of 0.70 mg kg$^{-1}$ and 13.65 kg ha$^{-1}$ over that of control while, the availability of N, P$_2$O$_5$, K$_2$O, pH and EC did not influenced significantly by zinc application.

5.3 INTERACTION EFFECT BETWEEN POTASSIUM AND ZINC

Interaction effect between potassium and zinc was found significant in respect of total soluble solids in fruit of tomato at harvest. Combined application of potassium @ 80 kg ha$^{-1}$ and zinc @ 10 kg ha$^{-1}$ significantly recorded higher total soluble solids (6.12 ⁰Brix) over other treatment combinations.
However, interaction effect between potassium and zinc was found non-significant in respect of biometric parameters, fruit yield, stalk yield, content and uptake of nutrient and available soil nutrients after harvest of crop.

CONCLUSION:

On the basis of pot experiment results, it can be concluded that K and Zn supplementation at 80 kg K$_2$O ha$^{-1}$ and 10 kg ZnSO$_4$ ha$^{-1}$ along with recommended dose of fertilizer increases growth, yield and quality parameters of tomato crop (*rabi*, Variety JT-3) in medium black calcareous soils of South Saurashtra region of Gujarat.