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*\* Introduction \**

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## VIII

Trees have different meanings for different people. For our ancestors they were a source of fuel and shelter and sometimes an object of worship. To the people they are a source of pleasant shade in the summer, but in the autumn a nuisance which shed leaves on the earth. When it is realised by man, that trees are giving a lot of <sup>shade</sup> besides fuel and shelter, then the importance of trees was increased very much. Trees provide us timber, fuel, fruits, medicines, edible and non-edible oils etc. The trees are directly and indirectly used by man right from his cradle to bier. In forests, trees are helping in reducing atmospheric temperature, they increase the waterholding capacity of soil, stop the soil erosion and help in receiving maximum rainfalls. Also they provide the best resort to our wild heritage "the wild life".

As the importance of trees increased and human population also increased, more and more pressure was exerted on the plant population. The man started cutting of trees in uncontrolled manner, for his needs. The needs were increased tremendously but no efforts were done by man to cultivate new forest or to protect the remaining forests. It resulted in, creating scarcity of trees and tree products and created barren lands. When he realised the negative effects of this act, he started plantation. Now a days more and more attention is paid towards Agroforestry and Social forestry programmes. Through these programmes, the road sides, barren

## IX

lands, naked hills, mountains and waste lands are brought under the plantation. By considering the topography, average rainfall, soil nature he selected particular tree species. Among these most promising fast growing, and drought resistant tree species are Eucalyptus and Acacia. These tree species are also economically important. Eucalyptus globulus. Labill. There are 600 species of it, till recorded in the world. Eucalyptus species are quickly spread all over the world because of their multifarious uses. Eucalyptus is evergreen fast <sup>growing</sup> tree. It attains 8-50 meter height. It grows well in temperature and hot region. It is widely adapted to the diverse climate, some grows in swamps, barren desert and waste lands. It is grown from its seeds. The seeds are very small, light and many. The leaves are of different shapes and sizes and vary according to species, in length and breadth, ranging from spear shaped to heart shaped. The leaves are gland-dotted containing essential oil. The tree is very important because of its medicinal and insecticidal properties. The flowers are small and produced in clusters with crimson, scarlet, pink, white, yellow orange in color. The tree trunk attains maximum girth within short period. It provides timber, from which best hardwood is obtained in the world. The wood is also used for making paper pulp. From leaves and wood, an essential oil is obtained. In Australia gum is extracted from it. Every Eucalyptus species bear a lignotuber - a

big bulb like structure under the ground. In it reserve foods are stored. It is used <sup>in</sup> the period of stress and for resuming the quick and fast growth after the felling or destruction by devastating fire. Acacia auriculiformis Cunn. There are about 1000 species of Acacia throughout the world. A. auriculiformis is evergreen fast growing perennial tree. It attains 6-20 meter height. Most of the Acacia species are native to Australia. They are spread all over the world from Australia. It can be cultivated in any season. This species is mostly decorative, it produces glowing masses of golden blossom. It does not bear true leaves at all, merely phyllodes are present. The phyllodes are green, flattened thick and leaf like in shape. (For our experiments these phyllodes are used). The phyllodes have thick cutical. This is best adaptation of plant to xeric conditions. This species grow into large tree and live very long. They develop quickly into large trees and produce greenary in gardens, along the roadsides, and in afforested area. The Acacias are grown mainly from seeds. Many of the small Acacia species make useful stock fodder in the times of drought to which they are well adapted. The wood of many species is used as timber, for agricultural equipments and fuel. The wood is also used for making paper pulp.

The foresters are also interested in cultivating some hardy fruit trees, which are well adapted to xeric conditions. They have cultivated some Anona species, from

## XI

which we have selected Anona squamosa species for our investigation by considering its fruit value and increased demands in market.

Anona squamosa Linn. - is small statured deciduous tree or under shrub. It is native to tropical America. This species has spread throughout the world from tropical America. It can grow upto 2-7 meter in height. It is profusely branched right from base to apex. The main stem and branches are full of lenticels. The leaves are distichous, petiolate, ovate oblong or elliptic oblong thin, the base is obtuse or rounded, the apex is obtuse or acuminate. The margins are entire and leafblade with gland-dots. These glands are containing an essential oil, which is insect repellent. This species requires very less amount of water. It can grow on sandy, stony and rocky soils. It thrives best in warm humid climate on loam soils. Now a days this species is strongly recommended by horticulturists for its sweet fruits containing, 80% water, 1% proteins, 18% carbohydrates and Vitamins like B<sub>1</sub>, B<sub>2</sub> and C in their pulp surrounding the seeds. The fruits can fetch an attractive cash from market. From seeds oil is extracted, which is used in insecticides. The old and malformed trees are used for fuel, because the wood is light and soft, and can be easily attacked by termites.

By considering all the beneficial aspects of these trees, we tried to know little bit about their physiological

## XII

processes involved in drought resistance, because most of the herbaceous crop species are constantly tapped by plant physiologists and not more attention is paid towards this aspect of tree plants.

Plant physiology is the branch of Botany dealing with the processes of living plants. Plant physiologists attempt to understand the processes that occur in plants as well as how and why they occur. An understanding of plant physiology is essential in all fields of applied Botany, i.e. Agriculture, Horticulture and Forestry as it provides information on how plants grow and develop, and how they interact with their external environment.

Heredity and environment regulate the internal processes and conditions of the plant, thereby affecting growth and development. The ultimate shape, size, form and degree of complexity of a plant are the result of interactions between its genetic composition and the environment in which it grows. Now it is very well established that growth is the result of physiological processes such as water uptake, photosynthesis, translocation, assimilation, respiration and transpiration. Because of their large size, long lifespan and low ratio of photosynthesis to non-photosynthesizing tissues, trees present a special problem before plant physiologists. Nevertheless, the basic physiological processes are similar in all seed plants, and both genetic

### XIII

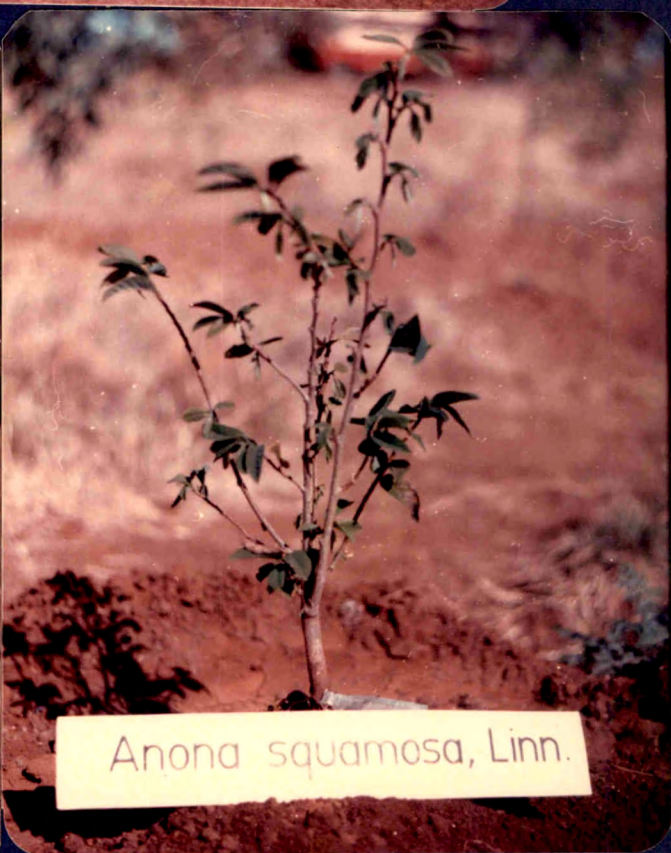
and environmental factors exert a great influence on these processes. Among the various environmental factors which control growth, development and productivity of plants, the most important is perhaps the availability of water. Hence the problem of drought resistance has attracted the attention of many plant physiologists for last several years. There have been continuous attempts to find out physiological criteria, which make the plant, more drought resistant and to employ these criteria in plant breeding programme. One such important biochemical parameter associated with drought resistance, recognised in last 15 years is the capacity of the plant to accumulate a heterocyclic amino acid of glutamate family, L. Proline.

The accumulation of free proline is found to be of great benefit for the plants under stress conditions as well as in post stress recovery period. This amino acid plays, osmotic as well as protective role and it also serves as a source of nitrogen and carbon. The review of literature indicates that, although extensive work has been carried out on the fate of this amino acid in plants. This work is mainly performed on crop species and tree species have been paid very little attention, hence we thought it worthwhile to concentrate mainly on this particular problem in three tree species namely 1) Acacia auriculiformis, 2) Anona squamosa, 3) Eucalyptus globulus.<sup>Fig.1</sup> Thus in the present





*Acacia auriculiformis*, Cunn.



*Anona squamosa*, Linn.



*Eucalyptus globulus*, Labill.

Experimental site  
and plant species

Fig. 1



#### XIV

investigation an attempt is made to study the fate of free proline in leaves of these species, <sup>with</sup> respect to season, environmental factors like rainfall, soil moisture and temperature, and endogenous factors like sugars and mineral elements. An attempt is also made to find out an influence of proline on transpiration process and activity of an important enzyme of nitrogen metabolism, the nitrate reductase.

The entire work is divided into four chapters. In order to understand, the physiological studies in the role of proline in plants, brief resume of current status of literature is covered in Chapter I. An attempt has been made to take a brief review of historical account, chemical properties, biosynthesis, proline accumulation due to various environmental factors etc. The second Chapter deals with the methodology followed for present investigation. It includes spectrophotometry, flame photometry, autoporometry and gravimetry. The Third Chapter deals with results and discussion. The significant findings of present investigation have been depicted and discussed in the light of relevant literature in this chapter. The Fourth Chapter is "Summary and Conclusion", in which brief summary and conclusions are drawn regarding our findings. The literature cited in the thesis is properly represented in 'Bibliography' part of this thesis.

XV

The author is fully aware of the limitations of the present investigation, nevertheless it is certain that, these studies although of preliminary nature can give some basic idea about the process of accumulation of free proline in the three tree species, which make the conventional crop species have got a very long life span and hence complex physiology.

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