CHAPTER 1

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Early man started agriculture after recognising the nutritive value of different wild plants. Therefore, it is not surprising that, together with cereals, leguminous crops were cultivated in the distant past. Of these, at least "Masha" (Urd, i.e., *Phaseolus radiatus* Roxb.), "Masura" (Lentil, i.e., *Lens culinaris* L. Medic.) and "Mudga" (Moong, i.e., *Vigna radiata* L. Wilczek) are mentioned in early Aryan literature and date back to thousands of years (Achaya, 1985). The early Roman and Greek farmers have also been credited with the knowledge of the beneficial effect of rotating leguminous and non-leguminous crops (Bould, 1963; Burris, 1965).

With the advancement of science and technology, agriculture has emerged as an industry in most of the developed and some of the developing countries, like India. As a rule, the success of an industry depends upon low energy investments, accompanied by high output, agriculture being no exception. Of the total energy invested in the agriculture sector of a developed country, like the U.S.A., about a quarter is used for synthetic fertiliser production. It is estimated that there has been a several-fold increase in the input of nitrogenous fertilisers during the past few decades (Flaig, 1978) and there is indication that this trend will continue. The situation in developing
countries is even more critical because of the general awakening among farmers coupled with constraints on fertiliser production. In India, for example, the existing gap between production and consumption of nitrogen has been doubled within the last few decades (Subba Rao, 1979) posing a heavy burden on the economy of the country.

Keeping these facts in view, judicious exploitation of the unique mechanism of dinitrogen fixation by leguminous crops could help in more than one way. It increases soil fertility, provides cheap alternative for costly synthetic nitrogenous fertilisers and checks environmental pollution. It is estimated that about 175 million tonnes of dinitrogen are fixed annually by various organisms (Burns and Hardy, 1975; p.54). The forage legumes contribute approximately 125-300 kg/ha, and edible legumes 50-60 kg/ha/year (Mishutin and Shilnikova, 1971). Moreover, leguminous crops, by virtue of their high grain protein content (20-40%), have unequivocally proved indispensable in tropical and sub-tropical regions of the world, including India in particular where the majority of the population depends mostly upon vegetable proteins. Ironically, the so called "Green Revolution", which helped in meeting the increasing demand of cereals during the recent past and proved successful in coping with the "population explosion", eclipsed the need for increased production of grain legumes. Therefore, neither the genetic stock nor the agronomic practices for the cultivation of leguminous crops could be improved. The ignorant farmers
continue to grow low yielding cultivars of legumes, often as inter-crops, in unirrigated areas. It results in low production in spite of covering 24 million hectares of arable land—the largest area of the world under leguminous crops (Mehta, 1968). It is, therefore, not surprising to note that total production of grain legumes in the country is only about 12 million tonnes, i.e., 500 kg/ha (Jeswani and Vanschaik, 1968; Mann and Singh, 1975) as against 3,494 kg/ha for example, produced by France (Anonymous, 1984). Lately the situation has prompted national planners to give top priority to the task of improving the genetic make-up of these crops and to work out a set of practices for full exploitation of their potential.

To achieve genetic limits of yield performance of a crop, it is essential that all the environmental factors contributing to its growth and development should be optimised. Of these, nutrition is a factor of prime importance. With the application of fertilisers and ameliorative additives, crop yield have been improved considerably. However, greenhouse and field studies have revealed that indiscriminate use of fertilisers may prove uneconomical or even sometimes harmful for plant growth and developments. Moreover, a proper balance in the nutrients present in the growing medium is essential for optimum growth and good returns.

Lentil and moong are two important pulse crops of India. The former is a winter season ("rabi") pulse, generally raised under rainfed conditions. It can be sown from the
middle of October to the end of November, this providing extra time for engaging the land under a late "kharif" (rainy season) crop. In addition, it requires minimum plant protection measures. Moong has been established as a full fledged off-season summer crop. It enables the farmers to make best use of their fallow land, which consequently becomes rich in nitrogen. As the crop is generally free from diseases during this season, a good yield may be ensured.

At Aligarh (India), Samiullah and his associates have made significant contribution regarding the cultivation of lentil and summer moong within a short span of time (Akhtar and Samiullah, 1982; Samiullah et al., 1982, 1983, 1985; Akhtar et al., 1983, 1984; Akhtar, 1985). These studies have resulted in the establishment of the optimum fertiliser doses and application schedules for some improved varieties. Recently, a modest attempt has been made to improve the productivity and quality of these grain legumes under culture and field conditions by exogenous application of vitamins, particularly vitamin B₆ (pyridoxine). Stimulation of root growth in barley, summer moong, lentil and urd by administering dilute aqueous solution of pyridoxine to seeds (Afridi et al., 1979; Khan and Ansari, 1984; Samiullah et al., 1985, 1988) indicated that pre-sowing treatment with pyridoxine favoured the uptake of water and nutrients by enhancing the area of the interface between roots and soils. This could have added
advantage in conserving the applied phosphorus which is very prone to be fixed in the soil (Russell, 1950)

Considering this, it was decided to undertake eight field experiments - four each on lentil and summer moong - to test the effect of the interaction of nitrogen and phosphorus with vitamin $B_6$. These crops were selected in view of: (i) diversity of genetic material, (ii) possession of fairly high and easily digestible seed protein and limiting amino acid contents, particularly methionine and tryptophan (Gupta, 1982 pp 297, 301), (iii) minimal requirement of irrigation, in view of drought creating adverse conditions every year in one part of India or the other and (iv) distribution of the investigations fairly through out the year.

The aims and objects of these field trials were to study the effect of:

Various doses of nitrogen/phosphorus and pre-sowing seed treatment with graded aqueous pyridoxine solutions, alone and in combination, on the growth and yield response of lentil and moong.

Basal dressing of several doses of nitrogen/phosphorus, supplemented with foliar spray of nitrogen/phosphorus alone or in combination with two concentrations of aqueous pyridoxine solution on the growth and development of lentil and moong.