INTRODUCTION
The word “Population” comes from a Latin word “Populus”, meaning “Peopling”. Population means the number of people inhabiting a given place at a given time. Recurring diseases and intermittent wars had held the world population in check. In 18th century, the population of the world stood at a billion (1830 AD). During the next century, population increased by another billion to reach the two billion mark by 1930 AD. There after, population multiplied and added another billion within the next 30 years, and the next billion in just 15 years to reach the four billion mark by 1975 AD (Graph 1). This sudden jump showed signs of geometrical increase bringing to mind the prophesy of the English economist Thomas Robert Malthus, back in 1798 AD, that uncontrolled increase in population would result in an increase of sickness and starvation. The increase in population was not only uncontrolled, but it was a sudden explosion. This population explosion resulted in problems of feeding, clothing, sheltering and health care of the ever increasing population. It was imperative that this population explosion had to be controlled or slowed down. The problem of population explosion was more severe in developing countries, with China and India contributing about half of this uncontrolled increase in population.

Today, the world’s population stands at approximately 6.7 billion and is rapidly increasing. India’s present population stands at 1.2 billion (http://www.esa.un.org/unpp). If the population increase is not controlled or checked, it will lead to several problems. The solution to
this predicament is population control. India opted for family planning to control the increase in population. Various methods of contraception were used for fertility control.

Contraception literally means prevention of conception, but generally it is taken to mean the prevention of pregnancy (Absar et al., 2006). In 1952, India was the first country to launch a national programme emphasizing family planning. However, fifty years later, this has not prevented the population touching the one billion mark. It is obvious that, despite good intentions and concerted efforts, India has not been successful in controlling its population growth.

There are a variety of methods available and are in use for female contraception (Bajaj, 1999). In contrast, except for the barrier method and vasectomy, there are no methods available for male contraception. It should be noted that although 89% of the people favour the use of contraceptives, only 45% account for actual users. Thus more than 50% of the people are yet to be covered within the available methods (Roy, 2001).

There is a global need to support individuals in family planning due to the increasing growth rate of the world’s population with its negative impact on environment, economic growth and poverty in underdeveloped countries.

The 1994 International Conference on Population and Development (ICPD) called for the development of reversible male contraceptives to expand the options for fertility regulation. The efficacy, convenience and safety of the existing regiments for female contraception have set the bar high for researchers. Male contraceptives are required to be as effective and safe as female contraceptives with a fast onset of infertility and complete restoration of fertility after withdrawal (Rhoden et al., 2004), and should be free from negative effects on the offspring (Rossow, 2002). They should also be affordable, non-obstructive and convenient.
Various processes in reproductive physiology may serve as targets for male contraception, including testicular production of spermatozoa, their maturation and transport within the testis and epididymis, and their passage to and interaction with female germ cells.

Homage to Gregory Pincus (Hechter, 1968) points out that every scientist changes the world. It is now up to you, up to us and each member of the international scientific community to act with vigour and determination. Today 6 billion fellow men and women pin their faith on the proven ability of scientists to change the world and improve the quality of life for all of them. Never in history had the international scientific community faced such a major challenge.

To meet this challenge, the scientists are presently engaged in a search for safe, acceptable, effective, easily administrable, cheap and reversible contraceptive agents from the extracts of plants that are commonly grown in India and elsewhere. One approach being pursued in the present study is to identify new fertility regulating agents and the search for their presence in natural sources.

The population explosion has thrown a challenge world over to change the outlook, attitude and behavior of individuals, families and nations towards life. In the history of man, never before has his very existence been threatened so dangerously by the very force of numbers which he had all along thought as an insurance against the deadly punishment of wars, epidemics, natural disasters and pestilences. But since the advent of modern scientific achievements, death rate has been considerably checked but the birth rate continues to be high. About 87 crore people of the world population do not have enough to eat, while 3500 new mouths are added to world population every twenty minutes. This has severely upset the phenomenal increase in the production of necessities of life. The pace of population growth is faster than that of increase in production of commodities. In India, concern for the number of children each family had and
measures to control births received attention centuries ago. Many methods of preventing conception are referred to in the works of the ancient writers. They all are not magical; some consist of the use of herbal concoctions, tampons and external applications, including the use of salt solution (Kirtikar and Basu, 1935, Chopra et al., 1965, Nadkarni and Nadakarni, 1954, Chaudhary et al., 1966).

India is the first country to adopt a determined population control program. The Government of India started its policy of family planning as early as 1952. But one of the states, Mysore, the old princely state and a part of the present state of Karnataka, started family planning programme nearly 60 years ago. The Government of India followed the policy of appeasement and offered a number of incentives to people who underwent sterilization as a means of birth control (Sarkar, 1996).

Advancements in medicine and public health have led to significant decrease in mortality and an increase in life expectancy. Today, India’s population has increased so much that it is straining its capacity of food supply, energy and raw materials. This population explosion will have negative impact on the economic policies and would eventually create imbalance in the socio-economic infrastructure. Thus the control of human fertility and its limitation are the most important and urgent of all bio-social and medical problems confronting mankind today.

The development of new fertility regulating drugs from medicinal plants is an attractive proposition because from times immemorial humans have relied on plants and their products as sources of drugs and therapeutic agents. Although synthetic drugs are used extensively in modern medicine, many modern medicines are developed through clues obtained from phytochemicals. Moreover, even today, the phytochemicals are important source of medicines. In recent times, the plant products are becoming more popular than the synthetic drugs; it is
mainly attributed to their low toxicity, low side effects and the long standing experience of exposure of these drugs in ethnic medicine systems like Ayurveda.

**Contraceptive Methods:**

Although several effective methods, summarized in Fig. 1, are currently available, none of them is free from some drawback either in the form of side effects or complication in its use (Sarkar, 1996).

**Natural Methods:**

Rhythm method is the use of safe-period for sexual intercourse and the avoidance of sexual intercourse around ovulation period. In a regular 28-day-menstrual-cycle, ovulation occurs on the 14\textsuperscript{th} day, but may also occur any time between the 12\textsuperscript{th} and 16\textsuperscript{th} day. The safe period is therefore calculated as starting from the first day of the menstrual cycle until the 10\textsuperscript{th} day of the cycle and from the 18\textsuperscript{th} to 28\textsuperscript{th} day of the cycle.

**Coitus Interruptus:**

Coitus Interruptus is also called Withdrawal method. It is a very common method, but it is inefficient in preventing majority of the pregnancies.

**Physical Barrier Methods:**

**Female Condom:**

The female condom, made of soft pliable polyurethane prelubricated with a silicone-based substance (dimethicone), is inserted into the vagina before sexual intercourse. An inner ring is used for insertion and holds the condom in place high in the vagina, and an outer ring lies flat
and covers the labia during sexual intercourse. After ejaculation, the female condom retains the seminal fluid, preventing it from coming into contact with the cervix.

**Male Condom:**

Male latex-condoms are effective against both unwanted pregnancy and STD/HIV infection if used properly with every act of intercourse. Male condoms are made of synthetic materials such as polyurethane. They have the potential advantage of maintaining structural integrity for longer duration under a broad range of storage conditions.

**Diaphragm:**

The Diaphragm is a dome-shaped latex device, which when inserted into the vagina, covers the cervix. The current recommendation is to use the Diaphragm in combination with spermicides.

**Cervical Cap:**

Cervical cap is a rubber or plastic cap that fits over the cervix and is held in place by suction produced by the rim of the cap. It is more difficult to insert than the Diaphragm. Attempts to develop more efficient versions of the cap have so far proved disappointing.

**Chemical Methods:**

**Spermicidal Agents:**

The spermicidal agents are surface-active agents which attach themselves to the spermatozoa, inhibit oxygen uptake and kill the sperms. The principal spermicidal agents such as nonoxynol-9 (N-9), octoxynol, menfegol, benzalkonium chloride etc., are used in the preparation of creams, gels, films, foams and foaming tablets. When used on their own, they are less effective than other barrier contraceptives. If a spermicidal agent is chosen, the client should be
advised to use it only in combination with physical barrier method. Neem oil has also been reported to have spermicidal action.

**Intra Uterine Devices (IUDs):**

The IUDs in some way prevent the fertilized eggs from developing into implanted embryo in the uterus. The IUDs are an effective and safe method of contraception. It is a highly acceptable method which is being used by approximately 100 million women world wide. The most widely used copper bearing IUD is the “TCu-380 A” for which the most epidemiological data on safety and effectiveness are available. Other copper devices include TCu 220 C, the multiload Cu 375, Nova-T and Levonorgestrel-releasing IUD.

**Hormonal Contraceptives:**

The development of the oral contraceptive pill in 1951 was one of the most significant milestones in the progress towards women’s improved reproductive health.

**Progesterone-only Pills (POPs):**

These are estrogen free oral contraceptives, containing a low dose of progesterone. They are taken continuously throughout the menstrual cycle without a break between cycles.

**Combined Oral Contraceptive Pills (COCPs):**

Combined oral contraceptive pills contain estrogen- ethinyloestradiol and varying types of progestogens.

**Triphasic Pills:**
Preparations of ethinyloestradiol and levonorgestrel have been recently introduced.

**Mini Pills:**

Mini pills include continuous administration of low dose of progestogens.

**Once-a-Week Pill:**

The latest break through in the science of pills is the introduction of Centchroman (Nityanand *et al*., 1990, Kamboj *et al*., 1992), a nonsteroidal antifertility agent with weak estrogenic and potent antiestrogenic activities. It is approved for use as “once a week pill” in India since 1991. The drug discovered by CDRI, Lucknow, works by disrupting the balance of estrogen and progesterone.

**Injectables:**

Progestosterone-only injectables suppress estradiol production by the ovaries. After the injection of Depot-medroxyprogesterone acetate (DPMA), the estradiol declines usually at midfollicular phase. A dose of 150mg of injection is given once in every three months. Another injectable, Norethisterone enanthate (NET-EN) is given at a dose of 200mg every two months.

Cyclofem/Cyclo-Provera is a combination of 25 mg medroxyprogesterone acetate and 5 mg estradiol cypionate. It is once-a-month injectable contraceptive.

**Implants:**

The Norplant subdermal contraceptive implants are long-acting, reversible, low-dose progesterone-only contraceptives which provides protection for 5 years, the drug levonorgestrel is delivered by means of six silastic capsules placed subdermally. Each capsule contains 36mg of
levonorgestrel and has a diameter of 2.4mm and length of 3.4 cm. The capsules release levonorgestrel at the rate of approximately 35-85µg per 24 h.

**Immuno Contraception:**

1) The β-subunit of human corionic gonadotropin (HCG) evokes specific antibodies and thereby produces temporary sterility.

2) Zona pellucida plays an important role in fertility. The Zona pellucida antibodies can either prevent sperm penetration in the ovum or prevent shedding of Zona after fertilization, so that implantation is impossible.

3) Antibodies to sperm antigens: The enzyme lactate dehydrogenase and acrosin cause immobilization and destruction of sperm.

4) An anti-FSH Vaccine (inhibin) is also under trial.

**Surgical Methods:**

Surgical contraception (sterilization) for both men and women is a popular and well established contraceptive procedure.

**Male Sterilization:**

Vasectomy is a highly effective method of contraception. Vasectomy is a simple and very safe operation in which vas deferens is either occluded or cut so that sperm cannot enter the ejaculate. A widely used modification of standard vasectomy avoids scrotal incertion and the need for stitching the skin. In the no-scalpel technique, the vas deferens is stabilized with a special instrument and a single midline puncture is made in the scrotal skin over the fixed vas
deferens with sharp forceps. This method is more preferred than conventional vasectomy as it has lower rate of complications such as haematoma and infection.

**Female Sterilization:**

The two most widely used surgical techniques for approaching the fallopian tubes are minilaparotomy and laparoscopy. In Minilaparotomy, the fallopian tubes are approached via 2-5 cm abdominal incision and both the tubes are usually occluded by ligation. This is the technique used for postpartum sterilization. Laparoscopy is usually done by an obstetrician/gynecologist in a hospital, with specialized equipment and staff, by laparoscopic application of silastic rings and clips, and bipolar coagulation.

**Some of the side effects of synthetic contraceptives:**

**Cardiovascular Disease:**

Historically, combination of oral contraceptives have been found to be associated with increased risks of myocardial infraction, stroke and other disorders. Whereas overall, oral contraceptives were found to promote the effects of age and other risk factors (Absar et al., 2006).

**Hypertension:**

With the increased risk for myocardial infraction and stroke, older formulations of combination oral contraceptives have been associated with significant elevations of blood pressure as well. The risk of hypertension appears to be much lower when estrogen and progestin doses are lowered (Absar et al., 2006).

**Thrombosis:**
As doses of estrogenic compounds were lowered to less than 50µg, a marked drop in the incidence of fatal and nonfatal pulmonary embolism was noted, thus implying an estrogen dose related effect (Absar et al., 2006).

**Hepatomas:**

Hepatomas may occur in women taking oral contraceptives, the most common of which are focal nodular hyperplasia and liver cell adenoma. Hepatocellular cancer was also felt to be associated with the use of combination oral contraceptives (Absar et al., 2006).

The family planning program has promoted several methods of contraception; but due to serious adverse effects produced by synthetic steroidal contraceptives, attention is now being focused on indigenous plants for possible contraceptives containing estrogen and progesterone effects. The risks caused by the synthetic drugs have triggered the need to develop newer molecules from medicinal plants for use as contraceptives. Hence there is a need for discovering suitable products from indigenous medicinal plants that could be effectively used in the place of synthetic pills.

Wide choice of contraceptive methods are available for women; only limited methods like condom, vasectomy and coitus interruptus are available for men. Thus there is a need to develop more male contraceptive methods.

A successful fertility regulating agent/method for the male should satisfy the following requirements:

- Be safe and produce no side effects on metabolic functions.
- Be effective and should not lead to unwanted pregnancy.
- The effects should be reversible.
- Not affect the libido, accessory gland and seasonal functions.
Maintain circulating levels of androgens at normal levels.

In spite of sustained global research over the past three to four decades towards the development of male contraceptives, many have not reached the stage of marketing for consumer use. This is due to inherent problems encountered in the development of an effective male contraceptive formulation. Unlike in females, where intervention of fertility needs to be directed only against one ovum released every month, inhibition of millions of spermatozoa produced daily leading to sustained azoospermia is difficult to achieve in men. In spite of many difficulties, various funding agencies and scientists around the world are actively involved in devising acceptable male contraceptive regimens as part of the national or international programmes, using different target areas in the male reproductive tract as sites of intervention.

The major target sites for fertility regulations in the male reproductive tract are:

a) Testes, where spermatogenesis and sperm production occur. The use of antispermatogenic compounds which lead to oligospermia, azoospermia or abnormal production of spermatozoa.

b) Epididymis, where spermatozoa acquire progressive motility and fertilizing capacity (sperm maturation). This organ represents an ideal extragonadal site for fertility regulation.

c) Vas deferens is a passage for transport of spermatozoa during ejaculation. Intervention at this site would lead to either azoospermia or inability of spermatozoa to initiate fertilization associated events.