CHAPTER VII

SUMMARY AND CONCLUSIONS
The present study was planned to understand the behaviour of seeds/fruits and the seedlings of some important forest tree species. The object of this study was to have some idea about seed germination, and growth and establishment of seedling which may be useful for afforestation and reforestation practices.

The study was carried out on some common dry deciduous forest tree seeds/fruits i.e. *A. catechu*, *A. latifolia*, *B. monosperma*, *C. fistula*, *D. melanoxylon*, *D. sissoo*, *L. parviflora*, *Q. dalbergioides*, *T. grandis* (local as well as southern variety) and *T. tomentosa* and their seedlings. In addition to these, some other species of dry deciduous forest and fast growing species like *A. auriculaeformis*, *A. pendula*, *A. procera*, *B. retusa*, *E. officinalis*, *M. parvifolia*, *P. pinnata*, *C. pentandra*, *T. belerica* and *T. populnea* were also included in some of the experiments. The experiments were performed in Botanical garden, University of Saugar, Sagar (23°50' N latitude and 78°40' E longitude) and Ranipura State Government Forest Nursery ca. 12 km from Sagar city on Sagar-Jhansi road, mainly on three lines.

1. Seeds/fruits germination behaviour was studied in relation to controlled (seed germinator) and semi-controlled environment (nursery bed), dimensions, emergence time, potting media, duration of imbibition, different litter depth above seed/fruit surface, and litter leachate.
2. Seedling growth performance in relation to different months and potting media.

3. Seedling growth analysis.

Germination of seeds in nursery-bed was comparatively less than in seed germinator, except for *T. tomentosa*. It was reduced by 42% in *T. grandis*, 33% in *A. latifolia* and 25% in *G. fistula* in nursery bed.

In case of seeds, maximum (60%) and minimum (5%) germination were found in *P. pinnata* and *A. latifolia* respectively. While among fruits, *T. belerica* (47%) and *T. tomentosa* (11%) were found to have maximum and minimum germination.

Number of days after which germination starts and total days required for its completion was observed to range from 4 to 9 and 6 to 13 days, respectively except for *D. melanoxylon* in which germination starts after 19 days of sowing and completed in next 5 days. In most of the species, 2 to 3 days were required for complete germination after the start of germination.

Comparatively better germination was found in 100% black soil, and 50% black soil + 50% sand than in 50% black soil + 50% saw dust.

Positive relationship was found in between duration of imbibition and germination of all the species except for *R. monosperma* in which germination increased upto 6 hours of
imbibition, followed by a decline. During 48 hours of
imbibition maximum germination was recorded in D. melanoxylon
(72%) and minimum in T. grandis (10.67%).

Heavy weight seeds were found to have better germination
than the light weight seeds in almost all the species studied.

Negative correlation between litter depths and germination
was found. A. catechu and A. procera appears to be most
affected by litter depths, while reverse was true for
D. melanoxylon. Leachates of B. monosperma, L. camara,
T. grandis and T. tomentosa litter were inhibitory to the
germination of T. grandis seeds except for litter type of
T. grandis. Higher dilution effects were obtained in prolonged
leaching hours. Higher dilution of B. monosperma was promitory
while its lower dilution were inhibitory in germination of
T. grandis seed.

Dry matter production in shoot/root components of
seedlings was seasonal as it was more in shoot during growing
months than roots, while reverse was true for later phases of
growth. Considerable decrease in total dry weight of seedling
of all species was noticed in December except for O. dalbergioides
where it was low during March, and from March onwards the total
dry weight of seedling have again resumed the increments.

Dry matter production in relation to potting media was
maximum in O. dalbergioides (3.71 g), D. sissoo (1.94 g) and
T. grandis (2.29 g) in 1:1 soil-saw dust mixture in 1st two species; and hundred percent soil in last species respectively.

Four definite patterns of distribution of dry matter were observed in leaves, shoot, and root component of one year old seedlings of tree seedling.

Growth in length of seedling was faster in early phase of growth in most of the species than the later phases. E. officinalis, A. auriculaeformis and C. pentandra showed maximum changes in the growth of seedlings. A steady growth in length was observed in D. melanoxylon.

Leaf area increased upto the end of growing season and it was maximum in O. dalbergioides while it decreased in later phases due to leaf fall. Species-wise, maximum leaf area in relation to potting media for O. dalbergioides, D. sissoo and T. grandis was maximum in hundred percent soil; and 1:1 soil-saw dust mixture respectively.

Moisture content was higher in early phase of growth than later phase of growth. On the whole, variation in moisture status was more or less similar and ranged from 20.46% to 72.06% in all species.

O. dalbergioides, T. grandis and D. sissoo appeared to be similar in capacity to absorb moisture and nutrient as indicated by their secondary root number in 1:1 soil -
saw dust mixture, 1:1:2 soil - sand - saw dust mixture, and 1:3 soil - saw dust mixture respectively.

Monthly growth analysis of seedling showed variation in F, RGR and NAR due to gradual increase in dry weight, deciduous nature of species, and climatic stresses. It appears that NAR and F controlled the RGR.

On the whole, it can be concluded that collection of healthy seeds/fruits which have good amount of stored food, treatment of seeds/fruits with various physical and chemical devices, suitable potting media and early seedling growth and their after care seems to be the most important aspects, besides the other factors, should be kept in mind during nursery practices. Following are some suggestions to improve germination and seedling growth especially for dry deciduous forest species.

1. Collection of seeds be made from middle aged healthy parent tree, occurring in different localities in order to include seed types for better germination, and quality.

2. Large/medium sized seed(on the basis of weight) could be considered separately to get better germination and equal size planting stumps.

3. Pre-soaking of seeds/fruits before sowing, for different duration in water could be taken into consideration to
facilitate quick and better germination in nursery bed. Comparatively longer duration of pre-soaking in water in case of hard coated seeds/fruits (A. catechu, G. fistula, D. melanoxylon, L. parviflora, T. belerica, T. grandis and T. tomentosa) is more desirable, while reverse is true for soft coated seeds/fruits (A. latifolia, B. monosperma and D. sissoo).

4. On the basis of their germination in different potting media, seed can be classified into two groups: (a) Seed requiring more moisture and poor aeration; and (b) Seed requiring more aeration and lesser moisture. It can be of much use in plantations, where soil is dry with adequate aeration and wet soil having comparatively less aeration. In D. melanoxylon hundred percent soil and in A. catechu, T. grandis and T. tomentosa 1:1 soil - sand mixture is more desirable than other media.

5. Potting media also seemed to play important role during the course of seedling development and it is desirable that suitable medium should be used, while preparing the planting stumps, as survival and establishment of the planting stumps depends on its quality. Particularly here hundred percent soil for T. grandis, and for D. sissoo and G. dalbergioides 1:1 soil-saw dust mixture are suitable.
Proper attention must be paid in nursery during the late winter/summer, because during that duration environmental stresses are more acute, which affect the pace of growth considerably in early and later stages of growth of seedling.