Introduction
Rheumatoid Arthritis is an inflammatory disease that causes pain, swelling, stiffness and loss of function in joints. Rheumatoid arthritis is a systemic disease that affects the entire body (NIH, 2003). Rheumatoid arthritis is not fatal but complications of the disease may reduce the survival by a few years in some individuals (Harvey, 2002).

Rheumatoid arthritis (RA) is an autoimmune disease that causes chronic inflammation of the joints. Autoimmune diseases are illness, which occur when the body tissues are mistakenly attacked by its own immune system. The immune system is a complex organization of cells and antibodies designed normally to "Seek and destroy" invaders of the body, particularly in infections. Patients with this disease have antibodies in their blood, which target their own body tissues where they can be associated with inflammation. Because it can affect multiple other organs of the body, RA is referred to as a systemic illness & is sometimes called Rheumatoid disease (William, 2004).

A collection of immune system cells are molecules, at a target is broadly referred to as inflammation (Mishra, 2004). The inflammed joints lining the synovium layer invade and damage bone and cartilage. Inflammed cells release enzymes that may digest bone and cartilage. The joint involved looses its shape and alignment resulting in pain and loss of movement. The morphological changes of RA are divisible into joint lesions, which dominate clinical expression of the disease, and other (Mellors, 2001)

Rheumatoid arthritis is a common rheumatic disease, affecting more than two million people worldwide. The disease is three times more common in women as in men. It affects people of all races equally. The disease can begin at any age, but most often starts after the age of forty and before sixty (Mednet.com, 2004).
Adjuvant induced arthritis, rat model resembling Rheumatoid arthritis in humans, induced by heat killed cells of *Mycobacterium tuberculosis*, mimics the later immunological and biochemical features where self-antigens are recognized as foreign. During last 30 years immunology has witnessed an explosion of knowledge and experimental skills that has expanded our view of the immune system in an impressive way (Devasagayam *et al.*, 2002).

The modulation of immune response by using medicinal plant and its products as a possible therapeutic measure has become a subject of active scientific investigation. The basic concept has however existed in ancient Vedic scripture, the Ayurveda and has been practiced in India, thousands of years ago probably represented the first record of scientific medicine in the history of the world (Upadhadya, 1999).

Indian medicinal plants are rich source of substances that are claimed to induce paraimmune (Agarwal and Singh, 1999). Immune model after using Rasayana drug could provide an alternative to conventional chemotherapy. Certain plants are known to have immuno modulatory properties are *Acontinum heterophyllum*, *Aloevera* and *Glycyrrhiza glabra* (Thatte *et al.*, 1997).

The potential importance of medicinal plants has been internationally recognized. The WHO initiated programmes world wide to increase the medicinal self-sufficiency of developing countries and to exploit those aspects of traditional medicine that provides safe and effective remedies (Sharma, 2001).

Drugs of plant origin occupy an important position in different pharmacopoeias. Plant derived medicines have been part of traditional health care in the most parts of the world for thousands of years (Polombo *et al.*, 2001).

More than 80% of the population, in developing countries depends plants for their medicinal needs. In india medicinal plants are widely used by all sections of people (John *et al.*, 2002).
Glycyrrhiza glabra, is one of the most important medicinal plant is known to have potent immuno modulatory activity. It belongs to the family leguminaceae. It cures the inflammation and liver damage. Rhizome is used as the medicinal part of the plant (Simonmillis, 2000)

It was one of the most widely known medicinal plant in ancient history and records of its use include Assyrian tablets of around 2000 B.C and Chinese Kampoo and Ayurvedic traditions. Dioscorides gave the plant its botanical name (greek glukos = sweet, riza = root). Its 13th century English name was lycorys later called as Glycyrrhiza glabra - liquorice has long been used for both culinary and medical purposes. It posses antiinflammatory antiviral, antiasthmatic and hepato protective properties (Bradley, 1992)

Spontaneous oxidation of lipid molecules in membrane by oxygen at room temperature is termed as lipid peroxidation. It is a free radical chain reaction. Removal of a hydrogen atom homolytically from a methylene carbon of unsaturated fatty acid (RH) can initiate lipid peroixidation (Anjali et ah, 2001)

A normal attribute of aerobic life is structural damage of number of compounds proteins, Carbohydrates and lipids by oxidation. The oxidative damage caused by ROS is called oxidative stress.

Considerable evidence implicates reactive oxygen species (ROS) as mediators of inflammation and tissue destruction in inflammatory disorders such as Rheumatioid arthritis and adjuvant induced Arthritis (AIA) (Santos et al., 2003).

Oxidative stress is a state of imbalance between generation of reactive oxygen species (ROS) like hydroxyl and super oxide radicals and the level of antioxidant defense system. The endogenous antioxidant defense includes enzymatic (SOD, Catalase and Peroxidase etc.,) and non-enzymatic systems. (Vit C, Vit A, Vit E and GSH etc.,) (Karthikeyan et al., 2003).
Antioxidants are capable of either reducing ROS or preventing their formation, form a powerful reducing buffer which affects the ability of the cell to counteract the action of oxygen metabolites (Gutteridge, 1999).

Aerobic life is characterised by continuous Production of oxidants balanced by equivalent synthesis of antioxidants. The improper balance between ROS production and antioxidant defense results in oxidative stress, which degenerates the cellular functions leading to various pathological conditions. ROS have been implicated in the pathogenesis of a number of diseases (Lee et al., 2001.)

In arthritis, production of ROS and other inflammatory mediators are believed to induce damage that occurs in inflammed joints. The antioxidants play a vital defense mechanism in radical induced arthritis. The antioxidants have antiinflammatory, antiarthrogenic and anticarcinogenic properties (Halliwell et al., 1993).

Large-scale production of elite plants in vitro will be advantageous for conservation of germplasm and for extraction of secondary compounds for commercial use (Manjula et al., 2000).

Mass multiplication by tissue culture is the best way of propagation of slow growing exotic plants with variety of medicinal uses. Plant derived medicines have been part of traditional health care in most parts of the world for thousands of year (Polombo et al., 2001).

Plant produces a broad variety of chemical compounds that have large economical importance. Production by plant cell cultures is economically feasible for certain compounds, provided that cell clusters do produce them. Plant tissue culture play an additional important role during the development of new plant derived compounds as a drug. Plant cells may provide the necessary amounts of Secondary compounds when an agri (horti) cultural production is not yet available.
Thus for the biotechnological production of complex natural products, plant tissue culture seems to be most interesting alternative (Verpoorte et al., 1999).

Plants produce diverse array of organic compounds that appear to have no direct function in their growth and development. These substances are known as secondary metabolites. It is produced for defense and survival of the plant in the ecosystem (Oomahd, 2000). Secondary metabolites are sought after because they are known to exhibit numerous biological activities that promotes health effects.

Phytochemistry is rapidly expanding area with new techniques for the analysis of organic plant components (Harborne, 1993). In order to discover new bioactive compounds, extracts are simultaneously evaluated by chemical screening (Wink, 1999).

Modern methods of extraction are based on chemical polarity and solubility. Thus an aqueous extract / organic extract might be prepared and further analysis required clean up and purification followed by bioseparation of compounds within a fraction by Chromatographic methods. But final analysis by Mass Spectroscopy or Nuclear Magnetic Resonance of the selected sample is necessary in order to unambiguously identify the compound of interest (Kaufmann, 1999).

For many years, the adaptive, significance of most plant secondary metabolites was pioneered in 19th and early 20th centuries, because of their importance in medicine, agriculture and industry. Many secondary metabolites have been suggested to have important ecological functions. These exhibits numerous biological activities and as a consequence, of these applications the world markets exceeds 10 billion US dollars annually (Mashelkar et al., 2004).

Pharmacological value of plant secondary metabolites is increasing due to constant discoveries of their potential role in health care and lead chemicals for new drug development (Oomahd, 2000)
Objectives of the study

The present study is focused with the following main objectives to assess the medicinal properties indulged in *Glycyrrhiza glabra* in order to validate its effect in curing rheumatoid arthritis.

➢ Determination of antiinflammatory, hepatoprotective and antioxidant effect of *Glycyrrhiza glabra* in FCA induced animal models

➢ Phytochemical characterization of *Glycyrrhiza glabra*

➢ Isolation and purification of secondary metabolites by Column chromatography, TLC

➢ Characterisation of *Glycyrrhiza glabra* by NMR and GC-MS

➢ Callus induction in *Glycyrrhiza glabra*

➢ Optimization of callus induction using growth regulators namely IAA, 2,4-D, Kinetin, NAA and regeneration of *Glycyrrhiza glabra*. 