CHAPTER - 1
General Introduction
Tropical forests occupy seven per cent of the land surface, represent a major portion of the biosphere's biomass. These harbour about sixty per cent of the world flora and are depleting at an alarming rate due to unprecedented increase in urbanization, industrialization, mining, encroachment on vast areas of forest lands for extension of arable expanses, unsustainable practices of shifting cultivation, uncontrolled grazing etc. This formed a direct on slaughter on forest resources resulting in severe environmental crisis and question the very existence of life.

Forests provide subsistence to millions of people and are very significant in maintaining ecological equilibrium. These aid in controlling the global climate by balancing oxygen and carbon dioxide levels in atmosphere, earth temperature, influencing local precipitation, nutrient and hydrological cycles, arrest soil erosion, avoid floods and these are described as reservoirs of genetic diversity, harbouring a wide variety of flora and fauna.

India is one of the twelve megabiodiversity states in the world representing 6.5 per cent of world’s known wild life. Due to over exploitation of the forest resources, atleast ten per cent of India’s recorded wild flora is on the verge of extinction and many more wild species are on the threatened list, awaiting a similar fate. Majority of the Indian population still depends on forest resources for their daily food, medicine, housing, agriculture, fodder and fuelwood. The loss of biodiversity is a direct and irreversible attack on their livelihood and social security witnessing a woeful sight. Due to the population explosion, there is an exacerbated pressure on the forest resources. Rapid urbanization and industrialization especially demanding timber from the forests,
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has resulted in denudation of natural habitat. Hence, there is a dire need to go for alternative strategies to develop timber resource there by releaving pressure on existing forest wealth.

The scope for restoration of natural forests in the near future is very bleak unless a Herculian effort has to be taken up for the sustainable development. To ensure sustainable and equitable use of resources for meeting the basic needs of the present and future generations without fore closing the existing resources, the best option is to practice massive tree plantation of forest species. Hence, attention has to be focussed to develop a cost effective and less time consuming system. Massive tree plantations primarily need a good nursery for raising large number of saplings. Most of the forest tree species are not amenable to conventional methods of propagation. Prolonged juvenile period of trees take many years to reach seed bearing age. On the otherhand, seed propagation is also having major constraints such as prolonged dormancy, low germinability, poor viability. Clonal multiplication through rooted cuttings has been attempted for many years. However, vegetative propagation is also forming a hindrance as it cannot be applied to all species, if so practiced, the number of cuttings and size of the cutting are fairly more which inturn question the very existence of the elite mother plant. Further, the cuttings can be procured only during a specific season, not round the year. When such conventional methods of propagation achieve poor and unpracticible results, it has become imperative to devise methods by which large scale propagules of selected elites can be raised.

In this context, the technique of plant tissue culture has rightly been conceived as an effective means with immense potentiality, which offer methods for rapid multiplication and large number of planting stocks for afforestation programmes, conservation of rare and elite germplasm.

Plant cell tissue and organ culture is now being used for solving various problems in forestry and provide techniques like meristem culture to eliminate viruses, somatic embryogenesis for mass propagation, anther culture to establish haploid plants and homozygous lines and micropropagation for obtaining true to type plants.

Rescue of leguminous trees through tissue culture is not done at the same pace along with other herbaceous species, as regeneration of forest trees in general and legumes in particular has been a difficult task. In the present investigation, three timber yielding leguminous tree species with high economic potentiality have been selected owing to their importance as reforestation tree
species. *Pterocarpus santalinus*, the pride of Andhra Pradesh is confined to a narrow restricted area in certain forest tracts of Chittoor and Cuddapah. This particular taxon fall in the category of threatened plants. Any disturbance in their narrowly confined ecosystems could mean extermination of the species. Because of its superior quality timber and natural dye santalin, this taxon is being over exploited which resulted in faster rate of depletion of its number. *Pterocarpus marsupium* yields one of the most important timbers in peninsular India and is coupled with medicinal value. *Hardwicikia binata* an endemic taxon to India yields an extremely hard durable timber. Problems with germination and recalcitrance nature of the three selected trees is a constraint to natural regeneration, which even holds good for establishment of in vitro cultures. In the present study attempts are being made in seedling material to avoid constraints with mature trees such as interference of phenolics, non-availability of juvenile material through out the year. Especially material from mature trees of *Pterocarpus santalinus* and *Pterocarpus marsupium* are to be transported from a long distance which pose problems like contamination. Fundamental studies which include identification of right cultural conditions, best explant for rapid multiplication, callus initiation etc., by employing seedling explants are ought to be done which can later be adopted for elite mature trees for stimulating advanced studies such as protoplast fusion, somatic embryogenesis, artificial seeds and cryopreservation. Hence, the present investigation is helpful to a plant propagator as an applied field, as it provides a rapid propagation system and to a technologist it is a basic research by providing right cultural conditions which will be an anchor to improve advanced technology.

With this back ground the present investigation has been undertaken with the following objectives.

*Testing the germinability in the selected tree legumes and to improve germination per cent by various methods including in vitro seed culture.*

*Standardization of three media (MS, B5 and WPM), and to evaluate best suitable medium for efficient shoot regeneration.*

*Assessing the potentiality of various seedling explants for regeneration capacity.*

*To standardize protocols for high per cent frequency of shoot bud regeneration in selected explants by fortifying the media with varied concentrations and combinations of hormones, further different concentrations of coconut milk and various other carbon sources.*

*To evaluate the efficacy of various auxins in different concentrations to induce callus.*
* To establish shoot tip cultures, nodal cultures, suspension cultures and long term cultures.

* Evaluation of rooting performance by using different auxins at varied concentrations either in liquid or solid media and to standardize effective protocol for rhizogenesis.

* To perform in vitro studies in mature tree explants.