CHAPTER - I

INTRODUCTION

High yields with low inputs has been the main objective of Agricultural technology from time's immemorial. The same holds good for mulberry cultivation. This objective attains greater importance for success of sericulture industry, since the silkworm Bombyx mori L. has universal preference for mulberry as food plant.

Sericulture is a very important industry which has a significance in India as it provides subsistence to approximately 6 million people. Sericulture, having an economic consideration augmented with social pertinence, is negotiated in large numbers by the poorer sections of rural community. Therefore, the national objective of providing profitable employment and reducing the dissimilarties between different sections of our society can be attained by the betterment of industries like sericulture.

Today Andhra Pradesh stands second with an occupied area of 1,75,000 acres (upto March, 1991) in the sericulture map of India covering the irrigated tracks of Rayalaseema, Telangana and coastal Andhra.

The Government of Andhra Pradesh has taken a project with a financial outlay of Rs.118.44 crores assisted by the World Bank and coordinated by the Central Silk Board for the overall development of Sericulture Industry during 1989-94.

An additional area of 60,000 acres of Mulberry cultivation is proposed during the 8th plan period, with a target of producing 15,000 tonnes over the present production of 8,000 tonnes of raw silk. In achieving this set target, an urgency has been created in the line of improving conditions of host plant development, since the leaf of mulberry is the raw material for the industry and whose quality changes the quality of cocoons.

Mulberry belongs to the genus Morus of family Moraceae and comprises about 65 species. Morus is the Latin word for mulberry (French: Muries, Italian: Gelso, Japanese:Lewwa). Mulberry is presumed to be a native either of India or china and it is believed to have orginated on the lower slopes of the Himalayas. According to Western historians mulberry culture spread to India from China through Kotan (Tibet) by about 140 B.C.

Mulberry is propagated by asexual means such as stem cuttings and root grafts. Since cross pollination

is the rule rather than an exception, enormous heterozygosity occurs in the plant (Das, 1983). The speed of improvement of this crop is restricted because of its perennial nature and prolonged juvenile period. Although it is sexually fertile it is not possible to propagate commercially through seeds because of high degree of heterozygosity. The drawback of seed propagation is they bring about varied populations. There is a paucity of information about the inheritance pattern of yield contributing characters which is a limiting factor in choosing the parents. Further, propagation through seeds also limited by the ploidy. Among the polyploids of mulberry the triploids have many desirable traits including faster growth rate, superior quality of leaf and resistance to cold and diseases (Ho-Rak Kim et al., 1985). But the production and multiplication of triploids is time consuming (Das, 1983).

In vegetatively propagated plants like mulberry, it will take many years to evolve a desirable clone from economic and commercial point of view by conventional hybridization methods (Rao et al., 1989). Many elite varieties have poor rooting ability, and also propagation through cuttings is resticted to only certain months of the year (Narayan et al., 1989).

One more limitation of good quality and quantity of mulberry is poor tolerance of mulberry varieties to adverse environmental conditions. These include acidity, alkalinity, drought etc.

Considerable progress has recently been made in the development of new techniques such as tissue and cell cultures which is an answer to many unsolved problems in plant breeding, development of homozygous lines, genetic manipulation, production of resistant varieties in plants including mulberry.

Though in 1893 Rechinger reported formation of callus on isolated fragments of stems and roots. The culture of plant tissues on a nutrient medium was first performed by Haberlandt (1902). According to cell theory proposed by Schleiden (1838) and Schwaan (1839), the genetic information necessary for the development of the entire organism is contained in all the living cells. When such cells are released from the developmental controls, they are able to divide and differentiate organs and whole organisms.

Scientists exploited this totipotent nature of the cells and developed various media and cultural conditions for the proliferation of callus, which was described as an unorganised proliferating mass of

tissue. The callus can be again differentiated into whole plants by manipulating the media. Earlier investigators were under the impression that the regenerated plants are true to type. It is not universally the case. On the basis of intensive survey of literature, Larkin and Scrowcroft (1981) came to the conclusion that changes could be induced in the genetic material during culture. These can be described as somaclonal variants which was observed in many plants. Induced changes include most of the economically important characters such as male sterility, resistance to diseases, plant type and increase in yield.

Rapid progress has been made in plant tissue culture and its application in agriculture and horticulture during the past fifty years. The importance of tissue culture technique for clonal propagation of tree species has been amply stressed by Geissubuhler and Skoog (1957) and Haissig (1965). In most of the trees which are not amenable to vegetative multiplication or where the conventional methods are time consuming, it has become imperative to devise methods by which large scale populations of selected trees can be raised (Mehra et al., 1974).

The history of regeneration of complete plants in tree species through tissue culture is only about a

decade old. The immense possibilities offered by application of technique of tissue culture for genetic upgrading of economically important plants have been emphasized by Murashige (1977).

The use of shoot apex cultures and axillary bud cultures to clonal propagation provides an alternative to routine vegetative propagation of woody species. Micropropagation can be described as the invitro multiplication of a plant and it normally involves the hormonal release of dormancy of the axillary buds and their outgrowth. These released axillary buds then be sub-cultured into a similar medium and the whole process repeated. It is clear that by using this technique large numbers of plantlets can be produced in a short time. The advantage of a micropropagation system over conventional seed propagation is that it is possible clonally to multiply plants with a desired genotype (Jones et al., 1982). Micro propagation can speed up the production of planting stocks. This has also formed the basis of creating somaclonal variants and for producing a novel source of genetic variability with potential for improvement.

Tissue and cell cultures are going to play a key role in this new wave of research activity by providing advanced technology such as single cell cultures,

protoplast cultures and somatic hybridization. The unique features to be appreciated include the ability of wide range of plant cells to be cultured indefinetly in fully defined media.

Successful work in fundamental research can stimulate applied studies. Hence, there is every need to develop right cultural conditions, for callus initiation, shoot initiation and root initiation in mulberry which provides an anchor for developing advanced technology.

The present investigtion is having worth scientific utility and aimed:

1. to standardize protocols for the initiation of callus mainly from stem segments and nodal explants of two varieties of mulberry (Kanva-2 and Mysore local),

2. to evaluate the per cent efficiency of callus production in two media (MS and B5), and to study comparatively both the varieties in the two media,

3. to evaluate different concentrations of 2,4-D in two media for high per cent initiation of callus,

4. to develop protocols for micropropagation of Mulberry (Kanva-2 and Mysore local) through axillary bud

cultures,

5. to test the rooting ability in IAA, NAA and 2,4-D,

6. to get complete plants and these would be transferred to pots successfully and to acclimatize the plants to natural field conditions.