Introduction
Plants are natural reservoir of medicinal agents almost free from side effects normally caused by chemicals (Johnson, 2002). Medicinal plants and derived medicines are widely used in traditional culture systems all over the world and they are becoming increasingly popular in modern society as natural alternatives to synthetic chemicals. In last few decades, there has been an exponential growth in the field of herbal medicine and getting popularized in developing and developed countries owing to its natural origin and lesser ill effects. It is documented that 80% of the world population has faith in traditional medicine, particularly plant drugs for their primary health care (Venkatesan and Karrunakaran, 2010; Dubey et al., 2004). Plants used for traditional medicine systems contain a wide range of substances that can be used to treat chronic, metabolic as well as infectious diseases. Recent trend, however, shows that the discovery rate of active chemical entities is declining (Lam, 2007). Natural products of higher plants may give a new source of antimicrobial and immunomodulatory agents with possibly novel mechanisms of action. Now a days due to the indiscriminate use of antibiotics in treating infectious diseases microbes have developed multiple drug resistance. (Davis, 1994; Service, 1995). In addition to this problem, antibiotics are sometimes associated with adverse effects such as hypersensitivity, immune suppression and allergic reactions. Therefore, there is a need to develop alternative antimicrobial drugs from medicinal plants (Clark, 1996; Cordell, 2000).

Though India is a goldmine of well recorded and traditionally well practiced knowledge of herbal medicine. Nature is bestowed with a very rich botanical wealth and large number of diverse type of plants grows in different parts of the country. India is rich in three levels of biodiversity, namely species diversity, genetic diversity and habitat diversity (Singh and Jain,
Over 7500 plants in India that represent about 75% of the medicinal needs of the one-third of the world’s countries are used as traditional, folk medicines. Out of these, the real medicinal value of over 4000 plants is either little or unknown to the mainstream population (Rajshekharan, 2002; Kumar et al., 2011). The major hindrance in the use of herbal medicines in modern medical practices is the lack of scientific and clinical data that fails to give scientific answer regarding the process of their functions and mode of mechanism in host defense system. Similarly, it is not clear, how they treat metabolically disordered human beings and animals and how they regulate bimolecules (cytokines and chemokines) for the safe guard of host body. However, in the recent years, researches on medicinal plants have attracted a lot of attention of researchers globally and scientific evidences have been accumulated to demonstrate the promising potential of medicinal plants in the treatment of various infectious and non infectious diseases of humans and animals (Hamil et al., 2003; Motsei et al., 2003).

It has now been recognized that modulation of cytokine secretion may offer a novel approach in the treatment of variety of diseases and one strategy in the modulation of cytokine expression may be through the use of herbal medicines. A class of herbal medicines known as immunomodulators alters the activity of immune functions through the dynamic regulation of informational molecules such as cytokines and interleukins (Spelman et al., 2006). Immunomodulators regulate the specific or non specific responses as per demand of the host defense system against the microbial pathogens and foreign agents such as allergens etc. Immunomodulators also work to heighten humoral and cellular response by either enhancing cytokine secretions or by directly stimulating B or T lymphocytes. In clinical medicines, immunomodulators are used to treat patients suffering from AIDS, auto immune diseases and to prevent graft rejection (Zhang et al., 1995; Tan and Vanitha, 2004). Modulation of immune functions by using medicinal plants and their products as a possible therapeutic measure (Varshney, 2011). It is tempting to speculate that the restorative and rejuvenating power of herbal remedies might be due to their action on the
immune system by influencing the secretion of biomolecules and some of the medicinal plants are believed to enhance the natural resistance of the body. Literature surveyed reveals the insufficient data regarding the immunomodulatory activity of *C. fistula*, a member of leguminosae family. *Cassia fistula*, a semi-wild Indian herbarium also known as Golden Shower, is distributed in various Asian countries, Mauritius, South Africa, Mexico, China, West Indies, East Africa and Brazil etc. It is as an ornamental tree for its beautiful branches of yellow flowers, as recognized by the British pharmacopoeia (Mukhopadhya *et al.*, 1998). *C. fistula* has been used in the treatment of various ailments in ancient Indian system, dating back to *Sushruta and Charaka Samhita*. Both the leaves and pods of *C. fistula* have been widely used in traditional medicine as strong laxatives suitable for children and pregnant women and it is purgative due to the wax aloin and a tonic and has been reported to treat many other intestinal disorders like healing ulcers (Kirtikar and Basu, 1975). In Indian literature, this plant has been described to be useful against rheumatism, skin diseases, liver troubles, haematemesis, puritus, leucoderma and diabetes (Asolkar *et al.*, 1992). This plant is widely used by tribal people to treat various ailments including ringworm and other fungal skin infections (Rajan *et al.*, 2001). It is used by Malailis tribe in India use this plant to treat nasal infection (Perumal *et al.*, 1998). The whole plant of *C. fistula* is used to treat diarrhea; seeds are used to treat skin diseases; flower and fruits are used to treat skin diseases, fever, abdominal pain and leprosy. *C. fistula* also exhibited significant antimicrobial activity and showed properties that support-folkloric use in the treatment of some diseases as abroad-spectrum antimicrobial agents. There are reports indicating its antimicrobial activity against wide spectrum of bacteria namely *E. coli*, *Bacillus cereus var mycoides*, *Bacillus subtilis*, *Mycobacterium smegmatis*, *Klebsiella aerogenes*, *Pseudomonas aerogenes* and *Proteus vulgaris* (Abbas *et al.*, 2004). Besides it, high antioxidant activity of *C. fistula* may be contributed to its high phenolic and flavonoids contents. Antioxidant activities of the aqueous and methanolic extracts exhibited significant antioxidant activity in DPPH, Nitric oxide and hydroxyl radical
induced in vitro assay methods (Raju et al., 2005). Anti-inflammatory and antipyretic activities of ethanolic leaf extracts have been reported (Gobianand et al., 2010). C. fistula has a significant role in hepatoprotective activity (Bhakta et al., 1999).

Though Cassia fistula is well anchored medicinal plant in its traditional uses and has now found wide spread acceptance across the world, yet in the present scenario, its medicinal potential in form of immunomodulation, biomolecules induction and antimicrobial mechanism needs scientific validation. Hence, keeping this in view, this study has been undertaken with the following objectives.

1. Effect of hot aqueous extracts of pods and leaves of Cassia fistula on blood (Hematological and Biochemical)
2. Effect of hot aqueous extracts of pods and leaves of Cassia fistula of humoral and cell mediated immune response.
3. Effect of hot aqueous extracts of pods and leaves of Cassia fistula on splenocytes proliferation and cytokine induction (IFN γ, IL-10) using albino rat as an experimental model.
4. In vitro antibacterial effect of extracts of pods and leaves of Cassia fistula against Gram positive and Gram negative bacteria.
5. In vitro antifungal effect of extracts of pods and leaves of Cassia fistula against Candida albicans.
6. In vitro antiviral effect of hot aqueous extracts of pods and leaves of Cassia fistula on IBR virus using MDBK cell line.
Photo: Cassia fistula
Photo: Pods and Leaves of *Cassia fistula*