SYNOPSIS
Now, what I want is, facts. Facts alone are wanted in life.

Charles Dickens (1812-1870)
Hard Times (1854) bk. 3, ch. 8 (Mr. Sleary).
SYNOPSIS

Legumes are a group of plants which are of utmost importance, useful as a source of proteins in food for humans and animals. They are useful as rotation crops to improve the soil fertility. Until recently, legumes have been mainly used for human consumption as a very cheap source of protein. Recently alternate uses of legumes mainly in the canning and freezing industries have been recognized.

Chickpea (Cicer arietinum L.), originally a crop of subtropics has gained popularity and is being widely grown in the tropics. This major legume is a host to numerous diseases and insect pests and incurs heavy losses (Altarf & Ahmad 1990). The fungal diseases that affect chickpea are the Fusarium wilt and Ascochyta blight. Tremendous loss is also incurred due to the insect pest- the pod borer (Helicoverpa armigera).

This “recalcitrant” crop has not responded well to the efforts to bring about improvement in the genetic variability and no significant change in yield potential has been achieved over the past 20 years (Swindale 1990). Conventional plant breeding which is slow and time consuming has not helped in the improvement of chickpea.

Innovative biotechnological approaches are suggested as an alternative to combat against major biotic and abiotic stresses in chickpea. This could be achieved by transfer of desirable traits to high yielding and adaptive cultivars. Integrated pest management and disease control and increase in nutritional quality and yield of grains are the other characteristics which need to be improved in grain legumes. For this, the basic pre-requisites such as high frequency efficient plant regeneration system either through organogenesis or somatic embryogenesis from various explants of chickpea and development of gene transfer methodologies are essential.

The present work entitled “Somatic embryogenesis and genetic transformation studies in chickpea Cicer arietinum L.” is devoted to the fulfillment of the basic pre-requisites, in particular, development of in vitro regeneration of plantlets from various mature explants of chickpea and standardization of a methodology for genetic transformation through vector mediated gene transfer system.

The thesis has been divided into six chapters, followed by a summary and bibliography.

CHAPTER 1: GENERAL INTRODUCTION

This chapter gives a general information of legumes. A thorough literature survey of in vitro studies with emphasis on somatic embryogenesis and genetic transformation in grain legumes in general and chickpea in particular has been dealt with. Various techniques used in somatic embryogenesis and plant transformations has also been described in this chapter.
CHAPTER 2: MATERIAL AND METHODS

The source of glassware, plasticware and chemicals used in the present work has been elucidated in this chapter. This chapter also describes the procedures followed for cleaning of glassware and preparation of media. The composition of different media and the various techniques used during the course of this work have also been included.

CHAPTER 3: ESTABLISHMENT OF AN EMBRYOGENIC SYSTEM FROM MATURE EXPLANTS

Seedling explants and mature embryo axes of different cultivars of chickpea were evaluated for induction of somatic embryogenesis. The effect of different parameters on induction of somatic embryos has been described in detail in this chapter. This chapter also deals with optimization of conditions for maturation and conversion of somatic embryos. The mode of initiation of somatic embryos has been studied histologically.

CHAPTER 4: STUDY OF ABERRANT MORPHOLOGIES AND LACK OF CONVERSION OF SOMATIC EMBRYOS

Numerous morphologically aberrant somatic embryos were examined histologically and the lack of meristematic cells at the shoot apical region was correlated to their non-conversion and to the low % frequencies of somatic embryo conversion into plantlets. The morphology and the histology of different types of somatic embryos has been described in detail.

CHAPTER 5: SCANNING ELECTRON MICROSCOPIC STUDIES OF ZYGOTIC AND SOMATIC EMBRYOS

This chapter gives a comparative account of pattern development of zygotic and somatic embryos at different developmental stages. The nature of surface, apical meristems, suspensor as viewed under scanning electron microscope and the morphology of different types of somatic embryos have also been discussed in this chapter.

CHAPTER 6: GENETIC TRANSFORMATION STUDIES

Agrobacterium-mediated genetic transformation of chickpea explants was attempted. The protocol of genetic transformation was standardized using tobacco as a model system. The transformants confirmed by GUS activity were field grown and the seeds in F1 generation were found to be GUS positive. The standardized transformation methodology was later extended to chickpea mature embryo axes explants. Transformation studies carried out with tobacco as well as with chickpea have been dealt in detail in this chapter.

SUMMARY

This part of the thesis summarizes the findings of the present investigation and its future implications.
KEY REFERENCES
