CHAPTER I

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The green revolution in India was limited to mostly cereal crops and that too under irrigated condition. Production of oilseed crops, which are largely grown under rainfed conditions in arid and semi arid tracts of India, is more or less stagnant since last few decades. The causes are many but these resulted in gradually widening gap between demand and supply. In spite of increased imports of edible oil the present per capita availability of oil is only 14 g as against the recommended level of 18 g per day. In order to minimise the drainage of invaluable foreign exchange and to meet the anticipated requirement of 4.2 to 6.2 million tonnes of edible oil by 2001 AD, the country has to exploit the conventional as well as the non-conventional sources of edible oils (Bhatnagar, 1985).

Soybean (Glycine max (L) Merr.) is an excellent source of high quality protein and edible oil as it contains about 40 per cent protein and 20 per cent edible oil (Manjhi, 1982). It can play a leading role in meeting the protein and edible oil requirements. It produces 2-3 times as much grain as compared to many other legume crops and produces over 33 per cent more protein than any other pulse crop. Even from the calory deficiency viewpoint and food for the poor, soybean plays an important role.

The central part of India i.e. Madhya Pradesh, having
FIG 1.1: LOCATION MAP OF CHHATTISGARH REGION WITH DIFFERENT AGROCLIMATIC ZONES

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- NORTHERN HILL ZONE
- CHHATTISGARH PLAINS
- BASTAR PLATEAU
largest area under soybean cultivation in India, is presently known as soybean state. The cultivated area covered is about 18 lakh hectare with estimated productivity of 8-9 q/ha during 1988-89 (NRCS, 1988). The agroclimatic requirements of soybean are very much similar to upland (kharif) crops such as maize, sorghum, black gram, green gram, pigeonpea etc. and therefore soybean can be primarily grown in rainy season (Singh and Saxena, 1979).

In Chhattisgarh region (Figure 1.1) about 10 percent of the total cultivated area comes under deep vertisol (clayey) in unbunded situations (ZARS, 1984). During "kharif" season due to excess of moisture they are left fallow and during "rabi" season gram, mustard, linseed, lathyrus and lentil are grown under residual moisture. Being a high rainfall area, in moderately drained soils black gram, pigeonpea and minor millets are grown but with poor yields during "kharif" season. These crops get affected due to excess water and shallow water table. This causes poor nodulation and enhanced pathogenic infection. Under such situation, soybean is the only alternative crop as it has capacity to develop aerenchyma tissue which serves to aerate the underground plant parts and increases the tolerance of flooding under excessive moisture condition (Fukui, 1956). If these fallow lands are sown with soybean, not only the moisture will be utilized but the land will also become rich in fertility since soybean is a legume crop and in normal and excessive rainfall years, a second (rabi) crop could also be taken under residual moisture.
Thus soybean has potential in this area in the deep vertisol which is not utilized fully in the "kharif" season. The vertisol gets eroded extensively if it is kept fallow. The overall fertility status is getting deteriorated. Moreover the existing crops like millets, pigeonpea do not give adequate coverage to the soil. There is a direct impact of falling rain drops responsible for soil erosion. Soybean leaves adequate foliage on the soil and root residues within the soil profile in order to maintain and built up the soil fertility. Soybean grows quite luxurient and gives better productivity than the present pulse or oilseeds crops. It is only through adequate nitrogen and phosphorus that the productivity of soybean can be enhanced, since the fertility status of these soils in this region is low to medium in available nitrogen and phosphorus and high in available potash (ZARS, 1984). Being a new introduction to this area, information on the nutritional aspect carries significant value.

Soybean is a high protein crop. It requires a large amount of nitrogen for optimum production. A good crop of soybean is able to utilize upto 240-245 kg nitrogen per hectare; out of this it has a capacity to meet the requirement of 100 kg N/ha from atmosphere by way of symbiotic nitrogen fixation (Chandel and Saxena, 1988). It has, therefore, been recognised that symbiotically fixed nitrogen alone can not meet the crop requirement. Along with the symbiotically fixed nitrogen, soil and fertilizer nitrogen are necessary for early establishment of the crop (Singh, 1989).
Soybean has a relatively higher phosphorus requirement than the other legume crops. (Pasricha and Tandon, 1990). Phosphorus helps to stimulate early root formation and growth. Plants having adequate amount of phosphorus will start more rapidly and vigorously than plants that are starved of phosphorus. Phosphorus is involved in many important metabolic processes in the plant (Illinois, 1982).

Soybean is tolerant both to excessive moisture and water stress. It has been found quite successful in heavy rainfall areas where rice is the predominant cereal crop. However, with higher foliage cover, the evapotranspiration (ET) rates of soybean might be higher than the other crops. It was therefore, aimed to determine the water requirement and ET rates through gravimetric lysimeters. This will give information on moisture utilization pattern of soybean.

In view of the immense scope of soybean in Chhattisgarh region in black soils under rainfed conditions a systematic research on its nutritional aspects in terms of nitrogen and phosphorus as well as the water requirement of the crop was carried out under Raipur conditions with the following objectives.

1. To study the response of the nitrogen and phosphate fertilization on growth, yield and its attributes.

2. To find out interaction effect of nitrogen and phosphorus on yield and its components.
3. To determine the nutrient uptake in soybean

4. To estimate the protein and oil content due to fertilizer application

5. To assess the water requirement of soybean through lysimetric studies