REVIEW OF LITERATURE

Many plants are mentioned in our ancient literature as well as traditional literature and are used by tribals and by rural communities to prevent pregnancies. Although use of many herbal medicines is well documented in our ancient literature but these are not supported by experimental evidences. In last one or two decades interest of scientific community has developed in medicinal plants and there is much advancement in research in this field. Initially scientific work on medicinal plants was done during 1960s, 70s and 80s. Then enthusiasm of the scientific community declined. But after success of some plant products now global interest in plant products has increased.

The work done on Indian Medicinal Plants was compiled in the form of a book by Kartikar and Basu in 1918 and in 1933, for the first time. Delazlo and Hansaw (1954) initiated the interest of the use of plants to induce infertility in male. In 1976 and 1987 Indian Council of Medical Research, New Delhi published two volumes on medicinal plants of India.

Madan studied spermicidal activity of Canscora decusata on human volunteers in 1960. Mann et. al., in 1964 observed the biochemistry of semen and of the male reproductive tract. Antispermatogenic property of leaf extract of Vinca rosea was studied by Joshi and Ambey in 1968 and Chinoy et. al. in 1983.
In 1971, Arora et. al. studied antifertility activity of *Embelia reibes*. Kholkute et. al. (1978) and Purandare et. al. (1979) studied contraceptive activity of an indigenous plant *Embelia ribes* berries. Antifertility effect of *Embelia reibes* in male rats was studied by Agarwal et. al. in 1986. Gupta et. al. (1989) reported anti-spermetogenic effect of *Embelia reibes*, a plant benzoquinone on male albino rats *in vivo* and *in vitro*.

In 1972, Kashinathan et. al studied antifertility activity of *Ocimum sanctum*. Anti-spermatogenic effect of *Ocimum sanctum* was also reported by Setb et. al. in 1981. Khanna et. al. (1986) studied effect of long term feeding of tulsi *Ocimum sanctum* L on reproductive performance of adult albino rats. Ahmed et. al. in 2002 reported reversible anti-fertility effect of benzene extract of *Ocimum sanctum* leaves on sperm parameters and fructose content in rats. Effect of crude aqueous extract of *Ocimum gratissimum* leaves on testicular histology and spermiogram in the male albino rats (Wistar strain) was studied by Olufisayo et. al. in 2008.

Spermicidal activity of *Trigonella forenum-graecum* seeds was first studied by Setty et. al. (1976). Tyagi et. al. (1989) studied effect of acetone extract of *Trigonella forenum-graecum* L. on male reproductive organs of albino rats. Antifertility effect of acetone extract of *Trigonella forenum-graecum* L on testes and epididymis of male albino rats was studied by Tyagi et. al. (1989). Tyagi et. al. (1989) also reported spermicidal activity of aqueous extract of *Trigonella forenum graecum* L. in albino rats. Tyagi
et. al. (1994) also reported antifertility effect of acetone extract of *Trigonella foenum graecum* L. on testes and epididymis of male albino rats. **Bansal et. al. (1997)** studied the antifertility effects of *Trigonella foenum graecum* aqueous extract on male albino rats.

**Setty** and **Kamboj et. al. (1976)** studied the spermicidal potential of saponins from Indian plants. **Setty et. al. (1977)** studied the spermicidal activity of some Indian plants such as- *Albizzia lebbeck, Caltha pallustris, Clerodendrum serratum* and *nothopegia colebrookiana*.

**Pakrashi et. al. (1958)** reported effect of *Malva viscus conzatti* flowers extract on male fertility. In 1977 **Dixit et. al.** showed the effect of *Malva viscus conzatti* flower extract on testicular function of the house rat *Rattus rattus* and male gerbil *Meriones hurrianae*. **Dixit (1977)** and **Joshi et. al. (1981)** studied antifertility activity of *Malva viscus conzatti* in different animal models. Antifertility effect of *Malva viscus conzatti* flower extract on the male albino mice was studied by **Verma et. al. (1980)**. **Joshi et. al. (1981)** studied antifertility effect of chronically administered *Malva viscus conzatti* flower extract on male albino rats. **Chakrabortary et. al. (1991)** studied antifertility effect of chronically administered *Malva viscus conzatti* flower extract on male rats.

**Dixit et. al. in (1978)** worked on effect of *Momordica charantia* L fruit extract on testicular function in dogs. Antifertility activity of *Lygodium*
flexosum was studied by Gaintonde and Mahajan in 1980. Effect of Pueraria tuberose DC on reproductive performance of rats was studied by Chandhoke et. al. (1980). Antifertility effect of common edible Portulaca oleracea on the reproductive organs of male albino mice was studied by Verma et. al. in 1982.


In 1980, Dai and Pan and in 1981, Zhou and Lei reported that long term treatment of gossypol may cause complete atrophy of the seminiferous epithelium in some of the rats, indicating the possibility of irreversibility of fertility. Gossypol caused some adverse side effects such as hypokalaemia and irreversibility of fertility in a few percentage of the volunteers during clinical trials conducted by Liu et. al. (1981), Prasad and Diczfalussy (1982), (1983) and Lee (1983). A major milestone in the development of male antifertility agents was the discovery of gossypol as a potential male fertility regulating agent by Chinese scientists. Xue (1981), Lei (1983) conducted extensive studies on antifertility activity of gossypol. In 1989, Agarwal studied the antifertility effects of optical isomers of gossypol. Effect of gossypol on few testicular enzymes in mature was rats studied by

Atrophy of testicular and epididymal elements by feeding alcoholic extracts of *Portulaca oleracea* and *Protulaca quadrifida* was reported by Verma et. al. in 1981, and 1982. In 1982, antifertility activity of *Allium sativum* was studied by Dixit and Joshi. Rao (1988), reported arrest of spermatogenesis by use of alcoholic extract of *Solanum xanthocarpum*. Sinha et. al. (1986) reported antifertility activity of alcoholic extract of *Syzygium cumini* seeds.

Tygi et. al. (1991), studied antifertility activity of *Canscora decusata* in male albino rats. Purohit et. al. (1990), studied the antifertility efficiency of the plant *Striga lutea* in rats. The antispermatogenic effect of *Vinca rosea* was studied by Murugavel et.al. in 1991. Dhar and Shetty et. al. (1992) studied the post coital antifertility activity of the marine plant, *Achrosticheum auricum* L in rats. Bansal et. al. (1997) studied the effect of *Astracantha longifolia* seeds on the testes of albino rats. Meriggiola et. al. (1997) used progestin–androgen combination regimen for male contraception. Wu et. al. (1999) reported that oral progestogen combined with testosterone worked as a potential male contraceptive.
Chinoy et. al. (1984) studied induction of functional sterility in male albino rats treated with aqueous extract of *Carica papaya* seeds. Antifertility investigation on the crude chloroform extract of *Carica papaya* Linn seeds in male albino rats was conducted by Lohiya et. al. (1992). Antifertility effect of aqueous extract of *Carica papaya* seeds in male rats was studied by Lohiya et. al. in 1994. In 1997, Chinoy et. al. observed reversible effect of aqueous extract of *Carica papaya* seeds on microenvironment and sperm metabolism of cauda epididymis of rats. Lohiya et. al. (1999) studied the reversible contraception with chloroform extract of *Carica papaya* Linn seeds in male rabbits. Lohiya et. al. (2002) also reported that chloroform extract of seeds of *Carica papaya* oral administration induces long term reversible azoospermia in langur monkey. Udoh et. al. (2005) studied hepatotoxicity of the methanol extract of *Carica papaya* seeds in Wistar rats. Studies on antifertility effects of paw paw seeds (*Carica papaya*) on the gonads of male albino rats was studied by Udoh et. al. (2005). Udoh et. al. in 2005 isolated alkaloid extract of *Carica papaya* seeds and tested their activity of reproductive function in male wistar rats. Manivannan et. al. (2009) reported sperm characterstics and ultrastructure of testes of rats after long-term treatment with the methanol sub- fraction of *Carica papaya* seeds.

Antifertility effect of *Piper betle* L extract on ovary and testes of albino rats was reported by Adhikari et. al. (1989). Sarkar et. al. (2000) observed the reversible antifertility effect of *Piper betle* Linn. on Swiss albino male mice. Antifertility efficacy of *Piper betle* Linn. (Petiole) on
female albino rats studied by Sharma et. al. (2007). Mishra et. al. (2009) reported antispermatogenic and antifertility effects of fruits of *Piper nigrum* L. in mice.

In 1990, Dwivedi et. al. observed spermicidal potential of *Sapindus saponin*. Reproductive, haematologic and biochemical profile of male rats treated with aqueous extract of *Spondias mombin* bark was studied by Raji in 2006.

*Azadirachta indica* is another plant, besides gossypol that has been extensively studied for its antifertility potential. Joshi et. al. (1990), observed contraceptive efficiency of *Azadirachta indica* (flower and bark) in male rats. In 1993, Upadhyay et. al. studied antifertility effects of neem (*Azadirachta indica*) oil in male rats by single intravas administration. Kasturi et. al. (1995) reported changes in epididymal structure and function of albino rats treated with *Azadirachta indica* leaves. In 1996, S.S. Rair worked on antifertility activity and other medicinal properties of neem. Joshi et. al. (1996), Prasad et. al. (1997) also observed antifertility activities of different extracts of *Azadirachta indica*. In 1999, Ravindranath studied effect of *Azadirachta indica* leaves on rat spermatozoa. Aladakatti et. al. (1999) reported changes in spermatozoa of rats after treatment with *Azadirachta indica* leaves. Again in 2001, Aladakati et. al. reported changes in sperm parameters induced by *Azadirachta indica* in albino rats. Spermicidal activity of *Azadirachta*
Indica (neem) leaf extract was studied by Khillare et. al. in 2003. Ultrastructural changes in cauda epididymal epithelial cell types of Azadirachta indica leaf treated rats was studied by Ghodesawar et. al. in 2004. In 2005, Mishra et. al. worked on effect of aqueous extract of Azadirachta indica on the reproductive organs in male mice. Deshagan et. al. (2006) studied histology of male reproductive organs after treatment with Iranian botanical Azadirachta indica (neem) seed extract. Spermicidal activity of Azadirachta indica (neem) aqueous leaf extract on male albino rats was worked by Sathiya Raj et. al. in 2010.

Kesman (1990), worked on reversibility effect of LHRH agonists and other antiandrogenic hormones on the testes. Dafau et. al. (1993) used corticotropin releasing factor as an antireproductive hormone of the testes. Maltin et. al. in 1993 studied male antifertility compounds form Tripterygium wilfordii. Bebb et. al. (1996) observed that combined administration of levonorgestrel and testosterone induces more rapid and effective suppression of spermatogenesis than testosterone alone. Anawalt et. al. (1999) also reported that lower dosage of levonorgestrel and testosterone combination effectively suppresses spermatogenesis and circulating gonadotropin levels. Meriggiola et. al. (1997) used progestin androgen combination regimen for male contraception. Raji et. al. in 1997 worked on antifertility activity of Quassia amara in male albino rats. Antispermatic and antiandrogenic activities of Momordica charantia (karela) in albino rats was studied by Naseem et. al. (1998). In 1999 Wu et.
al. reported that oral progestogen combined with testosterone worked as a potential male contraceptive.


In 2000, Akbarasha et. al. reported male antifertility property of andrographolide isolated from Andrographis paniculata in albino rats and studied its effect on the testes and cauda epididymal spermatozoa. Kamboj et. al. (2000) published a review article about herbal medicines. In 2000, Anawalt et. al. showed that desogestrel plus and testosterone effectively suppresses spermatogenesis but also cause modest weight gain and high density lipoprotein suppression.

Decrease in sperm number after treatment of rat with Austroploncopia populena was observed by Mazaro et. al. in 2000. Effect of Terminalia cutappa seeds on sexual behavior and fertility of male rats was studied by Ratnassoriya et. al. (2000). Antifertility studies of the root extract of Barleria prionitis Linn in male albino rats with special reference to testicular cell population dynamics was studied by Gupta et. al. in 2002.
Effect of *Lepiduim meyenti* (maca) roots on spermatogenesis of male rats was studied by Chatterjee et. al. (2001).


Antifertility study of *Colebrooking oppositifalicia* leaf extract on testicular cell population dynamics was studied by Gupta et. al. (2001). Lohiya et. al. (2001) reported prospects of developing a plant based male contraceptive pill in current status in fertility regulation.

2002, Gupta et. al. reported that *Archicarps hetirophyelus* seeds inhibit sexual competence but not fertility of male rats. Verma et. al. (2002) reported effect of *Sarcostemma acidum* stem extract on spermatogenesis in male albino rats. In 2002, Mali et. al. reported antifertility effect of chronically administered *Martynia annua* root extract on male albino rats.

Silveria et. al. (2003) evaluated long-term exposure of *Mikania glomerata* (Sprengel) extract on reproductive organs, sperm production and testosterone level of male Wistar rats. Mishra et. al. (2003), studied response of the reproductive organs to certain plant preparations in the male laboratory mouse. Antifertility effect of Ethanolic extract of *Amalakiyadt churna* in male albino mice was studied by Seetharan et. al. in 2003. Antifertility activity of *Derris brevipes* was studied by Badmi et. al. in 2003. Vijay Kumar et. al. (2003) worked on antifertility activity of various extracts of *Crotalaria juncea* Linn. seeds in male mice.

Manivannan et. al. (2004) studied ultrastructural changes in the testes and epididymis of rats following treatment with the benzene chromatographic fraction of the chloroform extract of the seed of *Carica papaya*. In 2004, Gupta et. al. studied anti-fertility effect of methanolic pod extract of *Albizia lebbeck* in male rats. Antifertility activity of ethanol extract of *Aristolochia tagala* leaf was studied by Balaji et. al. in 2004. Bhatia et. al. (2004) worked on alteration in the functional status of reproductive organs of male albino rats after the oral administration of
decoction and ethanolic extract of *Adiantum incisum*. Antispermagenic and hormonal effects of seed extract of *Crotolaria juncea* Linn. were studied by Kumar et. al. in 2004.

Chattopadhyay et. al. (2005) studied sperm motility inhibiting activity of *Alstonia macrophylla* leaf extract, a plant that is used by tribals as medicine for stomach ache, skin diseases and gastrointestinal troubles. In 2005, Dehghan et. al. studied antifertility effect of Iranian neem seed alcoholic extract on epididymal sperm of mice. In 2005 Gebri et. al. studied the possible mechanisms for the antifertility action of methanolic extract of root of *Rumex studelii*.


In 2006, Anitha et. al. observed impact of feeding ethanolic extract of root bark of *Cananga odorata* (Lam) on reproductive function in male rats. Gupta et. al. (2006) published a list of medicinal plants exhibiting antifertility activity in males. Contraceptive efficacy of *Strychnos*
potatorum seed extract in male albino rats was studied by Gupta et. al. (2006). Kassem et. al. (2006) reported evaluation of the potential antifertility effect of Fenugreek seeds in male and female rabbits. Sandya et. al. (2002) reported impact of feeding ethanolic extract of Achyranthes aspera Linn on reproductive functions in male albino rats. In 2006, Paul et.al. conducted a study for in vitro determination of the contraceptive spermicidal activity of a composite extract of Achyranthes aspera and Stephania hernandifolia on humen semen.

Bhatt et. al. (2007) reported contraceptive evaluation of seed extract of Abrus precatorius (L) in male mice (Mus masculus). Krishnamoorthy et. al. (2007) reported effect of T. chebula fruit extract on lipid peroxidation and antioxidative system of testis of albino rats. Munshi et. al. (2007) studied effect of aqueous extract of Anethum graveolens (L) on male reproductive system of rats.

Reversible changes in the anti-fertility in male albino rats by Aegle marmelos were studied by Chauhan et. al. (2008). Antifertility activity and phytochemical studies of Pergularia daemia leaves in male albino rats was studied by Londonkar et. al. 2008.

Sathiyaraj et. al. (2010) observed antifertility effect of aqueous leaf extract of Aegle marmelos on male albino rats. Kumar et.al. (2011)
isolated and evaluated antifertility activity of total alkaloids from leaves of *Aegle marmelos* in male albino rats.

**Mishra et. al. (2009)** evaluated anti fertility potential of aqueous extract of *Bougainvillea spectabilis* leaves in Swiss albino mice. In 2009, **Savadi et. al.** studied antifertility activity of ethanolic extracts of *Plumbago indica* and *Aerva lonata* on albino rats. Antifertility activity of ethanolic extract of *Allium cepa* Linn in rats was studied by **Thakre et. al. (2009)**. In 2009, **Singh et. al.** worked on evaluation of antifertility potential of *Brahmi* in male mouse.

**Bhatia et. al. (2010)** reported antifertility effects of crude extract of *Adiantum lunulatum* Burm on reproductive organs of male albino rats. Effect of *Tecoma stans* leaves on the reproductive system of male albino rats was studied by **Mathur et. al. (2010)**. A survey of plants having antifertility activity from Western ghat area of Maharashtra state was conducted by **Pokharkar et. al. (2010)**.

**Rao et. al.** in 1989 worked on effects of alcoholic extract of *Terminalia bellirica* fruit extract on male reproductive functions. **Venkatesh et. al. (2002)** made a comparative study of effect of alcoholic extracts of *Sapindus emarginatus, Terminalia bellirica, Cuminum cyminum* and *Allium cepa* on reproductive organs of male albino rats. **Satishgouda et. al.** in 2009 observed contraceptive effect of *Terminalia*
*Terminalia bellirica* (Bark) extract on male albino rats. A study of biochemical parameters of male albino rats treated with alcoholic extract of leaves of *Terminalia bellirica* was conducted by Singh et. al. in 2010. Effect of *Terminalia bellirica* bark extracts on activities of accessory reproductive ducts in male rats was observed by Patil et. al. (2010). In 2010, Sachin et. al. evaluated antifertility activity of *Tabernaemontana divaricata* (Linn) R. Br. leaves in rats. D Cruz et. al. in 2010 worked on effects of plants and plant products on the testes.

In 2011, Chaudhary et. al. studied reversible contraceptive efficacy and conducted safety evaluation of ethanolic extract of *Maytenus emargineta* in male albino rats. Kachroo et. al. (2011), worked on anti-implantation activity of different extracts of the peels of *Citrus medica*.

Antifertility activity of aqueous leaf extract of *Andrographis paniculata* in male albino rats was tested by Sathiya Raj et. al. (2011). Shivabasavaiah et. al. (2011) studied antifertility effects *Madhuca indica* leaves in male Swiss albino rats. In 2011, Shajeela et. al. reported antifertility activity of ethanol extract of *Dioscorea esculenta* (L) schott on male albino mice. Amadi et. al. (2011) worked on male infertility and herbal pharmacologia supplements.

Antifertility activity of *Cryptolepis sanguinolenta* leaf ethanolic extract in male albino rats was studied by Ayodeji et. al. (2012). Priya et. al.
al. Published a work on medicinal plants with potential antifertility activities in 2012 - a review of sixteen years Global population trends and policy options. This is observed by Ezeh et. al. in 2012. *Aegle marmelos* - A review on its medicinal properties is published by Pushpendra et. al. in 2012.