International Journal of Botany Studies
www.botanyjournals.com
ISSN: 2455-541X
Received: 27-05-2021, Accepted: 08-06-2021, Published: 24-06-2021
Volume 6, Issue 3, 2021, Page No. 805-810

Overview of herbal research and testing regarding male fertility deprivation and male contraceptive biomedical research

Nitin Kumar*, Munesh Mani
School of Pharmaceutical Sciences, IFTM University, Moradabad, Uttar Pradesh, India

Abstract
Population growth has created a global paradox, placing significant strain on physical, cultural, and resource extraction. While contraceptive pills have lessened the prevalence of fertility, their severe complications inhibit widespread usage. Because of all these negative effects, current antifertility interventions are not producing satisfactory results; and as consequence, users are searching at alternative and experimental therapies for antifertility effects. Over forty-five thousand flowering plant species are documented in India, and hundreds of these are reported to have medicinal properties. Today, ancient herbal intervention in China, India, South America, and Africa are increasing in popularity as a promising source of potential plant-derived medicines. Our primary aim was to establish the effectiveness and usefulness of herbs commonly used in traditional medicine by (1) considering multiple recorded uses of such plants in traditional medicine and (2) researching medical and pharmacological literature on their therapeutic uses. As a result, research paper highlighted the impact of producing and evolving herbal contraception from wealth of medicinal herbs with antifertility abilities, local expertise, and traditional medicine practitioners' prescriptions (TMPs).

Keywords: contraception, medicinal plants, herbal contraceptives, male contraceptives

Introduction
There has been fierce debate about population increase, so many strategies were used to limit both men and women's total fertility rates, particularly in developing economies [1]. Several researchers cautioned that the earth might come to a point where food supplies would not be able to keep up with population growth; this rapid population growth is already due to a variety of causes, the most significant of which is modern contraceptive usage [2]. As per Bhakta and Das (2018), most effective methods of birth control are sterilization by means of vasectomy in males and tubal ligation in females, intrauterine devices (IUDs) and implantable contraceptives. Numerous hormonal contraceptives consist of oral pills, patches, vaginal rings, and injections. Other effective methods include barriers such as condoms, diaphragms, contraceptive sponge, and cervical caps, in addition to basal body temperature method, rhythm method and other fertility awareness methods [3]. All methods of contraception have benefits and drawbacks, and no approach is medically suitable, sufficient, or appropriate for all partners in all situations. Medicinal plants in India have been screened for contraceptive potential and anti-fertility effects since country has always been concerned about population explosion [4]. Exploration of drugs having anti-fertility activity is the need of current time, and many time plants extracts have been investigated for their anti-fertility effect in animals [5].
According to Bala *et al*. (2014), herbal contraceptives may be categorized into the following:

1. Antifertility drugs: These are the drugs that obstruct the formation of gametes and interfere with the process of fertilization.
2. Anti-ovulatory drugs: These are the antifertility agents that induce infertility by suppressing the ovulation. These drugs are incorporated either orally or by injection.
3. Anti-implantation drugs: These are the agents that prevent the attachment or penetration of fertilized ovum into the uterus.
4. Abortifacients are those drugs or substances which causes early expulsion of foetus [6].

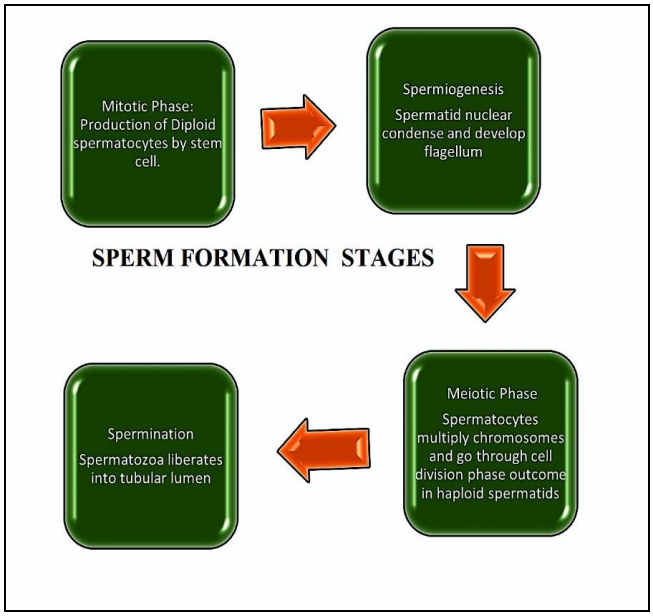

Fig 1: Phases for sperm formation

The list of possible antifertility plants includes scientific name, and the details of the active fractions and contraceptive activity. Plants which did not exhibit a noticeable antifertility effect were omitted.

Benefits of Contraception

Generally, contraception has numerous health benefits such as preventing unplanned and unintended pregnancies, ensuring optimum and healthy spacing between births, reducing maternal and child mortality, enhancing attainment of development goals, and improving the lives of women and children in general [7]. Unexpected pregnancy poses a big challenge to the sexual health of women especially in developing countries. Birth control helps to safeguard mothers from high-risk births, unwanted abortion, sexually transmitted infections, and sexually transmitted diseases (STDs), namely HIV/AIDS. Birth control is a fast and convenient way for minimizing overpopulation. In contrast, with aid of the multiple abortion services offered to women in U.S.A. unplanned pregnancy rate is about forty five percent. Even though women contraception is far more effective in preventing unplanned child, with high return results. Yet it can also be implemented by a higher percentage of the women due to their numerous detrimental consequences. (Figure 1) Besides that, there is a rise a need for male contraceptives to avoid unintended pregnancies since few males would like to be accountable for birth control [8]. In ancient times, male contraception initiated using a condom in Roman Civilization. Male contraceptive experiment deals with ultimate intent of getting simple targets to male reproductive organs by restricting either the semen or the testis from working. Although there are numerous medical contraceptives in marketplace, these all have a multitude of adverse side effects [9].

Why not make use of Herbs?

Herbs are among largest major nutrients which aim to protect and maintain a healthier lifestyle. There are 422,000 flowering plant documented across the planet, from which 20,000 are accepted as edible plants species and much less than 20,000 are consumed as dietary supplement by ninety percent of a global population, contributing to approximately twenty five percent of dosage forms from crops or their extract [10]. Regarding it, for primary care, over than eighty percent of global population is switching to herbal therapeutic agents including plant extracts. Plant-based contraceptives which are effectual approaches for governing the fecundity of animals and humans. Phytoconstituents including flavonoids, terpenes, tannins, quinines, diterpenoids, and lactones are known to maintain antifertility via different mechanism. Diverse likely processes for male contraception are researched and comprising of hormonal, chemical, and immunological strategies [11]. Current research trends are focused alteration of male fertility using plants due to reasons like well-suited to human being, tittivated cultural tolerability, and diminished detrimental outcomes [12].

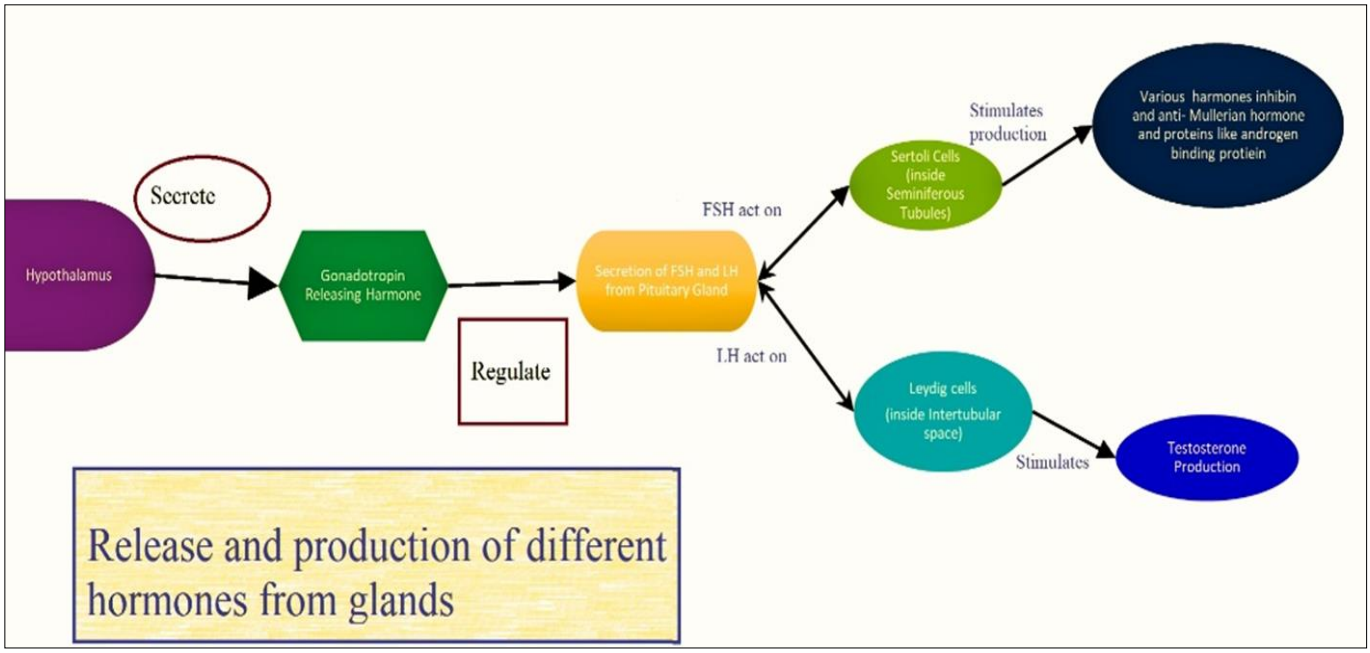

Fig 2: Scheme of hormone production

Testicles carries out two principal objectives [9]

1. Testosterone production
2. Spermatogenesis (origin of haploid germ cells)

Male Contraceptives might work as Follows:

1. Suppress sperm production by antispermatogenic
2. Prevention of maturation of sperm
3. Prevention of the flow of sperm through vas deferens
4. Prevention of deposition of the sperm.

Phytoconstituents acts through Sertoli cells by killing the viable and hinder work of Sertoli cells. It has various effects on spermatogenesis, including reducing the nuclear and cytoplasmic volume and vacuolizing Sertoli cell. Phytoconstituents acts through Leydig cells and have antimotility activity. Phytoconstituents acts by unbalancing hormone by lowering levels of testosterone, LH, and hormone-stimulating follicles due enzymes present [13].

Table 1: Summary of medicinal plants exhibiting antifertility activity in males [14, 16]

Name of the plant	Common/ English name	Part used	Type of plant extract / active principles	Activities
Abrus precatorius	*Chirmi*	Seed	Ethanol extract (Steroidal fraction)	Reduces sperm motility and density, Post-testicular antifertility, Reduced sperm motility, Antispermatogenic, Antiandrogenic
Acacia concinna	*Shikakai*	Stem bark	Acacic acid	Spermicidal, semen coagulating
Acacia auriculiformis	*Akashmoni*	Seed	Triterpene, saponins	Sperm immobilizing effect
Acacia caesia	*Aila*	Fruit	Saponins	Sperm immobilizing
Achillea millefolium	*Gandna*	Flowers	Ethanol extract	Antispermatogenic
Achyranthes aspera	*Kadaladi*	Root	Ethanol extract	Spermicidal
Actiniopteris dichotoma	*Morepankhi*	Whole plant	Ethanol extract	Antifertility
Aegle marmelos	*Bael*	Leaves	Ethanol extract	Resist spermatogenesis, Reduced sperm motility
Albizia lebbek	Flea tree	Pod, Bark	Methanol extract, Saponins	Antifertility activity
Albizia procera	*Sarapatri sirsi*	Seed, Root	Proceric acid,	Spermicidal, semen coagulating
Allium sativum	*Lahun*	Pod	Dry powder	Antispermatogenic activity
Aloe barbadensis	*Gheekumari*	Leaves	Ethanol extract	Antiandrogenic activity
Alstonia scholaris	*Saptaparni*	Stem bark	Methanol extract, α-Amyrine	Antifertility effect, Marked decline in germ cells
Anagallis arvensis	*Dhartidhak*	Whole plant	Oleanolic acid	Spermicidal, semen coagulating activities
Ananas comosus	*Annanas*	*Unripe fruit*	Alcoholic extract	Antispermatogenic activity
Andrographis paniculata	*Kirayat*	Leaves	Dry powder, Andrographilode	Antispermatogenic, antiandrogenic
Annona squamosa	*Sitaphal*	Seed	Alcoholic	Antispermatogenic activity
Aristolochia indica	*Hukka bel*	Root	Aristolochic acid	Antispermatogenic, antiandrogenic
Austroplenckia populnea	*Mangabarana*	Leaves	Hydro-methanol extract	Affects sexual behavior Epididymal sperm concentration
Azadirachta indica.	*Neem*	Seed, Leaves, Bark, flower	Seed oil, Neem oil, Dry powder, Aqueous and Ethanol extract	Antispermatogenic, antiandrogenic, Post-testicular antifertility, Spermicidal, Leydig cell dysfunction, Induced azoospermia, changes in testes and epididymis
Balanites roxburghii	*Hingan*	Fruit	Pulp extract, Ethanol extract	Antispermatogenic activity, Testicular necrosis, and atrophy
Bambusa arundinacea.	*Baans*	Shoots (tender) Stem	Ethanol extract,	Impaired the structural and functional activity of epididymis, Reduced sperm motility
Barleria prionitis	*Vajrada nti*	Root	Methanol extract	Antifertility effect
Berberis chitria	Barberry	Root	Palmitine hydroxide	Antispermatogenic action
Bursera fagaroides	Elephant Tree	Stem, Leaf	Saponins, Leaf	Sperm aggregation
Butea monosperma	*Palash*	Whole Plant	Butin, Aqueous, Ethanol extract	Effects on testicles function, Antispermatogenic action
Calotropis procera	*Aak*	Root, Flower	Calotropin, Aqueous, Ethanol, extract	Antispermatogenic effect and Leydig cell atrophy Functional alteration of genital organs and inhibition of fertility
Cannabis sativa	*Ganja*	Leaves	Butin	Testicular lesions and Leydig cells atrophy
Carica papaya	*Papita*	Fruit, Seed Powder	Dry powder, Aqueous and Chloroform extract	Antispermatogenic, induced total sterility, inhibit fertility, Reversible post testicular antifertility, and sterility Contraceptive and anti-spermatogenic, Induced azoospermia, Regressive azoospermia, Oligospermia, Spermicidal, Suppression of sperm motility, Alter cauda epididymal microenvironment and structural changes in testis
Catharanthus roseus	*Sadabahar*	Whole plant	Aqueous extract, Vincristin	Antispermatogenic, Antiandrogenic, Regression of reproductive system, Epididymal dysfunction
Celastrus paniculatus	Black-Oil tree	Seed	Seed extract	Antispermatogenic
Cichorium intybus	*Kasni*	Whole plant	Aqueous extract	Antispermatogenic
Cinnamomum camphora	Camphor Tree	Whole plant	Chloroform extract	Arrest and inhibition of spermatogenesis
Citrullus colocynthis	*Tumba*	Fruit	Ethanol extract	Impairment of sperm Induced reversible antifertility effects
Colebrookia	Pansra	Leaves	Ethanol extract	Antifertility activity

oppositifolia.				
Convolvulus microphyllus	*Shankh pushpi*	Whole plant	Ethanol extract	Antispermatogenic effect
Crotalaria juncea	*Jhunjhunia*	Seeds	Ethanol extract	Antispermatogenic, antiandrogenic
Cuminum cyminum	*Jeera*	Seed	Ethanol extract	Antispermatogenic
Curcuma longa.	*Haldi*	Root	Ethanol extract	Interfere spermatogenesis and antiandrogenic effect
Cyclamen persicum	Sowbread	Whole plant	Saponins	Spermicidal activity
Cynomorum coccineum	Desert thumb	Inner pulp of stem and root	Aqueous extract	Effect on epididymal sperm pattern
Daucus carota.	Carrot	Seed	Ethanol extract	Antifertility effect
Desmodium gangeticum	*Chapot*	Whole plant	Gangenticum	Antifertility effect
Diploclisia glaucescens	*Vatoli*	Stem	Ecdysterone	Spermicidal activity
Ecballium elaterium	Squirting cucumber	Fruit	Contrasperm	Decreases sperm motility
Echeveria gibbiflora.	Donkey Ear	Whole plant	Aqueous extract	Reduced sperm motility
Echinops echinatus	*Oontkat alo*	Root	Ethanol extract	Sperm antimotility. Reduces sperm density in cauda epididymis
Embelia ribes	*Vidang*	Berry	Embelin	Reduced testosterone level Antifertility, Antispermatogenic, Antiandrogenic, Spermicidal, Antifertility
Epilobium angustifolium	Willow Herb	Leaves	Hexane/Aqueous extract	Reduced weight of accessory sex organs
Eupatorium brevipes	-	-	Brevipenin	Spermicidal activity
Euphorbia neriifolia.	*Thuar*	Root	Ethanol extract	Antispermatogenic effects
Foeniculum vulgare	*Saunf*	Whole plant	Alcoholic extract	Antiandrogenic activity
Gloriosa superba	*Shakar*	Tuber	Ethanol extract	Shrinkage of Seminiferous tubules and Leydig cells
Gossypium herbaceum	Cotton	Seed	Gossypol	Reduced sperm density, motility and weight of reproductive organs, Spermicidal activity, Antifertility effect Histological changes in epididymis Antispermatogenic effect, Reduced sperm production, Changes in sperm structure, Effect on pituitary reproductive axis, Induce oligospermia, Adverse effect on epididymal function, Inhibition of acrosomal enzyme
Hedera nepalensis	-	Inflorescence	-	Spermatozoa Immobilization
Hibiscus rosa-sinensis	*Gudhal*	Flower	Benzene and Ethanol extract	Antispermatogenic and antiandrogenic activity
Hyptis suaveolens	*Wilayati tulsi*	Whole plant	Ether extract	Antifertility effect
Justicia simplex	*Kala adoosa*	Flower	Saponin	Sperm acrosomal membrane stabilizing action
Lepidium meyenii	*Maca*	Root	Aqueous extract	Invigorates spermatogenesis by acting on its initial stages
Malvaviscus conzattii	Gercenum	Flower	Ethanolic Methanol extract	Antifertility, Antispermatogenic and antiandrogenic effect
Martynia annua	*Bichchu*	Root	Ethanol extract	Antispermatogenic activity
Melodinus fusiformis	-	-	Solasodine	Spermicidal activity
Mentha arvensis	*Pudhina*	Leaves	Aqueous and methanol extract	Sex organs secretion decreased, antiandrogenic, Antifertility
Millettia auriculata	*Ganj*	Leaves	Alcoholic extract	Antifertility
Momordica charantia	*Karela*	Seeds	-	Antispermatogenic, antiandrogenic and anti-steroidogenic activity
Mondia whiteii	Tonic root	Root bark	Aqueous and methanol extract	Reversible antispermatogenic and antifertility activity
Mucuna urens	Horse-eye bean	Seeds	-	Effect gonads and sex accessory glands
Myristica fragrans	*Jaiphal*	Seed	Ethanol extract	Premature ejaculation
Nicotiana tabacum	Tobacco	Leaves	Nicotine	Antiandrogenic effects
Ochna	*Kanakch ampa*	Plant top	Ethanol extract	Semen coagulating activity

jabotapita				
Ocimum sanctum	*Tulsi*	Leaves Leaves	Powder-	Arrest of spermatogenesis and atrophy of Leydig cells Reduction of sperm
Ophiopogon intermedius	Himalayan Lily Turf	Rhizome	n-Octacosanal, β-sitosterol	Spermicidal activity
Opuntia dilleni.	*Nagphan*	Phylloclade	Methanol extract	Antispermatogenic effect
Piper betle	*Pan*	Petiole	Ethanol extract	Reduced sperm motility Epididymal fluid changes Antiandrogenic, altered testicular histology Antifertility
Piper longum	Long pepper	Flower, bud	Piperine	Antispermatogenic effect
Pittosporum neelgherrense.	*Analivenga*	Plant tops	Pittosida-A and B	Spermicidal and semen coagulating
Plumbago zeylanica	*Chitrak*	Root, Stem bark	Plumbagin	Antiandrogenic activity
Plumeria alba	*Champa*	Leaves	Ethanol extract	Total sterility
Polemonium caeruleum.	Jacob's ladder	Leaves	Methanol extract	Antispermatogenic effect
Portulaca oleracea	*Lunkha*	Seed	Alcoholic extract	Impairment of spermatogenesis
Primula vulgaris	Primrose	Root	Saponins	Immobilization of spermatozoa
Pterocarpus santalinus	Red Sandalwood	Stem bark	-	Semen coagulating
Pueraria tuberosa	*Vidharikand*	Root	Methanol extract	Inhibition of spermatogenesis
Pyrus cuspidate	*Naspati*	Plant top	Extract	Spermicidal, semen coagulating
Quassia amara	Bitter wood	Stem, bark	Methanol extract	Antifertility activity
Ricinus communis	*Arandi*	Seeds	Ethanol extract	Alteration in motility, and morphology of sperms
Rubus ellipticus.	*Katsan*	Whole plant	Methanol extract	Antifertility activity
Salvia fruticose	*Satari*	Leaves	Aqueous extract	Antifertility activity
Sapindus mukorossi	*Ritha*	Fruit Pericarp	Aqueous extract	Alters sperm membrane physiology
Sapindus trifoliatus	*Ritha*	Fruit	Ethanol extract	Adverse effect on spermatogenesis
Sarcostemma acidum	*Somlata*	Stem	Methanol extract	Arrest of spermatogenesis
Semecarpus anacardium	*Bhilawa*	Seed, Fruit	Aqueous extract	Antiandrogenic, attrition of germ cell, spermatogenesis arrest
Sorghum halepense	*Jangli-jowar*	Berries, Seed, Roots	Solasodine, Alcoholic extract	Impairment of spermatogenesis, Reversible antifertility Activity, Epididymal dysfunction. Reduced testosterone level, effect on testes and immature spermatozoa, Antispermatogenic
Stephania hernandifolia	*Aknadi*	Leaf	Aqueous extract	Diminution of action androgenic enzymes and plasma testosterone with spermatogenesis
Stevia rebaudiana	Sweetleaf	Whole plant	Aqueous extract	Decrease in testosterone level
Striga orobanchoides	*Lalagia*	Whole plant	Ethanol extract	Antispermatogenic effect and reduced weight of sex organs
Syzygium cuminii	*Jamun*	Seed, Flower	Alcoholic extract,	Antispermatogenic, Antifertility
Terminalia arjuna	*Arjun*	Bark	Ethanol extract	Antispermatogenic effect
Tinospora cordifolia	*Giloy*	Stem	Methanol extract	Antifertility activity
Trigonella foenum-graecum.	Methi	Seed	Alcoholic extract	Antiandrogenic effect
Tripterygium hypoglaucum	Thunder God Vine	Root xylem	Aqueous extract	Reversible regressive effect
Tripterygium wilfordii	*Lei Kung Teng*	Root	Glycoside, and Tripchlorolide	Antifertility activity, Reduced motility of spermatozoa and sperm count, Reduced testosterone level, Degeneration in seminiferous tubules, Antispermatogenic activity
Tylophora asthmatica	*Damabel*	Leaf and Stem	Pure alkaloid	Antispermatogenic activity
Vigna ungiculata	Cowpea	-	Aqueous extract	Antifertility effect
Vitex negundo	Chasteberry	Seed	Seed extract	Induced azoospermia

Conclusion

Plants are a traditional source of drugs since time immemorial. Present-day, scientists and public had identified herbs importance as a colossal fount of new as well as complimentary medicinal products.[8] Previously there are records of plants with contraceptive,

emmenagogues, and abortifacient properties albeit not validated scientifically [6]. Chronicle of medicinal plants for remedying and regulate fertility issues, signifies that medicinal plants do have an essential role in future reproductive health-care system. Presently, investigators are evaluating traditional information for regulating and curing fertility challenges. Study and interpretations of medicinal plants data show existence of numerous types of phytochemicals, including alkaloids, flavonoids, tannins, and saponins that shows the immense effect on reproductive health. [16]. This review is a summarized form of many of the scientific proven information about these types of phytochemical constituents and their antifertility activity found in some medicinal plants.

References

1. Lampiao F. Complementary and alternative medicines: the herbal male contraceptives. Afr J Tradit Complement Altern Med,2011:8(5):27-32.
2. Olugbenga-Bello AI, Abodunrin OL, Adeomi AA. Contraceptive practices among women in rural communities in South-Western Nigeria. Global Journal of Medical Research,2011:11(2):1-8.
3. Bhakta S. and Das S.K. Baleful effects of the commercial birth control pills and focus on frontier herbal contraceptives devoid of side effects of pills contrary herbal. International Journal of Academic Health and Medical Research (IJAHMR),2018:2(8):12 - 15.
4. Zade V, Wikhe M, Dabhadkar D. *et al*. Antifertility efficacy of Cannabis sativa leaves on female albino rats. Int J Sci Invent Today,2013:2(2):107-117.
5. Kulkarni TR, Kothekar MA, Mateenuddin M. Study of anti-fertility effect of lemon seeds (Citrus limonum) in female albino mice. Indian J Physiol Pharmacol,2005:49(3):305-312.
6. Bala K, Arya M, Katare DP. Herbal contraceptive: an overview. World Journal of Pharmacy and Pharmaceutical Sciences,2014:3(8):1305-1326.
7. Solanke BL. Factors influencing contraceptive use and non-use among women of advanced reproductive age in Nigeria. J Health Popul Nutr,2017:36(1):1.
8. Amory JK, Male contraception. Fertil Steril,2016:106:1303-1309.
9. Singh R, Kakar S, Shah M, Jain R. Some medicinal plants with anti-fertility potential: a current status. J Basic Clin Reprod Sci,2018:7:7-19.
10. Zaman W. *et al* The quest for some novel antifertility herbals used as male contraceptives in district Shangla, Pakistan. Acta Ecol Sin,2020:40:102-112.
11. Kaur R, Sharma A, Kumar R, Khar BR. Rising trends towards herbal contraceptives. J Nat Prod Plant Resour,2011:1:5-12.
12. Kumar N, Saxena G, Shukla S, Seliya M, Samuel A. Formulation and evaluation of contraceptive herbal gel. Pharma Innovation,2018:7(11):520-523.
13. Soni PK, Luhadia G, Sharma DK, Mali PC. Antifertility activates of traditional medicinal plants in male with emphasis on their mode action: a review. J Glob Biosci,2015:4:1165-1179.
14. Dewal S, Sharma R, Gupta RS. “A review on antifertility activity of plants of chambal riverine" Asian J Pharm Clin Res,2018:11(8):8-14.
15. Saxena G, Mittal A, Siddiqui AW. Evaluation of preliminary phytochemical screening, acute toxicity and antioxidant profile of *Ocimum kilimandscharicum*. Journal of Drug Delivery and Therapeutics,2019:9(2):372-375.
16. Gupta RS, Sharma R. A review on medicinal plants exhibiting antifertility activity in males. Nat Prod Radiance,2006:5(5):389-10.