CHAPTER - I
INTRODUCTION

India is one of the major pulses growing country of the world, accounting roughly for one third of total world area under pulse cultivation and one fourth of total world production. Pulses occupy a key position in Indian diet and meet about 30 percent of the daily protein requirement. Among the food crops, pulses are an important group which occupies a unique position in the world of agriculture by virtue of their high protein content. Importance of pulses is relatively more in our country as its contribution in nutrient supply is far more in Indian diet than that in Asia and World as a whole. Among the pulses, chickpea is a most important rabi crop with high acceptability and wider use (Singh, 2011).

Chickpea (Cicer arietinum L.) belongs to the genus Cicer, tribe Cicereae, family fabaceae and sub-family Papilionaceae. It has 2n=16 chromosome number. The origin of the crop is considered in Western Asia from where it spread in India and other part of the world (Ali and Kumar, 2001). There are two distinct types of chickpea, “Kabuli” (also known as macrosperma) and “Desi” (also known as microsperma). “Desi” (Cicer arietinum L.) type chickpea’s colour ranges from brown to yellow. Seeds are normally small in size. It is widely grown group of chickpea. “Kabuli” (Cicer kabulium) chickpeas are usually white in colour. Seeds are bold and attractive. Chickpea also known by different names in various countries, such as gram, bengal gram, chana, pois, hoos, hommos, grao-de-beco and garbanzo. Chickpea is mostly consumed in the form of processed whole seed (boiled, roasted, parched, fried, steamed, sprouted etc.) or dal or as dal flour (besan). It is used in preparing a variety of snacks, sweets and condiments. It is mixed with wheat flour for “chapatti” making. Fresh green seeds are consumed as green vegetable. Green leaves are used as vegetable. Grains are also used as vegetable (chhole). Husk and bits of dal are used as nutritious feed for animals. Chickpea can also be used as green fodder for animals. Chickpea is a good source of protein. It contains 18-22% protein, 62% carbohydrates, 4% fat and is rich source of phosphorous, calcium, iron, niacin, vitamin C (in green stage) and vitamin B1. Chickpea has significant amounts of all the essential amino acids except sulphur-containing amino acids. It contains malic and oxalic acid, which
Chickpea is mainly grown in about more than 50 countries including India, Pakistan, Turkey, Iran, Myanmar, Australia, Ethiopia, Canada, Mexico and Iraq (Gaur et al., 2010). Chickpea is the third most important pulse crop in the world after beans and field peas. In India, chickpea is the premier pulse crop occupying 10.2 million hectares area and contributing 9.9 million tones to the national pulse basket with the productivity of 967 kg ha\(^{-1}\) (Anonymous, 2014-15). The major chickpea producing states are Madhya Pradesh, Rajasthan, Uttar Pradesh, Maharashtra, Haryana, Karnataka, Andhra Pradesh, Gujarat, Bihar and West Bengal. In Gujarat, chickpea occupied an area of 2.47 lakh hectares with a production of 3.10 lakh tones with the average yield of 1251 kg ha\(^{-1}\) (Anonymous, 2014-15). But the state’s productivity in comparison with other state’s productivity is low. The reasons for low productivity of chickpea in Gujarat may be due to growing of crop on residual soil moisture, lack of balanced nutrition, development of deficiency of nutrients in soils other than NPK, proper sowing time etc.

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) in crops is well known in the present context. As gram being a leguminous crop major part of nitrogen requirement can be met through the fixation of atmospheric nitrogen. Besides nitrogen, phosphorus and sulphur are also essential for getting optimum crop yield and better quality. Phosphorus (P) and sulphur (S) are major nutrient elements for grain legumes.

In many soil types, P is the most limiting nutrient for the production of crops. It plays primary role in many of the physiological processes such as the utilization of sugar and starch, photosynthesis, energy storage and transfer. Legumes generally have higher P requirement because the process of symbiotic nitrogen (N) fixation consumes a lot of energy. Phosphorus is fascinating plant nutrient as it involved a wide range of plant processes from permitting cell division to the development of a good root system ensuring timely and uniform ripening of crop. It is needed by most
by young, fast growing tissues and performs a number of functions related to development and growth. It is a constituent of ADP and ATP, two of the most important substances in life processes.

Sulphur is becoming deficient in our soil due to use of high grade S free fertilizers, cultivation of high yielding varieties. Sulphur is a vital part of the ferredoxin, an iron-sulphur protein occurring in the chloroplasts. Ferredoxin has a significant role in nitrogen dioxide and sulphate reduction and assimilation of N by root nodule and free living N-fixing soil bacteria. The sulphur performs many physiological functions like synthesis of sulphur containing amino acids mainly cystein and methionine, chlorophyll and protein content of pulse crop. Sulphur is also responsible for the synthesis of vitamin-B$_1$, metabolism of carbohydrates and proteins. It promotes nodulation and bold grains in legumes.

Among the nutrients, phosphorus deficiency is considered to be major cause for low pulse yield and responses to phosphorus application by the chickpea crop have been obtained. Sulphur is one of the essential plant nutrients and its importance in Indian agriculture is being increasingly emphasized. It’s role in the crop production particularly in oilseeds and pulses is well developed.

About 17% soils in Saurashtra have been reported to be deficient in sulphur. The soils being medium balck calcareous, also face the problem of phosphorus availability (Golakiya and Shobhana 2000). At present DAP is major fertilizer used as source of phosphorus, followed by SSP to some extent. The SSP though supplies sulphur inadvertently, but is in limited supply. Considering the significant role of phosphorus and sulphur nutrition in chickpea 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 Phosphorus and Sulphur on growth, yield and quality of chickpea.
2. To study the effect of Phosphorus and Sulphur on nutrient content and uptake by chickpea.
3. To study interaction effect of P and S on growth, yield and nutrient uptake by chickpea.
4. To assess economic viability of various treatments.
Introduction