CHAPTER - I
INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) is a member of Solanaceae family and a major vegetable crop throughout the world. Its origin and centre of diversity is South America particularly Peru, Ecuador and Bolivia. In India, the English traders of the East India Company introduced it in 1822 (Chhabra, 1992). Tomato is an annual or short-lived perennial pubescent herb having greyish green curled uneven pinnate leaves. The tomato plants are determinate, semi determinate and indeterminate in growth habit. The flowers are off white yellowish coloured, bearing clustered or solitary or two fruits, which are red or yellow in colour.

Tomato crop is grown in almost all kinds of ecological conditions. In India, it is being grown from snow lines of Himalayas to sea lines of South India. India occupies second position in the world after China in area and in production third after China and Japan (Singh and Kalloo, 2001). In India, tomato covers an area of 9.05 lakh ha with a total production of 19.10 million tonne, having productivity of 21 tonne ha\(^{-1}\) (Anonymous, 2014a). Major tomato growing belts are Bihar, Karnataka, Uttar Pradesh, Odisha, Andhra Pradesh, Maharashtra, Madhya Pradesh, Assam and Gujarat. In Gujarat, tomato is one of the major vegetable crop cultivated in an area over 44,000 ha with the total production of 11.56 lakh tonne having productivity of 26.28 tonne ha\(^{-1}\) (Anonymous, 2014b). It is cultivated in almost all districts of Gujarat mainly in Surat, Valsad, Vadodara, Ahmedabad, Gandhinagar, Navsari, Junagadh, Tapi, Anand, Sabarkantha, Khera and Jamnagar.

Tomato is one of the most common, leading, widely consumed, popular, staple, day neutral, self pollinated, annual and economically important solanaceous fruit vegetable crop. Its fruits are very popular among people of all social strata and consumed in variety of ways. It is equally liked by both poor and rich and is quite high in nutritive value. Apart from this, it also embodies certain Ayurvedic medicinal properties. With the advent of modern technologies, scenario of vegetable industry in India is changing at a fast rate. Now, it is not only a question of providing enough vegetables for a balanced diet, but also to produce quality vegetables that are acceptable and competitive in international market.
Tomato is popularly known as the ‘poor mans apple’, constitutes one of the chief vegetable crops of our country. It is one of the most important protective food because of its special nutritive value. Tomato provides all nutrient components like carbohydrates, protein, fat, vitamins and minerals along with roughages, which are the essential constituents of a balanced diet. The hundred gram of fresh tomato contains 94 percent moisture, 20 g Calories, 3.6 g Carbohydrates, 0.9 g Protein, 0.2 g Fat, 351 mg Carotene, 0.18 mg Vitamin B, 27 mg Vitamin C, 48 mg Calcium, and 0.4 mg Iron. A hectare of tomato provides 535 kg Protein, 299 kg Carotene and 20.20 kg Ascorbic acid (Anon., 1990). The rising popularity of tomato in the recent years is due to its multifarious uses in raw, cooked and processed forms such as soups, sauces, ketchups, preserves, paste and puree, acid sweet taste and unique flavour (Singh and Kalloo, 2001); high consumer preference and its nutritional value.

It is generally believed that micronutrients are present in adequate quantities in Indian soils, with this assumption, in the past the growers were generally advised to apply required doses of N, P and K for higher crop yields. It is, however, now realized that high doses of N, P and K alone are not sufficient to increase the production of vegetables and thus the need for micronutrients management has been felt. Due to non-availability and high cost of farm yard manure, the vegetable growers of Gujarat are forced to reduce the basal application of natural source of micronutrients. As such elements like boron, zinc, iron and manganese availability in the soils have become scarce, leading to deficiencies. The need for use of zinc and other micronutrients in these soils for maximizing crop yield is therefore, obvious.

Due to increased awareness of crop quality accompanied with maximum production, a renewed interest in the role of micronutrients in vegetable is currently gaining importance. Now a day, vegetable crops are responding to micronutrients and their use in vegetable growing would be of great significance. Applications of micronutrients alone or in combination with major nutrients not only increase the yield but also improve the quality of the produce (Bose et al., 2002).

Optimum fertilizer application is one of the well established technique to augment the production potential of any crop. The role of primary and secondary (N, P, K, S, Ca and Mg) nutrients in crops is well known in the present context. Tomato requires large quantities of both organic and inorganic nutrients for economic yields and quality. Potassium and Zinc are important for tomato by increasing both quality and quantity.
Potassium is one of the essential plant nutrient and one of the three those are taken up by roots from the soil solution in its ionic form. K is involved in numerous physiological processes that control plant growth, yield and quality parameters such as sugars, total soluble solids (TSS) etc. (Wuzhong; 2002 and Lester et al., 2005). Potassium is the most efficient cation for tomato plants and according to several authors, it plays a key role in the improvement of several quality traits in tomato fruits and in almost all vegetables (Cakmak, 2005; Chapagain and Weisman, 2004; Dorais et al., 2001). It also affects the nutritional quality of tomato as it increases lycopene content which may protect against certain cancers such as prostate cancer and add in redness of fruit (Etminan et al., 2004).

Micronutrients play an important role in the plant activities and its application can improve the vegetative growth, fruit set and yield of tomato (Adams, 2004) by increasing photosynthesis of green plants (Mallick and Muthukrishnan, 1980). Among micronutrients, Zn is very important for plant nutrition. Tomato requires both major and micronutrients for its proper plant growth (Sainju et al., 2003). Zinc plays an important role on growth and development as well as carbohydrates, protein metabolism and sexual fertilization of plant (Imtiaz et al., 2003; Vasconcelos et al., 2011).

Potassium is the most efficient cation for tomato plants and it plays a key role in the improvement of several quality traits in tomato fruits. Potassium is not the constituent of the organic matter, but its physiological function in tomato include enzyme activation, osmoregulation, photosynthesis, and translocation of photosynthates into sink organs. Potassium is the only mineral element known as the quality nutrient because of its vital role in building up of metabolites and activation of enzymes which ultimately improves chemical and sensory attributes of tomato fruit.

Zinc play an important role in improving the yield and quality of tomato in addition to checking various diseases and physiological disorders and also important for the development and function of growth regulators (e.g. auxin) that influence internode elongation and chloroplast development.

Interaction between potassium and zinc is said to be positive or synergistic when combined application of two nutrients results in an increase in yield that is more than their sole or individual application. Considering the significant role of potassium and zinc nutrition in tomato production and also in view of very little work done on this aspect, it was thought meaningful to undertake the present investigation with the
following major objectives:

1. To study the effect of different levels of Potassium and Zinc on growth, yield and quality of tomato.

2. To study the effect of different levels of Potassium and Zinc on nutrient content and uptake by tomato.

3. To study interaction effect of Potassium and Zinc on growth, yield and nutrient uptake by tomato.