# *Chapter :- V*

# SUMMARY AND CONCLUSIONS

## V. SUMMARY AND CONCLUSION

Natural vegetation covers about a fifth of the total land in our state. More than half of our land has been brought under cultivation. The nature of vegetation range from thick high tropical forests in the wetter regions of our mountain ranges to the thorn and scrub of the dry, hill regions of central Maharashtra. We have fairly large forests on the wetter slopes of the Sahyadri and the Satpura and Ajanta ranges; and, on the whole, the vegetation of the state is rich enough for our own needs. Teak, which is used for furniture and in the building of houses, ships and railway carriages is found in the forests of eastern Vidarbha, on the eastern slopes of Sahyadri and Satpuras. Our forests give us other woods as well like Sandle wood, ebony, tiwas, dhaman, khair and babul. The bamboo, too, grows in most of our forests particularly those in the Konkan and eastern Vidarbha and is very useful on the farms. The tendu grows plentifully in Vidarbha and tendu leaves are used to make bidies. The silk cotton tree, the Semul, grows in the forest regions which have a moderate rainfall. It provides us with soft cotton for pillows. Sandal wood is used in the manufacture of scented oils and soaps and in medicines, while the barks of the babul and the low bush called tarwad are used in tanning. Large pastures with good grass from part of our forest wealth. There are several good patures on the slopes and plateau of Satpura and on the Sahyadri foot hills in the district of Dhule

and Thana; Sheeps and cattle grazed on these pastures. The moshi grass which grows in the district of Thana makes very nutritious fodder. The rosha grass found in the districts of Dhule, Jalgaon and Amaravati is used for making scented oils. Different kind of flowers are found in the forests and so are honey and wax. A sticky substance called Shelloc which is used in making Varnish, is called from the Palas trees which grows in abundance in Satpura and Ajanta ranges. Besides there are many useful fruits which grow wild in these forests. Among these are jambul, avala, Kokum, jack fruit and berries or karwand. Many of our tribal people collect and sell them.

Forests are one of the most important renewable natural resources and deserve a prominant status in the national economy. It is evident that the existance and stability of forests are very much intimately related with the environment. Forests act as the buffers maintaining the balance in the environment and living world.

Seed germination represents one of the important phases in the life cycle of a plant. It represents a series of complex processes which transform a seed from an almost inert to a most active, growing, entity. Due to the unique position occupied by the seed in the life cycle of a plant and due to the peculiar state of affairs in the germinating seeds, the process of seed germination has attracted attention of several research workers. Much infomration on physiology of seed

germination has been accumulated in recent years. However, seeds of only few species like barley, peas, castor bean, lettuce, wheat and rice have been throughly investigated. There is very less information available on physiology of germination of forest tree seeds. Review of literature clearly revealed that not even preliminary understanding of the metabolic events occuring during germination is clear for seeds of forest trees. These facts have prompted us to undertake studies on germination of seeds of forest trees.

In the present investigation an attempt has been made to study the nature of dormancy in some of the promising forest trees. For the further studies in germination and physiology, Local, K8 and K28 varieties of Leucaena lencocephala (L.) de.wit. So called "Soo-babul" were selected. The work is divided into five parts. Chapter-II deals with the review of literature on problems and perspectives of forestry in our country and the brief resume of physiology of seed germination in general. Chapter-III describes the methodology of investigation. All the results have been critically discussed in the light of recent literature in the next part of the thesis i.e. Chapter-IV "Results and Discussion". The significant findings of the present investigation can be summarised as follows :

Effect of pretreatments :

Effect of presowing soaking treatments of water, Sulphuric acid and ascorbic acid on germination of Leucaena,

Silver oak, Casurina, Terminalia and teak; under field conditions revealed that except Leucaena, treatment with water seems to be only slightly effective in breaking the dormancy of seeds in Terminalia, teak and silver oak. It appears that seeds of Casurina show the highest level of dormancy among all the plants, studied. In case of Leucaena presowing soaking treatment with water even breaks the dormancy in appreciable amounts. However, seeds pretreated with ascorbic acid and $H_2SO_4$ increases the percentage of germination in this plant, so called the "Soo-babul." From the present observations it is suggested that dormancy in the seeds of Leucaena can be broken with acid scarification. It can also be seen that for breaking seed dormancy in Silver oak, Casurina, teak and Terminalia further investigations are required. As Local variety of Leucaena responded well, we concentrated on some Leucaena varieties for the investigations in the physiology of seed germination.

Study of effect of presowing soaking treatments with 0.1 N, NaCl, 2% $H_2SO_4$, 200 ppm ascorbic acid, cold water, low temperature, hot water and high temperature on germination and seedling growth in Leucaena varieties Local, K8 and K28 under field conditions and polyethylene bags revealed that varieties K8 and K28 exhibit considerable seed dormancy when compared with Local. Hot water treatment and high temperature pretreatments are effective in breaking the seed dormancy and increasing the rate of seed germination in all the three varieties. However, it is the low temperature which is favourable

for further growth of seedlings. Highest germination percentage is observed in the seeds of variety Local when pretreated with high temperature 35° to 40°C. In other varieties this treatment is less effective. Seedling growth appears to be vigorous in variety Local when pretreated with 2% $H_2SO_4$, while low temperature pretreatment is showing maximum growth in varieties K8 and K28. The results obtained in the experiments where the seedlings are grown in polythene bags are also on the similar lines except that it is the high temperature treatment which is effective in both, breaking the dormancy and further seedling growth. Germination percentage is increased in the varieties K8 and K28 due to treatment with 35° to 40°C temperature. Acid treatment and high temperature treatment may be favourable for germination and low temperature or normal temperature conditions for seedling growth in Leucaena varieties Local, K8 and K28.

Study of effect of pretreatments on germination and growth of seedlings in ideal conditions in petridishes in the Laboratory showed that cold treatment at 0° to 10°C temperature (over night) appears to be the most effective in all respects in all the three varieties. However, varieties K8 and K28 showed very poor performance when compared with that of Local. Highest germination % was found in variety Local. Variety K8 seems to be highly sensitive and K28 occupies intermediate position. The conditions in field and laboratory influences differently, the germination and seedling growth processes. Varietal difference does exhist even in the ideal laboratory

conditions. Performance of seedling in all the three varieties is always better in the field conditions; which indicates that soil is the best medium for germination and developmental of plants.

Effect of Post treatments :

Seeds were germinated in the solution of salts like $CaCl_2$, KCl, NaCl, $Na_2CO_3$ and $Na_2SO_4$; some growth regulators thiourea, ascorbic acid and pblyethylene glycol at different concentrations. It was found that all the salts tried delay germination in Local variety. All the salts are inhibitory at higher concentrations. Highest germination % has been found when seeds germination in thio-urea and ascorbic acid Leucaena varieties appeared to be drought sensitive as polyethylene glycol even at low osmotic potential inhibits germination. $CaCl_2$ and NaCl salts are effective to some extent in stimulation of germination in K8 and K28 varieties. Polyethylene glycol solution even at the lowest osmotic potential (-2 to -5 bars) is highly toxic for germination of seeds of all the three varieties of Leucaena. It is evident that except $Na_2SO_4$ all the salts even at the lowest concentration arrest the growth and development of seedlings. Thiourea and ascorbic acid however, stimulate the growth and development of seedlings. High concentrations of all the substances may be toxic. Variety Local shows very very poor performance when germinated in polyethylene glycol. $CaCl_2$ is most effective salt which causes to enhance biomass production even at 50 mM concentration.

$CaCl_2$ also stimulates the uptake of water by growing seedlings. $CaCl_2$, KCl, $Na_2SO_4$ and ascorbic acid are slightly stimulatory for germination while polyethylene glycol strongly inhibits germination in Leucaena variety K8. However NaCl and KCl favour growth and development of the seedlings. KCl and NaCl at the highest concentrations are highly toxic. $CaCl_2$ and ascorbic acid increases the fresh weight and water content of germinating seeds of Leucaena variety K8. In variety K28, $CaCl_2$ and NaCl salts at concentrations 50 to 100 mM stimulate the process of germination. KCl and thiourea are stimulatory in the biomass production at the high concentrations.

From the present study of effect of post-greatments on germination and growth and development of Leucaena, it can be said that the influence of substances tested differs from the substance and simultanously the response shown by Leucaena seeds varies from variety to variety.

Biochemical changes : The analysis of germinating seeds with respect to carbohydrate levels as influenced by post treatments revealed that though the response shown by the varieties of Leucaena is of the same type where in each case there is degradation of starch and accumulation of soluble sugars, the extent of effects is varying from treatment to treatment and variety to variety.

The salts $CaCl_2$, NaCl and $Na_2SO_4$ seemed to stimulate proline production in the germinating seeds of either one or

other variety of Leucaena. It is found that proline content of seeds of all the varieties germinated in $Na_2CO_3$ solution is the lowest indicating inhibitory effect of salt. It can be suggested that proline produced in the germinating seeds of Leucaena may help, further growth of seedling under stressed conditions.

Crhomatographic analysis with respect to amino acid and sugar composition of germinating seeds prompted us that most of the treatments bring about differential effect both at qualitative as well as quantitative levels. $Na_2CO_3$ treatment appears to be unique which inhibits the production or synthesis of amino acid as well as sugars. It is suggested that the probable reason for increasing the number of amino acids and their concentration in most of the treated seeds may be stimulation of amination and transamination reaction due to treatments.

From the present investigation, it appears, that Leucaena seeds are resistant to number of salts upto 50 to 100 mM concentration. Higher concentrations are, however, toxic. This effect is also reflected in the biochemical aspects of the present study. The response shown by Leucaena to $Na_2CO_3$ treatment is rather interesting. To understand the mechanism(s) under line this phenomenon realy needs further investigations.