1. INTRODUCTION
1. INTRODUCTION

Kerala State, situated between latitudes 8° 18' and 12° 48' North and longitudes 74° 52' and 77° 22' East, is bounded in the east by the Western Ghats and in the west by the Arabian Sea. Kerala has an area of 38355 km² which is about 1.03% of the geographical area of India. The State has typical tropical climate with average annual rainfall varying from 750-4000 mm, mean monthly temperature ranging from 17.5 to 35°C and mean relative humidity varying from 75-90 percent. The effective forest area of the State is about 9400 km² which is 1.26% of the total forest area of India and 24% of geographical area of the State (KSLUB, 1989). The forests of Kerala are distributed in three distinct altitudinal zones. The lower zone consists of undulating narrow belt up to ca. 100 m.m.s.l. comprising mainly bamboo forests and tropical moist deciduous forests. The intermediate zone reaching up to 1500 m consists of tropical semi-evergreen and wet-evergreen forests. The high altitude zone comprise of subclimax Savanna of high ranges and most of the non-refractory areas of these grasslands have recently been afforested with eucalypts, wattles, tropical pines, etc. The forest areas in Kerala can be broadly categorised as follows:
1. Tropical moist evergreen and semi-evergreen - 3450 km²
2. Tropical moist deciduous forests - 4010 "
3. Tropical dry deciduous forests - 100
4. Grasslands - 134
5. Forest plantations - 1604

From the above figure it is obvious that nearly 42.9% of the total forest area of Kerala is covered by tropical moist deciduous forests (KSLUB, 1989) which is the abode of many valuable indigenous tree species of vast plantation potential. Plantation forestry is mainly focused on monoculture of a few species mainly aimed at producing wood for industrial purposes and nearly 85% of the total forest plantations comprise teak, eucalypts and other soft wood and miscellaneous tree species (Evans, 1982). The percentage of area under plantations in Kerala has increased steadily from 3.62 in 1956-57 to 13.73 during 1987-88. The main tree crops grown in plantation are teak (50.97%), eucalypts (22.05%), soft wood (6.9%), and others (20.05%) which include cashew, wattle, Ailanthus, Albizia, balsa, bamboo, reed, etc. (Jayaraman and Krishnankutty, 1990).

In fact one of the main reasons why exotic species were preferred for afforestation programmes was the availability of adequate research and experimental background to grow them
successfully. Lack of such documented information in indigenous species is one of the major constraints for their less utilisation in plantation programmes. An indigenous species is one that grows naturally in the country concerned though not necessarily in all parts and not certainly suited to all sites. In addition, indigenous species have some important biological advantages over exotics such as i. they are well adapted to local environment; ii. even in monoculture they are more suited ecologically; and iii. their timber uses are well known to local consumers.

In India, particularly in Kerala, no organised effort has been made so far to evaluate the plantation potential of indigenous tree species, teak (Tectona grandis L.f.) being an exception. However, before evaluating their plantation potential, it is essential to understand their pathological problems, as high rainfall combined with tropical warm-humid climate provide conducive environment for the development and spread of several diseases especially when the host is also susceptible. Exotic tree species such as eucalypts are prone to serious diseases such as Cylindrocladium leaf blight and pink disease caused by Corticium salmonicolor Berk. & Br., which drastically affected the productivity of plantations.
(Sharma et al., 1985; Sharma and Mohanan, 1991). However indigenous species raised in monoculture are seldom affected seriously with indigenous pathogens. But when they suffer, they suffer seriously, the known example being that of rubber in Brazil where a native leaf blight pathogen Dothidiella ulei P.Henn. wiped out rubber plantations. So, before taking up any plantation programme with indigenous tree species it is imperative to have a good knowledge of pests and disease problems of tree species selected for such programmes.

In forestry, availability of seeds is an important factor for raising planting stock on a large scale. Germinability of seeds greatly depends upon seed health and storage conditions. Like seeds of agricultural and horticultural crops, seeds of tree species are also liable to be affected by micro-organisms during storage (Mittal, 1979; Sharma and Mohanan, 1980; Mittal and Sharma, 1981; Mittal, 1986; Vijayan, 1988). The various ways by which seed-borne micro-organisms affect the quality of seeds are i. reduced germination; ii. introduction of seed-borne diseases into newly sown crops/areas and iii. reduction of viability during storage. Moreover, availability of healthy stock of seedlings is intrinsic for raising plantations and to meet this, control of
nursery diseases by appropriate chemicals is of prime importance. However, in the case of indigenous tree species, information on microbial deterioration of seeds, seedling diseases and their control measures is either completely absent or meagre.

With a view to select appropriate tree species with fewer manageable disease problem(s) for use in future plantation programmes, seed pathology, seedling diseases and their management were studied, in respect of four indigenous tree species such as,

1. Albizia odoratissima (L.f.) Benth. (Mimosaceae)
2. Lagerstroemia microcarpa Wt. (Lythraceae)
3. Pterocarpus marsupium Roxb. (Papilionaceae) and
4. Xylio xylocazpa (Roxb.) Taub. (Mimosaceae).

Importance of the present investigation

Seed pathology is an integral part of seed technology. However, forest seed pathology has not developed to the extent of seed pathology of agricultural and horticultural crops. Production either of Agriculture or Forestry depends to a great extent on the quality of seeds used. Revolution in agriculture was possible to a large extent due to the use of
quality seeds. In the same way it could be possible to increase the productivity of our forest lands by the use of quality seeds.

Seed health testing forms the first and foremost procedure in pre and post-entry quarantine. Seed testing procedures depend invariably on the importance of the pathogen on the seed and the disease potential assigned to the pathogen in a given situation (Neergaard, 1977). Even though quite a number of methods have been developed to test the seed health in agriculture and horticulture crops in forestry very few methods have been standardised; standard blotter and agar plate method being the exceptions. A particular microorganism whether pathogenic or saprophytic has specific requirements for its occurrence and subsequent growth on the seed. It is unlikely that all the micro-organisms present on a seed will be recorded by a particular method. Hence in the present investigation, an attempt was made to evaluate various seed health testing procedures for forest tree crops to find out the best method for the expression of most of the seed-borne micro-organisms.

Several fungi have been found associated with the seeds but only a few of them may be pathogenic causing various types of disorders. Poor germination of seeds also could be caused
by seed-borne pathogens. However, literature on the seed microflora and its significance, especially of tropical forest seeds is scanty and an attempt has been made to bridge the information gap. Storage of agricultural seeds is a common feature, as adequate storage facilities are available. Though seed of forestry species are not stored for a long time as in the case of agricultural seeds, in certain cases it is imperative to store them for later use. Appropriate methods of storage under humid tropical conditions have not been standardised. Search of literature revealed that effect of seed microflora on the storage of forestry seeds has not even been attempted. Recent advances in storage practices have also unveiled the fact that the seeds stored at low temperature under dehumidified conditions and with fungicides are viable for a longer period and they showed reduced incidence of microbial attack (Christensen and Kaufmann, 1974; Morneo and Vidal, 1981; Morneo et al., 1985; Soman and Seethalakshmi, 1989). Hence, a detailed investigation was also carried out to find out the effects of storage of forestry seeds under different storage conditions and fungicidal application, on seed microflora, seed germination and seedling growth.

Hot water and fungicidal seed treatments are commonly used to control the seed-borne pathogens (Venkatasubbaiah et al., 1984; Donald and Lundquist, 1984). The use of fungicides
as dust, slurry and soaking have been used not only to remove the inoculum from the seed but also to protect the seedlings from diseases while they are in the nursery (Munjal and Sharma, 1976; Mittal and Sharma, 1982 abcd; Mittal, 1983 ab; Shukla et al., 1990). Since no detailed investigations have been carried out on the above line in indigenous tree crops, management of seed microflora with hot water and chemical treatment was attempted.

With the increasing demand for wood, forestry has gained importance and intensive forest management practices are practiced in order to achieve higher productivity of the plantations. Diseases, especially in nursery, began to appear due to these intensive management practices. In this situation availability of healthy stock of seedlings for planting and their disease free condition in the field became an important aspect of forest management. To minimise the disease hazards or control them is the most important aspect of this challenge. Before taking up any nursery disease control measures, it is imperative that the recognition of the causal organism of the disease through symptoms is attempted first. Later, the incidence of the disease can be monitored for a period of time to understand its level of severity so that chemical control measures can be worked out economically.
While considerable attention is being paid in preserving the natural forests, no attempt has been made to study diseases of seedlings of indigenous tree species. Under conducive macro and micro climatic conditions seedlings of exotics/indigenous tree species are liable to be affected from one or more serious diseases during their entire nursery period. Fungal pathogens cause heavy loss in forest nurseries and even though excellent literature is available on diseases of seedlings of some economically important exotic tree crops (Sharma et al., 1985) no information on seedling disease of indigenous tree crops and their management is available and hence, studies were taken up to identify serious disease problems in seedlings of indigenous tree species and work out the management strategy for economically potential ones.