Chapter - I

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) belongs to family solanaceae having chromosome number 2n=24. It is a self pollinated crop. Tomato is one of the most popular and nutritious fruit vegetables, widely grown around the world and second ranked after potato.

On the basis of availability of numerous wild and cultivated relatives, tomato has its origin in Peru, Ecuador and Bolivia. From its centre of origin, the tomato first moved to Mexico for domestication and cultivation. From Mexico it arrived in Europe by 1554.

The major tomato growing countries are China, India, USA, Turkey, Egypt, and Italy. In the world total area under tomato in 2010 – 11 was 4,582,438 thousand ha with production and productivity of 150,513,813 thousand tonnes and 32.8 tonnes/ha, respectively. *(Indian Horticulture Database, 2011).*

Total area under tomato crop in India is assessed to be 0.865 million ha with the production of 16,826,000 tonnes and productivity of 19.5 tonnes/ha *(Indian Horticulture Database, 2011).*

Tomato is consumed fresh and also in processed form of which one-third is used as processed products and two-third of tomato fruit is consumed fresh. The area under tomato is constantly increasing to produce more quality yield because it is a major vegetable in the menu of human diet. The fruits are eaten raw or cooked, large quantities of tomato are used to produce soup, juice, ketchup, puree, paste and powder. Tomato is a rich source of vitamins, minerals, organic acids, sugars, ascorbic acids, acidity and lycopene. Nutritive value varies in different cultivars depending upon the agro-climatic condition. It is a good source of Fe and vitamin A, B, and C. Edible portion of tomato contains, energy 18 kcal, protein 0.95 g, fat 0.11g, carbohydrate 4.01 g, sugars total 2.49 g, Ca 11mg, Fe 0.68 mg, Mg 9 mg, P 28 mg, K 218 mg, Na 11 mg, Zn 0.14 mg, Vitamin C 22.8 mg, Thiamin 0.036 mg, Riboflavin 0.022 mg, Vitamin B-6 0.079 mg, Vitamin E 0.56 mg, Fatty acids, total saturated 0.015 g, Fatty acids, total polyunsaturated 0.044 g.
per 100 g (USDA, 2013). Consumption of tomato and its products can significantly reduce the risk of developing of colon, rectal, and stomach cancer. Recent studies suggest that tomatoes contain the antioxidant lycopene, which markedly reduces the risk of prostate cancer (Kucuk, 2001).

To improve the yield and quality of the produce, it is necessary to pay attention on the optimum balanced use of nutrients through fertilizer application. Tomato requires large quantities of both organic and inorganic nutrients for its economic yields. Fertilizers play a key role in the production of both quantity and quality of tomato. Tomato plants should be providing with adequate fertilizer Nitrogen, phosphorus and potassium are these the main elements which affect growth, yield and quality of tomato plants.

Effect of nitrogen on vegetative and fruit yield is more obvious than other nutrients, as it promotes the setting of flowers and fruits. Nitrogen is the most commonly used mineral nutrient. It is important for protein production. It plays a pivotal role in many critical functions (such as photosynthesis) in the plant and is a major component of amino acids. Amino acids play important role protoplasm, formation division and plant growth. Nitrogen is also necessary for enzymatic reactions in plants. It is necessary component of several vitamins and nucleic acids (DNA and RNA).

Phosphorous has pronounced effect on tomato plant. The available of Phosphorous throughout the root zone is essential for root development and good utilization of water and other nutrients by the plant, it is also an integral part of ATP.

The need of tomato plants for potassium, Potassium has been found to improve the quality of tomato fruits, regulation of water and nutrient movement, it is also promotes flowering and fruiting (Sainju et al. 2003 and Kiran 2006).

Plants require mineral elements for normal growth and development. Plants require to essential for the normal life processes of plants and are needed in very small amounts are called trace elements or minor elements such as boron, zinc and magnesium etc. Boron play an
essential role in the development and growth of new cell in the plant meristem, it improve fruit
goodness and fruit set. Zinc involves in many enzymatic activities and IAA formation which
enhance increase flower number and fruit set. Mg is primary constituent of chlorophyll and ATP
require Mg. Fe is a constituent of many enzyme in the nutritional metabolism (Sainju et al. 2003
El-Nemr et al 2012).

Organic manure have the capability of supplying a range of nutrients and improving the
physical and biological properties of the soil such as Farm yard manure (FYM) refers to
decomposed mixture of dung and urine of farm animals along with the litter and left over
material from roughages or fodder fed the cattle. On an average well rotted FYM contains 0.5
per cent N, 0.2 percent P₂O₅ and 0.5 per cent K₂O. Organic manures are very important for plant
and healthy human and create of clean environmental.

Therefore, obvious choice is to maintain a natural balance for having a good health and to
keep clean environment, application of organic / inorganic fertilizer in a balance form, which is
important to improve the quality of agriculture produce natural.

Tomato is a warm season crop and requires relatively long season to produce a profitable
crop. It is highly susceptible to frost. Environment factors such as temperature and moisture etc.
markedly influence the process of fruit set of tomato and subsequent in fruit development and yield
(Calvert, 1959). Despite its economic importance, growers are not in a position to produce good
quality tomato with high productivity due to various biotic (pest and diseases), a biotic (rainfall,
temperature, relative humidity and light intensity) and crop factors (flower and fruit drop). Due to
eratic behavior of weather, the crops grown in open field are often exposed to fluctuating levels of
temperature, humidity, wind flow etc. which ultimately affect the crop productivity adversely
(Ochigbu and Harris, 1989). Besides this, limited availability of land for cultivation hampers the
vegetable production. Hence, to obtain a good quality produce and production during off season,
there is a need to cultivate tomato under protected conditions such as green house, poly house and
net house etc. Growth, development, productivity and post harvest quality parameters of tomato
crop largely depend on the interaction between the genetic constitution of the plants and
environmental conditions under which they are grown. Basically tomato is a warm season crop and
lacks adaptability to varied environmental conditions. Hence, tomato is one such crop which responds very well to the favorable environmental conditions.

Growing environment can be modified to suit to crops by use of protected structure for cultivation. Protected cultivation involves protection of crop at various production stages from adverse environmental conditions such as extreme temperature, hail storm, scorching sun and heavy rain. The optimum temperature for most varieties between 18 to 24 °C. But the plant tissues are damaged below 10 °C and above 38 °C . keeping all the fact in view , a field experiment entitled to Study effect of FYM, NPK and Micronutrients on Growth, Yield and Fruit Quality of Tomato (Lycopersicon esculentum Mill.) under protected cultivation on hybrid. indeterminate variety Heem Sohna, Syngenta Company.

Justification

Tomato requires optimum temperature for most varieties. protected cultivation done to control on environmental problem and disease management, however changes in seasonal weather adversely affect on grown of the plant. Large quantities of both organic and inorganic nutrients are required for economic yields and improve quality of tomato. The yield of tomato is low, therefore plant nutrients factor is limiting the tomato yield. Therefore must be adding adequate supply of the balanced nutrients to increase yield and improve the fruit quality. Therefore this study to determined adequate amount of NPK, FYM and micronutrient on tomato crop for it better growth, higher yield and improve fruit quality in protected cultivation.

Objectives

1. To find out the most suitable treatment for growth, yield and fruit quality of tomato under protected cultivation.

2. To work out the economics of various treatments.