CHAPTER – I

INTRODUCTION

The cereals are crop plants belonging to the grass family (Poaceae) that are grown for their edible starchy seeds having global importance. About half of the ploughed land of the world is given to growing the principal cereals. Wheat, rice, corn, barley, oat, rye, sorghum, and millets provide 56% of the food energy and 50% of the protein consumed on the earth. In general wheat, rice and corn together make-up three-fourth of the world’s grain production. Sorghum, barley, millets, rye and oat make-up the remaining cereal grain production on the earth.

Among the cereals, maize (Zea mays L.) ranks third in total world production after wheat and rice and it is principal staple food in many countries, particularly in the tropics and subtropics. It has high yield potential than any other cereal crop and it is also referred as “miracle crop” or the “queen of cereals”. It is grown as both food for man and fodder for animals and have several industrial uses also.

Being a C4 plant it has higher potential for synthesis of carbohydrates. In Indian agriculture, maize assumes a special significance on account of its utilization as food, feed and fodder besides several industrial uses.

Specialty corns viz., sweet corn, popcorn, baby corn, high oil corn etc. assume tremendous market potential not only in India but in international market as well. These specialty corns with their high market value are perfectly suitable to Para-urban agriculture. Sweet corn (Zea mays L. var. Saccharata Sturt) also called Indian corn, sugar corn, and pole corn) is a variety of maize with a high sugar content and prepared as a vegetable. Sweet corn is the result of a naturally occurring recessive mutation in the genes which control conversion of sugar to starch inside the endosperm of the corn kernel. Unlike field corn varieties, which are harvested when the kernels are dry and mature (dent stage), sweet corn is picked when immature (milk stage) and eaten as a vegetable, rather than a grain. Since the process of maturation involves converting sugar into starch, sweet corn stores poorly and must be eaten fresh, canned, or frozen before the kernels become tough and starchy.
Introduction

Cooked sweet corn has significant antioxidant activity, which has been suggested to reduce the chance of heart disease and cancer. Cooked sweet corn also releases increased levels of ferulic acid, which provides health benefits, such as battling cancer.

Diversified uses of maize for corn starch industry, corn oil production, baby corns, pop corns, etc., and potential for exports had added to the demand of maize all over world besides other commercial avenues. Among the different types of maize, sweet corn (Zea mays L. var. Saccharata) has a big market potential. It is a hybridized variety of maize specifically bred to increase the sugar content. It is one of the most popular vegetables in countries like USA and Canada and is becoming popular in India and other Asian countries also. It is consumed in the immature stage of the cob. The kernels of sweet corn tastes much sweeter than normal corn especially at 18 to 21 days after pollination. The total sugar content in sweet corn ranges from 25-30%. In addition fodder derived from harvest may be sold which brings additional income to the farmers. The sweet corn industry is expanding because of increasing domestic consumption, export development and import replacement. It is an attractive crop for producers to grow because the plant grows quickly and is considered a valuable rotational crop and farming operation can be mechanized. Most sweet corn is grown for the processing sector ending up on the super market shelves as products which include canned kernels, frozen cobetts and frozen kernels.

It is cultivated over an area of 8.80 million hectares with production of 22.56 million tonnes and average yield of 2,563 kg ha\(^{-1}\) in the country (Anonymous 2016a). Gujarat occupies an area of 3.87 lakh hectares with production of 5.72 lakh tonnes and productivity of 1,478 kg ha\(^{-1}\) (Anonymous 2016b).

Modern agriculture must supply crops with optimal rates of nutrients throughout the growth cycle in the most efficient manner and without degrading soil and water sources. This can be achieved through adoption of modern and precision practices in terms of nutrient management particularly fertilizers which are fully water soluble, solid or liquid fertilizers having high content of primary nutrients with low salt index. They may or may not have secondary and micronutrients. These water soluble fertilizers can be used for foliar feeding and fertigation of crops.

Water soluble fertilizer use as chemical fertilizers in drip and sprinkler irrigation systems and also as foliar spray to augment yield and improve quality of a
variety of crops like fruits, vegetables, oil seeds, pulses, cereals, cotton, coriander, tobacco, sugarcane, tea etc.

Maize is an exhaustive crop with high nutrient demand and its productivity mainly depends upon nutrient management system. The soil applied nutrient use efficiency is very low and depends on soil factors and climatic factors. Timely application of major nutrients through foliar sprays along with soil application has several advantages in supplementing the nutritional requirements of crops such as rapid and efficient response by crops, less quantity needed and independent of soil conditions.

Foliar application of water soluble fertilizers is already a known method of supplementation of plant nutrition. Nutrient uptake by leaves is considerably faster than the roots, foliar nutrition is extremely effective. Application of balanced fertilizer in critical stages of growth will greatly benefit level and quality of agricultural production (Dobrinoiu and Dumbrava, 2003). Tests have shown that foliar feeding can increase yields from 12 to 25 per cent when compared to conventional fertilization. When fertilizers are given through foliar, more than 90 per cent of the fertilizer is utilized by the plant, while a similar amount is applied to the soil, only 10 percent of it is utilized. In the sandy loam, foliar applied fertilizers are up to 20 times more effective when compared to soil applied fertilizers.

Foliar application of nutrients along with soil application has several advantages in supplementing the nutritional requirements of crops such as rapid and efficient response by the plants, less product needed and independence of soil conditions. Foliar nutrition designed to eliminate the problems like fixation and immobilization of nutrients. Hence, foliar nutrition is recognized as an important method of fertilization in modern agriculture. This method provides utilization of nutrients more efficiently and for correcting deficiencies rapidly especially for short duration crops. Recently, new generation specialty fertilizers have been introduced exclusively for foliar feeding and fertilization. Speciality fertilizers are a better source for foliar application (Vibhute, 1998). These fertilizers have different ratios of N, P and K which are highly water soluble and so amenable for foliar nutrition (Jayabal et al., 1999).

No work has been done on the “Effect of water soluble fertilizers on growth and yield of sweet corn (Zea mays L. var. saccharata)” Hence, an experiment planned to
Introduction

know the Effect of water soluble fertilizers on growth and yield of sweet corn (Zea mays L. var. saccharata)”

Practical Utility of the Research Work:

Maize is classified into different groups/types on the basis of endosperm of kernels like sweet corn, dent corn, popcorn, wax corn etc. Sweet corn is the recent form of grain vegetable maize, has got prime importance in diversification, revenue generation and value addition as well as the growth of the processing industry in an Indian agriculture. Among all the types of maize, sweet corn (Zea mays Saccharata S.) is one of the commercially used type of maize. It is grown primarily as a food and is harvested at about 70 per cent moisture. Approximately 40 per cent of such corn is frozen and rest is canned while processing. Sweet corn (Zea mays L. Saccharata) is a good source of energy. So in order to increase the yield and nutrition one has to go for the foliar application of water soluble fertilizers. Foliar feeding addresses the immediate needs of a growing crop, as opposed to long-term soil deficiencies, by spraying water-soluble fertilizers onto the leaf surface of the plants. All plants absorb nutrients through their leaves and stems, using stomata little openings similar to the pores of our skin. Plants absorb foliar sprays 20 times faster than soil-applied nutrients. Foliar help plants compensate for soil deficiencies (low fertility, low soil temperature, etc.) during the growing season.

Foliar feeding can also be timed to encourage or enhance critical points in the plant’s growth cycle, such as seedling emergence or rapid growth phases or flowering, fruiting and seed formation. Many crops benefit from 6–8 foliar applications per season. Some growers apply weekly foliar at low concentrations to improve nutrient balance. Taking note of the points highlighted above, the present study was conducted on the “Effect of foliar application of water soluble fertilizers on growth and yield of sweet corn (Zea mays L. var. Saccharata.)” was carried out at Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh during rabi season of 2016-17 with the following objectives:

- To study the effect of water soluble fertilizer on growth, yield and quality of sweet corn
- To find out the suitable water soluble fertilizer for foliar spray in sweet corn
- To find out economics of different treatments