Introduction
The west has made a phenomenal progress in Science and technology because the Greek Philosophers theorised and in the later period experimentation to support the theoretical concepts began. In brief, experimental science took birth in the west and hence that became the basis for the progress. The great mathematicians and thinker Gallilio experimented the gravitational effect on a falling object by dropping the things from the leaning tower of Pisa, which is exemplary in history of science and eventually he proved the concept. Nonetheless, there were great mathematicians and thinkers all over India. The Astrophysics and Astronomy developed equally well vis-a-vis in the Greece. However their postulations were not backed by experimentation. The mathematical science thus can be considered as a mother of all other branches of science perhaps including Biological Sciences (!), for there is a logic in it. We may say here that next to Mathematics, Physics and then Chemistry, which developed in the order, and hence today biology has progressed. If we take the old biology textbook written sometimes in the first or second decade of this century or even upto 1940, we find that the description of a cell is something which we can not imagine and take it as a very simple entity. Although the biologists in the 18th century did not have in their hands those powerful tools of analysis or optical mirror surface required for observations of a cell, their logical thinking and contemplation still makes a basis for present day description of a cell insofar as its functional aspect is concerned. In other words Scheldtin and Schwanns postulated life processes begin with a cell.
This great thinking entails the very birth of the great biological tenet of present day experimental science 'The tissue culture'. Lot of water has flown under the bridge before we could achieve successful regeneration of a plant under artificial conditions from one or a few meristematic cells. The pioneer in this field is the great anatomist Haberlandt, in 1902, was inspired to do experimentation to regenerate a plant from meristematic region. This needed many more discoveries and inventions and birth of consciousness or understanding of septic and aseptic conditions. Nonetheless, Haberlandt can be aptly regarded as the father of this tenet, Tissue Culture. It was his experiment to grow a plant from the meristems under artificial conditions, which can be regarded as a turning point from the factual study of tissue differentiation and development in plant to isolating and culturing it under artificial conditions. This experiment of Haberlandt, of course, did not meet with success because of the poor choice of the material, inadequate knowledge of nutrient requirement of growing plant and lack of knowledge about aseptic condition. In his write-up he has made the remark, I quote:

"At any rate the method of cultivating isolated plant cell in nutrient solution should make possible the experimental study of many important problems from a new point of view". (c.f. Maheshwari, P. 1961).

However the animal scientists were ahead of time and only after a decade of Haberlandt's work, Aelixis Karel (1912) together with Burrows developed a
technique to culture animal cells at ease using embryo juice as a growth promoting nutrient for animal tissue. More than two decades elapsed before Haberlandt's students Kotte (1922) and Robbins (1922) achieved isolation of roots from germinated seeds under aseptic conditions and culturing on artificial medium. This reflected that it is the lack of knowledge about the basic physiological mechanism of growth of plant tissue, their nutritional requirement of growth promoters, besides maintenance of sterile conditions, which was limiting factor for development of this great experimental tenet of Science in those days.

It was in the second decade of the century that the discovery of auxins as a plant growth hormone was made from human urine and its structural and functional role was made by Went and Thimann (1937). This has been the foundation of physiological mechanism of growth in plants. Taking an inkling from the successful culturing of animal tissue Czech (1926) and Prat (1927) and many others made an effort to grow excised plant tissues of plant extracts but met with no success.

The important development in the methods of plant tissue culture began with the work of the two great scientists, White in U.S.A. and Gautherhert in France. The success of the workers depended upon the choice of the media growing for plant tissue and eventually achieving the goal. Therefore while looking back towards the frontiers of knowledge and development of methodology in tissue culture, it can be regarded that they have laid the
foundations in culturing excised plant tissues under in-vitro conditions. White (1931, 1932, 1932 a, 1933 a, b) carefully examined the work of previous workers which yielded negative results and tried to overcome the limitations or constraints in the progress. His work which can be regarded as turning point in the discovery is that, the excised tomato root could be successfully grown under in-vitro indefinitely by transferring and successfully growing those root tips in fresh nutrient media. His sustained work for a period of more than 20 years opened the vistas of methodology in tissue culture and provided a sound knowledge about the nutrient media required for plant growth (White, 1939).

Simultaneously but independently Gautheret (1932) started his work on in-vitro culturing of plant tissues in France. Besides root tips he also tried to culture cambial tissue of arborescent plants. His extensive work with cambium and stem parenchyma, roots and tubers besides his work with other co-workers on inorganic, carbohydrate and nutrient requirement of plant under culture conditions and the effect of auxins, vitamins, more importantly, coconut milk on growth of normal and habituated tissue, has enriched the knowledge and gave the direction to the tenet of tissue culture in plants (Heller, 1953; Goris, 1954; Kulesha, 1950, 1954; Dhuhamet, 1955, 1957). Therefore, the contribution of Gautheret and his co-workers in plant tissue culture especially in using active growth substance such as auxins and vitamins makes the milestone in the progress of the knowledge.
More importantly, basic studies on nutrition and morphogenesis in plant, in general, plant tissue culture in particular, made headway during 1940-1978, with a greater resurgence of interest. In the early 1950s some fundamental studies were undertaken. White and Braun (1942) initiated experiments on crown gall and tumor formation in plants, especially in tobacco plants, which gave essential information on the requirement of auxins in the culture medium, vitamin, thymine hydrochloride, cystine hydrochloride.

The most significant event leading to the advancement in the subsequent decade was the discovery of nutritional quality of liquid endosperm, extracted from coconut. Following the success of Van-Overbaeek et al. (1941) with a culture of isolated Datura embryos on a medium enriched with the combination of coconut milk, many workers adapted this natural plant extract. The combination of coconut milk and 2, 4-D had a remarkable effect on proliferation of cultured carrot and potato tissues (Caplin and Steward, 1948; Steward and Caplin, 1951, 1952).

Steward's group at Cornell University made numerous contributions in developing techniques, nutritional requirements, qualitative analysis of culture growth and morphogenesis. In fact it is this school with the successful regeneration of carrot plantlets from the cultured secondary phloem cells of tap root demonstrated the totipotency of the plant (Steward, 1958). Approximately at the same time, Reinert (1959) also worked on carrot and demonstrated totipotency phenomenon.
Another important contribution to the progress of tissue culture comes by the landmarking discovery of cytokinins by Skoog (1940) at the University of Wisconsin. Although coconut milk or yeast extract plus IAA promoted cell division till Skoog and Tsui (1948) Sterling (1950) clearly showed the potent cell division factor cytokinin to degrade DNA, cytokinin was not known. Later it was isolated and purified. At later dates (Skoog, 1958) the related analogue 6-benzyl aminopurine were synthesised and showed to stimulate cell division in cultured tissues. The generic term cytokinin was given to this group of 6 substituted aminopurine derivatives. Soon it was discovered that Zeatin, Isopentyl Adenine are naturally occurring plant hormones.

Street (1977 a, 1977b) by his sustained work in England showed the nutritional requirements under culture conditions. It is he who defined the term tissue culture as tissue culture can be applied to any multicellular culture growing on solid medium or attached to substratum and matured with a liquid medium that consists of many cells in the protoplasmic continuity. He showed that the culture of explants consisted of one or more tissue resulted in a callus which has no structural counterpart with any tissue of the normal plant body.

Skoog and Miller (1956) advanced the hypothesis that shoot and root initiation in cultured callus can be regulated by varying the ratio of auxins and cytokinins in the medium. This may be considered as a landmark in the technique of micropropagation. Muir (1953), Hildbrandt and Ricker (1954) showed that callus fragment transferred to liquid medium aerated on a shaker.
gave a suspension of single callus and cell aggregates that could be obtained by
subculture. Stewards et al. (1966) concentrating the study on carrot suspension
culture have pioneered the development of various procedures for the culture of
cell suspensions which has a great significance in today's context of tapping
secondary metabolites by immobilizing the cells or through bioreactors or
alternatively making them to differentiation to embryoides which makes the
basis for the gene transfer.

During the 1960s it was shown that cultured pollens and
microsporogenous tissue of anthers have the potential to produce vast number of
haploid embryos (Guha and Maheshwari, 1964, 1967; Bourgin abd Nitsch,
1967). The later work of Nicotiana and Datura with doubling the chromosome
number in isogenic cultured microspores to resulted in to diploid plants within a
period of five months (Nitsch, 1974, 1977).

Another important development in 1960s was isolation and culture of
protoplast (Cocking, 1960). This method involves enzymatic digestion of cell
wall using purified preparations of cellulase and pectinase. The protoplast so
raised subsequently could be used for various purposes like cellular
hybridization by protoplast fusion, gene transfer, culturing the protoplast to
regenerate the new cell wall and obtain cell colonies and eventually used for
production of cytoplasmic hybrids or heteroplats where foreign organelles could
be introduced.
Today plant tissue culture techniques have been widely used for propagation of plants at commercial scale or by various means (referred above) using various explant sources for transgenic technique or isolation of mutants, isolation of homozygous line, tapping of secondary metabolites and by large for the purpose of plant genetic resources, conservation or maintenance of biodiversity.

In the present work the effort is mainly made to develop protocols of micropropagation by various means in the genus *Gloriosa* which has commercial importance from the point of view of obtaining secondary metabolites such as colchicine, gloriosine etc. As the plant propagates by two means one by seeds and another by tubers and the seeds have very poor germination rate, the rate of propagation in the nature is very low. Moreover, seed being the main source of colchicine, it is exploited for the said purpose. The commonly and widely growing *Gloriosa* species all along the Western Ghats is *Gloriosa superba* L., which is the target of exploitation for the said chemical principles. Besides this there are several other species, which have confined to Himalayan Ranges. Nonetheless, they are also sources of colchicine. However *Gloriosa lutea* Hort., which is a diploid species and grows only in Himalayan ranges, has short stature and high fruit bearing.

In the present investigation therefore, the work is mainly concentrated on following aspects:

Micropropagation
Somatic Embryogenesis

Embryo and Organ Culture

Interspecific Hybridization and Embryo rescuing

Callus culture and secondary metabolites.