CHAPTER-I
INTRODUCTION

Pulses are integral part of Indian dietary system because of its richness in proteins and other important nutrients such as Ca, Fe and vitamins viz., carotene, thiamine, riboflavin and niacin. Indian population is predominantly vegetarian and protein requirement for the growth and development of the human being is mostly met with pulses. They are said to be poor man’s meat and rich man’s vegetables. As per recommendation of WHO minimum requirement of pulses is 80 g/capita/day. Apart from the human diet, pulses from an important fraction of cattle feed and fodder as hay, green fodder and concentrates. Due to their short duration crop habit they can be grown as main, intercrop, catch and green manure crop. Pulses are known to improve soil fertility as they fix atmospheric nitrogen through symbiotic nitrogen fixation with the help of bacterium called Rhizobia. Thus every pulse plant is a mini-fertilizer factory itself.

The origin of cultivated greengram is India and central Asia. In India, it occupied an area of 3.24 million hectares having total production of 1.39 million tons of grain with productivity of 346 kg/ha (Anon., 2015a). In India, major greengram producing states are Orissa, Madhya Pradesh, Rajasthan, Maharashtra, Gujarat and Bihar. In Gujarat, it is cultivated in about 2.26 lakh hectares with an annual production of 0.97 lakh tonnes and average productivity of 429 kg/ha (Anon., 2015b).

Greengram is also known as mung, moong, mungo, goldengram, chickasaw pea and oregon pea. It contains about 25 per cent protein, 1.3 per cent fat, 3.5 per cent minerals, 4.1 per cent fiber and 56.7 per cent carbohydrate. The protein content of greengram is two to three times more than that of cereals. It is consumed as a whole grains as well as dal in a variety of way in homes; being easily digestible it is preferred by patients. It is valued for its excellent taste, flavour, high digestibility and free from the “flatulency effect” which is associated with other pulses. When greengram are allowed to sprout, ascorbic acid (Vitamin C) is synthesized besides riboflavin and thiamine is increased.

Development of short duration as well as photo and thermo insensitive varieties provided excellent opportunity for greengram cultivation both in kharif as
well as in summer season, where adequate irrigation facilities are available. In south Saurashtra, greengram is cultivated mainly in summer season because during *kharif*, fields remain wet for a longer time, which is not suitable for this crop.

Spacing is the key factor affecting yield, very low or high plant population per unit area results in lower yield and hence by sowing the crop at suitable spacing, to maintain optimum plant population produce maximum yield.

Fertilizers play key role for obtaining higher crop production. Nitrogen plays an important role in crop nutrition. Though greengram can fix atmospheric nitrogen, an application of 15 to 20 kg nitrogen per hectares as starter dose at sowing, depending upon the initial fertility of the soil appeared to be optimum for the crop. However, the degree of response depends on inherent soil fertility, soil moisture, temperature and the cropping patterns followed.

Phosphorus plays a key role in various physiological processes like root growth and dry matter production, nodulation and nitrogen fixation and also in metabolic activities especially in protein synthesis. It also helps in establishing seedling quickly and also hastens maturity as well as improves the quality of crop produce. The most obvious effect of phosphorus is on the root system of plants. It promotes the formation of lateral and fibrous roots, which facilitates more nodule bacteria and ultimately affects the nitrogen fixation in leguminous crops.

Inadequate and imbalanced nutrient application by farmers is the most important factor limiting crop productivity especially in pulses. The unprecedented like in cost of chemical fertilizers in the recent past has adversely affected consumption of chemical fertilizers and has aggravated the problems. It is now increasingly being realized that no single nutrient source could fully meet the nutritional requirement of crop. Moreover injudicious use of chemicals enhanced the soil and plant health problems. In this context use of alternative sources of plant nutrients such as bio-fertilizers is the need of the time.

Among various bio-fertilizers *Rhizobium* inoculation is a cheapest, easiest and safest method of supplying nitrogen to greengram through well-known symbiotic nitrogen fixation process. It increases the yield and improves the quality of legumes, also adds substantial amount of residual nitrogen in soil for subsequent crops.
**Introduction**

*Rhizobium* inoculation can increase the grain yield of pulse crops to the tune of 10 to 15 per cent (Ali and Chandra, 1985). Inoculation of appropriate strain enhances nodule formation resulting in better nitrogen fixation.

Only about a quarter of water soluble phosphate is taken up by plants in the season of its application and the remaining is converted into insoluble, unavailable forms. Phosphate solubilizing bacteria (PSB) have the consistent capacity to increase the availability of phosphate to plant by mineralizing organic phosphorus compounds. It solubilizes insoluble inorganic phosphorus compounds by exerting organic acids, which is the primary mechanism solubilization of insoluble inorganic phosphates. Besides organic acids, production of chelating substances, mineral acids and proton extrusion mechanism are also involved (Gaur, 1990).

In the present context, reducing use of fertilizer use in era in sustainable agriculture, biological means of adding nitrogen to the soil plant system has gained momentum in integrated nutrient supply system. Co-inoculation of phosphate solubilizing bacteria has been found to improve nodulation, nitrogen fixation and yield of legumes by increasing phosphorus availability (Alagawadi and Gaur, 1988).

Application of all the needed nutrients through chemical fertilizer had deleterious effect on soil fertility leading to unsustainable yields; while integration with bio-fertilizers would be able to maintain soil fertility and sustain crop productivity. The interactive advantages of inorganic fertilizers and bio-fertilizers of nutrients generally proved superior to the use of each component applied separately.

Precise information regarding appropriate fertilizer level and suitable spacing for greengram crop in summer is very limited. For exploiting maximum yield potentials and efficient utilization of light, land, water and nutrient inputs, optimum plant population is vital factor for greengram. Keeping in view the above considerations, comprehensive research programme is plan to study the judicious use of fertilizer and to determine the suitable spacing.

Taking note of the facts highlighted above, a field experiment entitled “Evaluation of spacing and nutrient management in summer greengram (*Vigna radiata* L.)” is proposed to undertake at Instructional Farm, Department of
Introduction

Agronomy, College of Agriculture, Junagadh Agricultural University, Junagadh during summer season of 2016 with following objectives:

1. To study the effect of spacing, fertility levels and bio-fertilizers on growth, yield and quality of summer greengram
2. To assess the interaction effect of spacing, fertility levels and bio-fertilizers on summer greengram
3. To study the effect of spacing, fertility levels and bio-fertilizers on nutrient content and uptake by greengram and post-harvest soil fertility
4. To work out economics of different treatments