



A REVIEW ON ANTIFERTILITY EFFICACY OF PLANTS IN MALES

PRIYANKA SHARMA, AKSHA SHARMA, MEERA AGARWAL AND SURESH C. JOSHI *

Center for advanced studies, Department of Zoology University of Rajasthan, Jaipur – 302 055 (India).

ABSTRACT

Medicinal plants are part and parcel of human society to combat diseases, from the dawn of civilization. Information about the benefits of herbal drugs is known in our ancient literature of Ayurvedic, Siddha, Unani and Chinese medicine. According to the WHO, 2003 about 80 % of the population of developing countries being unable to afford pharmaceutical drugs relies on traditional medicines, mainly plant based, to sustain their primary health care needs. Ayurvedic literature and folk medicine have been screened and searched thoroughly for antifertility effects in males all over the world. The World Health Organization has set up a task force on plant research for fertility regulation with an objective to find new orally active non steroidal contraceptive. Therefore, this article reviewed some of the medicinal plants having antifertility or contraceptive activity.

KEY WORDS: Medicinal plants, Health care, Antifertility effects, Non steroidal contraceptive.



SURESH C. JOSHI

Center for advanced studies, Department of Zoology University of Rajasthan,
Jaipur – 302 055 (India).

INTRODUCTION

One of the important concerns of today is the problem of over population. If the population increase is not controlled or checked, it will lead to several problems¹. 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. There are a variety of methods available and are in use for female contraception². In contrast, except for the barrier method and vasectomy, there are no methods available for male contraception. Thus, there is a need to develop multiple male contraceptive methods. The risk obtained by the drugs has triggered the need to develop newer molecules from medicinal plants. Hence there is need to search suitable products from indigenous medicinal plants that could be effectively used. Many local plants have been identified and tested for their antifertility effect in male rats and mice.^{3,4} Plants have provided a source of inspiration for novel drug compounds, as plant derived medicines have made large contributions to human health and well being⁵. Plants have been used globally across varied cultures as a safe natural source of medicines. From time immemorial, humans have relied on plants that could meet their basic necessities such as food, shelter, fuel and health of all the numerous uses attached to plants, their therapeutic abilities played an inevitable part in the lives of primitive societies, as they relied on plants for healing ailments. The knowledge of the healing powers of plants was initially passed down orally through generations, and as civilizations grew written records were prepared for the benefit of the population⁶. Fertility regulation with plants or plant preparation has been reported in the ancient literature of indigenous system of medicine⁷. Several plant products inhibit male & female fertility and may be developed into contraception⁸. Antifertility study of some medicinal plants *Abrus precatorius*⁹, *Trypteriguim wilfordii*¹⁰, *Mondia whitei*¹¹, *Mentha arvensis*¹², *Ocimum sanctum*¹³, *Quassia amara*¹⁴, *Azadirachta indica*¹⁵,

*Carica papaya*¹⁶, *Ricinus communis*¹⁷, *Chromolaena odoratum*¹⁸, *Rosmarinus officinalis*¹⁹ and *Fadogia agrestis*²⁰ had been done. Treatment with such plant materials results in infertility by reducing the sperm count, motility, fertility and viability as well as increasing the amount of abnormal sperm. The plant material inhibits normal spermatogenesis and testosterone biosynthesis. The saponins of *Cyclamen persicum*, *Primula vulgaris* and *Andrographis paniculata* have already been reported to cause almost instant immobilization of human spermatozoa in –vitro²¹.

The natural plant substances possessing estrogenic and anti-estrogenic properties offer themselves as an effective non-conventional source of contraception with less deleterious effects⁶. However, the search for an orally active safe & effective plant preparation is yet to be needed for fertility regulation due to incomplete inhibition of fertility or side effects.^{22, 23}

***Abrus precatorius* (Family –Fabaceae; Common name-Chirmi)**

Administration of methanolic extract of the seeds of *A. precatorius* (Fabaceae) (20 and 40 mg/kg b.wt. /day) for 45 days in adult male mice caused a significant decrease in caudal sperm motility, count and viability. There was a complete suppression of fertility at 40 mg/kg dose level. The decrease in weights of testes and cauda epididymis of mice at 40mg/kg level was also observed⁹. Methanolic extract of *A. precatorius* seeds (5.0 and 20.0 mg/ml) showed inhibitory effects on the motility of washed human spermatozoa. The extract caused a concentration-related impairment of percentage sperm motility. With the highest concentration tested (20.0 mg/ml), the onset of the antimotility action was almost immediate. In addition, this concentration impaired the functional integrity of the plasma membrane (hypoosmotic swelling test) and viability (nigrosin-eosin stain) of spermatozoa²⁴. Oral administration of crude mixture of *A. precatorius* seeds at dose of 50

mg/kg b.wt caused reduction in the epididymal sperm count & reduced level of testosterone was also observed²⁵.

***Aegle marmelos* (Family- Rutaceae ; Common name-Beal)**

The extract from the leaves of *Aegle marmelos* (50% ethanolic) 100, 200 and 300 mg (-1) kg (-1) day (-1) for each rat for 60 days caused a reduction in weight of testes and all the major accessory sex organs. There was a marked decline in motility and density of the sperm derived from cauda epididymis of the treated animals. Fertility and serum testosterone levels also decreased significantly. Thus, the leaf extract of *A. marmelos* (AMLEt) suppresses fertility in male rats²⁶. Further, Anti spermatogenic activity of 50% ethanolic extract of *A. marmelos* leaves at 100, 200 and 300 mg/kg b.wt./ day dose regimen has also been reported in rats from our laboratory^{26, 27}. When the animals were administered the aqueous leaf extract (250mg/kg body wt., and 350mg/kg body wt.), a dose related reduction in the testicular sperm count, epididymal sperm count and motility and abnormal sperm count was observed²⁸. Administration of 50% ethanolic extract of *A. marmelos* leaves caused reduction in the motility and sperm concentration along with complete inhibition of fertility at a dose of 300 mg/kg⁴. The antifertility effects of *A. marmelos* seemed to be mediated by disturbances in structure and function in testicular somatic cells including Leydig and Sertoli cells resulting in an alteration in physio-morphological events of spermatogenesis²⁹.

***Allium sativum* (Family-Alliaceae; Common name-Garlic, Lehsun)**

The crude aqueous extract of *Allium sativum* bulb possesses spermicidal activity and showed the most promising results by instant immobilization of the epididymal sperm at 0.25 g/mL and human ejaculated sperm at 0.5 g/mL.. More than 50 % reduction in sperm viability occurred in treated sperm, indicating the possibility of plasma membrane disintegration which was further supported by the significant reduction in the activity of membrane bound

nucleotidase and acrosomal acrosin³⁰. On the testes, use of garlic has been noted to compromise some male reproductive functions, as it affects spermatogenesis and testosterone levels, which are vital to reproduction^{31, 32}. Administration of aqueous extract of garlic different doses (500 mg/kg/d and 1000 mg/kg/d) to the wistar rats caused reduction in the percentage of morphologically normal spermatozoa as well as sperm concentration³³.

***Albizzia lebeck* (L.) Benth (Family-Mimosaceae; Common name-Siris tree)**

In male rats the methanolic extract of *Albizzia lebeck* pods causes spermatogenic arrest and brought about a significant decrease in sperm motility and density. There was a marked reduction in the numbers of primary spermatocytes, secondary spermatocytes and spermatids³⁴. Further, administration of saponins isolated from *Albizzia lebeck* L. (50 mg/ kg b.wt./day) for 60 days caused a significant decrease in the weights of reproductive organs of rats. The population of various spermatogenic cells in seminiferous tubules decline significantly³⁵.

***Andrographis paniculata* Wall. Ex Nees (Family- Acanthaceae; Common name-Kirayat)**

Dry leaf powder of *A. paniculata* (20 mg powder/day/rat) showed antispermatogenic and antiandrogenic effect as a result cessation of spermatogenesis, degeneration of samiferous tubules and regression of Leydig cells. Degeneration and reduction has also been seen in the accessory sex organs and its fluid content. Andrographilode, one of major constituents of this plant also affected spermatogenesis by preventing cytokinesis of the dividing spermatogenic cell lines, sperm counts, motility seems to be decreased and sperm also possess abnormalities³⁶.

***Azadirachta indica* (Family-Meliaceae; Common name-Neem)**

Administration of *A. indica* are reduced the fertilizing activity and administration of dry powder of leaves of *A. indica* at the dose level

of 20 mg, 40mg and 60mg/rat/day results in a decrease in weight of seminal vesicle and decrease in the sperm count³⁷. Histopathological and biochemical changes in the testis of rats treated with the leaf powder of *A. indica* were reported³⁸. It suggested a possible reversible antiandrogenic property of the leaves of *A. indica* in male albino rats. Neem seed extract is reported to induce abnormality in spermatogenesis and sperms production in some of the seminiferous tubules³⁹. Ultrastructural changes like intracellular spaces and vacuolization in Sertoli cells and defects in the mitochondrial sheath of late spermatids were induced by leaves of *A. indica* (Neem) in the testis of albino rats⁴⁰. Neem oil proved spermicidal against rhesus monkey and human spermatozoa in vitro. Antifertility effect of neem oil has also been studied and suggested to be a novel method of contraception⁴¹. Contraceptive effects of *A. indica* leaves (500 mg/ kg b.wt./day) on testosterone (0.25 mg/kg b.wt./day) were also studied in male rats⁴². Inclusion of neem leaf meal up to 15% in the ration of matured rabbit bucks could cause mild suppressive effect on the spermatogenesis, semen quality and seminiferous tubule diameter⁶. Male albino rat treated with low dose (0.6 mL of neem oil/animal) and high dose (1.2 mL of neem oil/animal) of neem oil revealed significant decrease in the seminiferous tubular diameter and number of spermatozoa⁴³.

***Bacopa monnieri* (Family Scrophulariaceae; Common name- Brahmi)**

Bacopa monnieri L. (Family Scrophulariaceae) commonly known as Brahmi has been used in the Ayurvedic system of medicine for centuries⁴⁴. Oral administration of aqueous extract of leaf (200 mg/kg b.wt) for 30 days to male rats caused some degenerative changes in the seminiferous tubule.⁴⁵ Brahmi treatment causes suppression of spermatogenesis and fertility, without producing apparent toxic effects. Brahmi at the dose level of (250 mg/kg body weight/day, for 28 and 56 days) to male mice of the Parkes (P) strain caused reduction in motility, viability, morphology, and number of

spermatozoa in cauda epididymidis. Histologically, testes in mice treated with the plant extract showed alterations in the seminiferous tubules⁴⁶.

***Barleria prionitis* (Family-Acanthaceae; Common name- Koranti yellow)**

Administration of isolated fractions of the *B. prionitis* root methanolic extract (100 mg/kg for 60 days) to male rats showed a significant reduction on spermatogenesis without affecting general body metabolism. Sperm motility as well density in cauda epididymides was reduced significantly. The population of various spermatogenic cells such as primary spermatocytes, secondary spermatocytes and round spermatids were declined significantly in treated animals⁴⁷. Oral administration of root extract of *B. prionitis* L. to male rats (100 mg/rat per day) for the period of 60 days brought about an interference with spermatogenesis. The no. of round spermatids was decreased. *B. prionitis* extract reduced the fertility of male rats and cross sectional surface area of Sertoli cells and mature Leydig cell numbers were significantly reduced (36.9%). Glycogen contents of testes were reduced. Fertility inhibitory effects of *Barleria* seemed to be mediated by disturbances in testicular somatic cells functions (Leydig and Sertoli cells) resulting in the physio-morphological events of spermatogenesis⁴⁸.

***Calendula officinalis* (Family-Asteraceae; Common name- Hajara; Marigold)**

Aqueous extract of *C. officinalis* (100 mg/kg.b.wt) for 60 days showed significant reduction in weight of testes, epididymis, seminal vesicles and ventral prostate in rats. Sperm motility, sperm density were decreased significantly. Serum testosterone levels were reduced. Total protein and Sialic acid content of testis, epididymis, seminal vesicles and ventral prostate were decreased significantly following the administration of *C. officinalis* (flower) aqueous extract (COFAq) Glycogen level in testis and liver reduced slightly where as cholesterol level was increased⁴⁹. Male rats treated with *C. officinalis* 50% ethanolic extract

(150, 250 and 500 mg/kg for 60 days) showed a significant reduction on spermatogenesis. Serum testosterone, FSH and LH level levels were decline. Cholesterol and lipid per oxidation in testes was significantly higher while Glutathion in testes was lower.⁵⁰

***Carica papaya* (Family-Caricaceae; Common name-Papaya)**

The benzene chromatographic fractions of chloroform extract of the seeds of *C. papaya* possess reversible male contraception potential and the effect appears to be mediated through the testis without adverse toxicity.⁵¹ Even aqueous extract of papaya bark has potential contraceptive activity. Further studies revealed that the inhibition of sperm motility may be due to ultrastructural changes in epididymis⁵². Gradual degeneration of germ, sertoli and Leydig cells as well as germinal epithelium in the male rats treated with *C. papaya* seed extract and confirm its antifertility activity⁵³. Recently it has been shown that it has good contraceptive efficacy in langur monkeys and action is mediated through inhibition of sperm motility⁵⁴. The extract of *C. papaya* leaf exerts toxic effect on the seminiferous tubule epithelium with concomitant reduction in reproductive potentials of the male rat. *C. papaya* leaf should therefore be cautiously used in both man and animal⁵⁵.

***Citrullus colocynthis* (Family-Cucurbitaceae; Common name-Bitter apple, Indrayan)**

Administration of crude 50% ethanol extract of *C. colocynthis* Schrad roots to male albino rats at dose levels of 50, 100 and 200 mg/kg b.wt./day for a period of 60 days caused a significant decreases in cauda epididymal sperm motility, density, number of pups and fertility⁵⁶. The 50% ethanolic extract of *C. colocynthis* extract showed an antiandrogenic nature, thereby reduced reversible infertility in male albino rats. The testes showed degenerative changes in the seminiferous epithelium and arrest of spermatogenesis at the secondary spermatocyte stage⁵⁷.

***Curcuma longa* (Family- Zingiberaceae; Common name- Haldi)**

Male rats fed with *C. longa* aqueous and 70 % alcoholic extract for 60 days (500 mg/kg/day) showed a decline in sperm motility and density. *C. longa* may have affected the androgen synthesis either by inhibiting the Leydig cell function or the hypothalamus pituitary axis and as a result, spermatogenesis is arrested⁵⁸. Male mice of the Parkes (P) strain were orally administered aqueous rhizome extract of *C. longa* (600 mg/kg b.wt./day for 56 and 84 days) showed adverse effect on motility, viability, morphology and number of spermatozoa in the cauda epididymidis, serum level of testosterone and on fertility. By 56 days of treatment withdrawal, however, the above parameters recovered to control levels. The results show that *C. longa* treatment causes reversible suppression of spermatogenesis and fertility, thereby suggesting the potential of this plant in the regulation of male fertility⁵⁹.

***Dendrophthoe falcate* (Family-Loranthaceae ; Common name-Honey suckled mistletoe)**

Oral administration of methanol extract of *Dendrophthoe falcate* stem to male rats at 50, 100 and 200 mg/ rat/day for 60 days caused a significant reduction in sperm motility and density⁶⁰. 70% methanolic extract of stem of *D. falcata* at a dose level of 100 mg/kg wt/day when fed to male albino rats for 60 days decreased testicular and epididymal weight. The seminal vesicles and ventral prostate also showed a significant reduction. Further, the animals also showed a notable depression of spermatogenesis. The reduced sperm count and motility resulted in 100% negative fertility at 100 mg/kg dose level⁶¹.

***Momordica charantia* (Family-Cucurbitaceae; Common name- Karela)**

Petroleum ether, benzene and alcohol extracts of the seeds of *Momordica charantia* tested in rats at the dose level of 25 mg/100 g body weight for 35 days showed antispermatogenic activity as the number of spermatocytes, spermatids and spermatozoa decreased. Increase in cholesterol level and Sudanophilic

lipid accumulation indicates inhibition in the steroidogenesis. Out of the three extracts, the alcohol extract was more potent in its antispermatogenic, antisteroidogenic and androgenic activities⁶². It has been shown that oral administration of *M. charantia* root extract (5 mg/ kg b.wt./day for 60 days) showed 100% antifertility in the rats⁶³. There was marked decline in testicular germ cell population, Leydig cell number and nuclear area as compared to controls. Serum testosterone level also reduced after extract treatment.

***Ocimum sanctum* (Family-Lamiaceae; Common name-Holy Basil, Tulsi)**

Ursolic acid one of the major constituents of the Tulsi leaves and it has been reported that it possess antifertility effect. This effect has been attributed to its anti-estrogenic activity which may be responsible for arrest of spermatogenesis in male and inhibitory effect on implantation of ovum in females. This constituent may prove to be a promising antifertility agent devoid of side effects. In males, Tulsi leaves reduce spermatogenesis by retarding sertoli cells activity⁶⁴. *O.sanctum* which is in the same genus with *O. gratissimum* had been reported to have antifertility effects in male albino rats⁶⁵. *O. gratissimum* caused distortion/destruction of the architecture and structure of the testicular histology, characterized by edema, reduced spermatogenesis and maturation arrest of spermatozoa at different stages of germ cell development⁶⁶. Aqueous crude extract of *O. gratissimum* showed deleterious action on the testis without disruption of the testicular endocrine function. It damage to the seminiferous epithelium, characterized by varying degrees of edema within the tubules and the interstitial cells and reduced spermatogenesis⁶⁷.

***Piper nigrum* (Family-Piperaceae; Common name- Black pepper)**

Administration of of *P. nigrum* fruit powder at 25 and 100 mg/kg body weight/day for 20 and 90

days to male mice affected sperm parameters caused marked alterations in male reproductive organs⁶⁸. The weight of the epididymis significantly decreased at dose of 100 mg/kg. Epididymal sperm count and motility decreased at 10 mg/kg and 100 mg/kg, and sperm viability decreased significantly at 100 mg/kg. Piperine could damage the epididymal environment and sperm function⁶⁹.

***Rosmarinus officinalis* (Family-Lamiaceae; Common name- Rosemary)**

Oral administration *R. officinalis*) in adult Sprague-Dawley rats at dose levels of 250 and 500 mg/ kg b.wt./day for 63 days reduced the average weight of epididymide, ventral prostate, seminal vesicles and preputial glands decrease significantly⁷⁰.

***Syzygium aromaticum* (Family-Myrtaceae; Common name- Clove)**

Oral exposure of hexane extract of flower buds of *S. aromaticum* at the dose level of 15mg, 30mg, and 60mg/kg BW for a single spermatogenic cycle (35 days) in Parkes (P) strain mice induced non-uniform degenerative changes in the seminiferous tubules associated with decrease in daily sperm production⁷¹.

***Terminalia bellirica* (Family-Combretaceae; Common name-Bahera)**

Contraceptive effects of Terminalia species have been reported on mammals. When fruit extract of *Terminalia bellirica* (50 mg/day/rat) were fed orally to male albino rats for 60 days, the sperm motility of cauda epididymis and sperm count of cauda epididymis and testis declined significantly leading to negative fertility test⁷². A significant decline in the weight of accessory reproductive organs were observed in the rats treated with 10 and 25mg dose level of benzene and ethanol extract *T. bellirica* barks. Structural and functional alteration in reproductive organs and reduction in sperm count and deformation in structure were also reported⁷³.

TABLE
LIST OF MEDICINAL PLANTS WITH THEIR ANTIFERTILITY ACTIVITY

S. No.	Name of plant	Common Name	Type of Plant Extract Used		Exper- imental Model	Activities	References
1.	<i>Abrus precatorius</i>	Chirmi	Alcoholic extract		Rat	Antifertility effect	9
			Ethanolic extract		Mice	Antifertility effect	74
2.	<i>Achyranthes aspera</i>	Kadaladi	50% ethanolic extract		Rat	Spermicidal action	75
3.	<i>Actinopteris dichotoma</i>	Morepankhi	50% ethanolic extract		Rat	Antifertility effect	76
4.	<i>Aegle marmelos</i>	Bael	Leaf	Methanolic extract	Rat	Resist process of spermatogenesis and decrease sperm motility	77
			Leaf	Methanolic extract	Rat	Antifertility effect	26
			Leaf	50% Ethanolic extract	Rat	Antifertility effect	29
					Human	Spermicidal activity	4
			Leaf	Aqueous Extract	Rat	Antifertility effect	28
5..	<i>Albizzia lebbek</i>	Siris	Pods	Methanolic extract	Rat	Antifertility effect	34
			Bark	Methanolic extract	Rat	Antispermatogetic and antiandrogenic activities	35
6.	<i>Allamanda cathartica</i>	Allamanda Vine	Leaf	Aqueous extract	Mice	Antifertility effect	78
7.	<i>Allium sativum</i>	Lahsun	Bulb	Crude aqueous extract	Rat	Spermicidal activity	30
			Bulb	Crude extract	Rat	Antispermatogetic and antiandrogenic activities	31
			Bulb	Aqueous extract	Rat	Antispermatogetic and antiandrogenic activities	32
			Bulb	Aqueous extract	Rat	Antispermatogetic Activity	33
8	<i>Aloe Barbadensis</i>	Aloe Vera	Leaf	Aqueous extract	Rat	Antifertility effect	79
9	<i>Alstonia scholaris</i>	Sapta-parni	Stem bark	Methanolic extract	Rat	Antifertility effect	80
10	<i>Amalakyadi churna</i>			Ethanol extract	Mice	Antifertility effect	81
11	<i>Anethum graveolens</i>	Dill	Seeds	Aqueous extract	Rat	Antifertility effect	82
12.	<i>Andrographis paniculata</i>	Kirayat	Leaves	Andrographilode	Rat	Effect on Spermatozoa	36
13.	<i>Austroplenckia populnea</i>	Mangabarana	Leaf	Hydromethanolic extract	Rat	Antifertility effect	83
14.	<i>Azadirachta indica</i>	Neem	Leaves	Alcoholic extract	Rat	Spermicidal activity	84
			Leaves		Rabbits	Antispermatogetic effect	6
			Oil		Rat	Structural changes	43
			Leaves	Aqueous extract	Rat	Spermicidal Activity	28
15.	<i>Bacopa monnieri</i>	Brahmi	Leaves	Dry powder	Mice	Suppression of spermatogenesis and fertility	46
16.	<i>Barleria prionitis</i>	Vajra-danti	Root	Methanolic extract	Rat	Antispermatogetic Activity	47
			Root	Alcoholic extract	Rat	Antifertility effect	48
17.	<i>Cananga odorata</i>		Root bark	50% ethanolic extract	Rat	Spermatotoxic effects	85
18	<i>Cannabis sativa</i>	Ganja	Root	Alcoholic extract	Rat	Antispermatogetic activities	1
19.	<i>Capparis aphylla</i>			Ethanolic extract	Rat	Disruption of the spermatogenic as well as androgenic compartment of the testis	86
20.	<i>Carica papaya</i>	Papita	Seeds	Chloroform extract	Monkey	Inhibition of sperm motility	54
			Bark	Aqueous crude extract	Rat	Antifertility effect	87
			Seeds	Chloroform extract	Rat	Inhibition of sperm motility	51
			Seeds	Chloroform extract	Rat	Ultrastructural changes in the testis	52
			Leaves	Aqueous extract	Rat	Antifertility effect	55
21	<i>Catharanthus roseus</i>	Sada-bahar	Leaves	Alcoholic extract	Rat	Antifertility effect	88

22.	<i>Cestrum parqui</i>		Leaves	Leaf extract	Rat	Potential spermicidal effect	89
23.	<i>Chrysophyllum albidum</i>	White star apple	Root bark	Ethanol extract	Rat	Spermicidal action	90
24.	<i>Citrullus colocynthis</i>	Tumba	Root	50% ethanolic extract	Rat	Antispermato-genic effects	56
			Fruit	50% ethanolic extract	Rat	Antispermato-genic and antiandrogenic activities	57
25.	<i>Colebrookia oppositifolia</i>		Leaves	Ethanol extract	Rat	Depression of spermatogenesis	91
26.	<i>Crotalaria juncea</i>		Seeds	Petroleum ether, benzene and ethanol extracts	Mice	Antispermato-genic and antiandrogenic effects	92
27.	<i>Cuminum cyminum</i>	Jeera	Seed	Ethanol extract	Rat	Antispermato-genic effect	93
28.	<i>Curcuma longa</i>	Haldi	Rhizome	Methanol extract	Rat	Antifertility effect	58
29.	<i>Dendrophthoe falcata</i>		Stem	70% methanol extract	Rat	Depression of spermatogenesis	61
30.	<i>Fadogia agrestis</i>		Stem	Aqueous extract	Rat	Adverse effects on the male rat testicular function	21
31.	<i>Fenugreek seeds</i>		Seeds	Dry powder	Rabbit	Antifertility activity	94
32.	<i>Hibiscus macranthus</i>		Leaves	Aqueous extracts	Rat	Antifertility activity	95
33.	<i>Hibiscus rosasinensis</i>	Gudhal	Bark	Methanol extract	Mice	Antispermato-genic and antiandrogenic activities	96
34.	<i>Juniperus phoenicea</i>		Cones	Ethanol Extract	Rat	Antifertility activity	97
35.	<i>Lepidium meyenii</i>		Root	Ethanol Extract	Rat	Antispermato-genic Effects	98
36.	<i>Leptadenia hastata</i>		Leaves and stem	Aqueous extract	Rat	Antispermato-genic Activity	99
37.	<i>Martynia annua</i>	Bichchhu	Root	50% ethanol extract	Rat	Antifertility effect	100
38.	<i>Madhuca Indica</i>	Mahua	Leaves	Alcoholic extract	Rat	Antifertility effect	101
39.	<i>Mentha arvensis</i>	Pudhina	Leaf	Petroleum ether extract	Mice	Antifertility property	102
40.	<i>Momordica charantia</i>	Karela	Seeds	Petroleum ether, benzene and alcohol extracts	Rat	Antispermato-genic and androgenic activities	62
41.	<i>Mondia whitei</i>		Root bark	Aqueous extract	Rat	Antispermato-genic and antifertility activities	103
42.	<i>Morinda lucida</i>		Leaf	Leaf extract	Rat	Antispermato-genic properties	104
43.	<i>Melia agdiracta</i>		Seed	Seed oil	Rat	Antifertility effect	105
44.	<i>Mucuna Urens</i>		Seed	Ethanol extract	Rat	antispermato-genic activity	106
45.	<i>Ocimum sanctum</i>	Tulsi	Leaf	Aqueous extract	Rat	Reduced spermatogenesis and maturation arrest of spermatozoa	107
			Leaf	Aqueous crude extract	Mice	Antifertility effects	67
46.	<i>Parkinsonia aculata</i>		Stem bark	Ethanol crude extract	Rat	Antispermato-genic activity	108
47.	<i>Pentadiplandra brazzeana</i>		Plants	Aqueous extract	Rat	Androgenic activity	109
48.	<i>Piper betle</i>	Pan	Leaf-stalk	Alcoholic extract	Mice	Antifertility effect	110
49.	<i>Piper nigrum</i>	Long pepper	Fruit	Dry powder	Mice	Antispermato-genic and antifertility activity	68
50.	<i>Quassia amara</i>		Bark	Chloroform extracts	Rat	Antifertility effect	14
51.	<i>Ricinus communis</i>			50% ethanol extracts	Rat	Antifertility effect	111
52.	<i>Rosmarinus officinalis</i>	Rose-mary	Fruit	Methanol extract	Rat	Antispermato-genic Activity	20
53.	<i>Ruta graveolens</i>		Leaf	Alcoholic extract	Rat	Antiandrogenic effects	112
54.	<i>Sapindus emarginatus</i>	Ritha		Alcoholic extract	Rat	Antifertility activity	113
55.	<i>Sarcostemma acidum</i>	Somlata	Stem	70% methanol extract	Rat	Arrest of spermatogenesis	114
56.	<i>Semecarpus anacardium</i>	Bhilawa	Fruit	Ethanol extract	Rat	Spermatogenic arrest	115
57.	<i>Strychnos potatorum</i>		Seeds	70% methanol extract	Rat	Antifertility effect	116

58.	<i>Syzygium aromaticum</i>	Clove	Flower buds	Hexane extract	Mice	Degenerative changes in the seminiferous tubules	71
59.	<i>Tecoma stans</i>		Leaves	Ethanol extract	Rat	Antispermato-genic properties	117
60.	<i>Terminalia bellirica</i>		Fruit	Alcoholic extract	Mammals	Antispermato-genic properties	118
61.	<i>Thevetia peruviana</i>	Yellow Oleander	Stem bark	Methanol extract	Rat	Antispermato-genic activity	119
62.	<i>Zizyphus mauritiana</i>	Ber	Bark	Aqueous, methanolic and saponin extracts	Human	Spermicidal property	120

CONCLUSION

In developing countries contraception use is further limited by restricted access to many available methods, both economically and culturally. Therefore, better access and education regarding existing contraceptives and more contraceptive options is needed. Studying the potency and toxicity of local plants for birth

control in the folkloric medicine may generate greater confidence in and wider acceptance of herbal contraceptives. However, the search for an orally active, safe and effective plant preparation or its compound is yet to be needed for fertility regulation due to incomplete inhibition of fertility or side effects.

REFERENCES

- Sailani, M.R., and Moieni, H. Effect of *Ruta graveolens* and *Cannabis sativa* alcoholic extract on spermatogenesis in the adult Wistar male rats. *Indian J. of Urology*. pp 257- 260, (2008).
- Thejashwini M.S., Krishna Ram H and Shivabasavaiah. Reversible antifertility effect of *Cyamopsis psoralioides* in male swiss albino mice. *Int. Journal of advanced biological research*. VOL. 2(4): 657-665, (2012).
- Verma, P.K., Sharma,A., and Joshi, S.C. Gupta, R.S. and Dixit V.P. Effect of isolated fractions *Barleria prionitis* roots methanolic extract on reproductive function of male albino rats. *Fitoterapia*. 76(5): 428-432, (2005).
- Remya, M., Sharma, R.C., Deepali, M., Sakshi, B., Nilesh, P., Tharini, S..In vitro effects of *Aegle marmelos* on human sperm Vitality. *Biomedicine*, 29(2):183-85, (2009).
- Dey, S.K., Banerjee, D., Chattapadhyay, S., Karmakar, K.B. Antimicrobial activities of some medicinal plants of West Bengal. *International Journal of Pharma and Bio Sciences*, 1(3): 1-10, (2010).
- Ifeanyi, P.O., Ifeanyi, C.O., Michael, U.I. Semen quality characteristics, reaction time, testis weight and seminiferous tubule diameter of buck rabbits fed neem (*Azadirachta indica* A. Juss) leaf meal based diets. *Iranian Journal of Reproductive Medicine*, 7(1): 23-28, (2009).
- Joshi S.C., Sharma A., Chaturvedi, M. Antifertility potential of some medicinal plants in males: an overview. *Int. J. Pharm. Pharm. Sci.*, 3(5): 204-217, (2011).
- Azmeera, M., Elumalai, A., Eswaraiah, M.C., Mathangi, N. An updated review on anti-fertility plants-2012. *Int. J. Pharmacother.*, 2(1): 4-6, (2012).
- Bhatt, N., Chawla, S.L., Rao, M.V. Contraception evaluation of seed extract of *Abrus precatorius* L. in male albino rats (*Mus musculus*). *J. Herb. Med. Toxicol.*, 1: 45-48, (2007).
- Huynh, P.N., Hikim, A.P., Wang, C., Stefanovic, K., Lue, Y.H., Leung, A., Atienza, V., Baravarian, S., Rentrakul, V. and Swerdloff, R.S. Long term effects of triptolide on spermatogenesis,

- epididymal sperm function and fertility in male rats. *J. Androl.* 21: 689-699, (2000).
11. Watcho, P., Kamtchong, P., Sokeng, S., Moundipa, P.F. Tantchou, J., Essame, J.L. and Koneta, M. Reversible antispermatogenic and antifertility activities of *Mondia whitei* L. in male albino rat. *Phytother. Res.* 15: 26-29, (2001).
 12. Sharma, N., Jacob, D. Antifertility investigation and functional alteration in the genital organ of male Swiss albino mouse after administration of *Calotropis procera* flower extract. *Pharmaceutical Biol.*, 39:403-407, (2001).
 13. Ahmed MM, Khan MY, Khan AA. Effects of *Ocimum gratissimum* (Tulsi) on the reproductive system: an updated review. *Biomed Res* 13:63-67, (2002).
 14. Praveen, S., Das, S., Kundra, C.P. and Pereira, B.M. A comprehensive evaluation of the reproductive toxicity of *Quassia amara* in male rats. *Reprod. Toxicol.* 17: 45-50, (2003).
 15. Dehghan MH, Martin T, Dehghanan R. Antifertility effect of Iranian neem seed alcoholic extract on epididymal sperm of mice. *Iranian Journal of Reproductive Medicine.* 3(2):83-89,(2005).
 16. Lohiya, N.K., Manivannan, B., Mishra, P.K., Sriram, S. Preclinical evaluation for noninvasive reversal following long term vas occlusion with styrene malic anhydride in langur monkeys. *Contraception*, 71: 214-226, (2005).
 17. Raji, Y. Kolade Oloyo, A. and Morakinyo, A.O. Effect of methanol extract of *Ricinus communis* seed on reproduction of male rats. *Asian J. Androl.* 8: 115-121, (2006).
 18. Yakuabu, M.T., Akanji, M.A. and Oladiji, A.T. Evaluation of antiandrogenic potentials of aqueous extract of *Chromolaena odoratum* (L.) K.R. leaves in male rats. *Andrologia*, 39: 235-243, (2007).
 19. Nusier MK, Bataineh HN, Daradkah HM. Adverse Effects of Rosemary (*Rosmarinus officinalis* L.) on Reproductive Function in Adult Male Rats. *Exp Biol Med* (Maywood), 232(6): 809-13, (2007)
 20. Yakubu, M.S., Akanji, M. A. and Oladiji, A. T. Effect of oral administration of aqueous extract of *Fadogia agrestis* (Schweinf. Ex Hiern) stem on some testicular function indices of male rats. *J. Ethnopharmacol.*, 115: 288-292, (2008).
 21. Lohiya NK. Plant products for contraception: How to make it a reality? In: Puri, CP., (Edn.), ISSRF News letter, Vol. 5, Indian society for the study of reproduction and fertility, Mumbai, 9-12, (2000).
 22. Stella, O.O.D, Grace, E.U., Herbert, A.B.C., Samuel, A.A. Oxytocic and anti-implantation activities of the leaf extracts of *Graptophyllum pictum* (Linn.) Griff. (Acanthaceae). *Afr. J. Biotechnol.*, 8(21): 5979-5984, (2009).
 23. Joshi S. C., Sharma A., Chaturvedi M. A review on plants/plants products possessing antifertility/contraceptive efficacy in males. *Pharmacologyonline*, 3: 818-832, (2010).
 24. Ratnasooriya, W.D., Amarasekera, A.S., Parera, N.S.D., Premakumara, G.A.S. Sperm anti-motility properties of seed extract of *Abrus precatorius*. *J. Ethnopharmacol.*, 38: 85-90, (1991).
 25. Gigani, Y., Vekaria, A., Ali, S.A. Effect of *Abrus precatorius* and *Amaranthus spinosus* combination treatment on fertility in male rats. *J. Pharmacol. Pharmacother.*, 3(3): 272-273, (2012).
 26. Chauhan, A., Agarwal, M., Kushwaha, S., Mutreja, A. Antifertility studies of *Aegle marmelos* Corr., an Indian medicinal plant on male albino rats. *Egyptian Journal of Biology*, 10: 28-35, (2008).
 27. Chauhan, A., Agarwal, M., Kushwaha, S., and Mutreja, M. Suppression of fertility in male albino rats following the administration of 50% ethanolic extract of *Aegle marmelos*. *Contraceptive*, 76: 474-481, (2007).
 28. Sathiyaraj, K., Sivaraj, A., Madhumitha, G., Kumar, P.V., Saral, A.M., Devi, K.,

- Kumar, B.S. Antifertility effect of aqueous leaf extract of *Aegle Marmelos* on male albino rats. *International Journal of Current Pharmaceutical Research*, 2(1): 26-29, (2010).
29. Chauhan, A., Agarwal, M. Reversible changes in the antifertility induced by *Aegle marmelos* in male albino rats. *Systems Biology in Reproductive Medicine*, 54(6) : 240–246, (2008).
30. Chakrabarti, K., Pal, S., Bhattacharyya, A.K. Sperm immobilization activity of *Allium sativum* L. and other plant extracts. *Asian J. Androl.*, 5: 131-135, (2003).
31. Hammami, I., Nahdi, A., Mauduit, C. The inhibitory effects on adult male reproductive functions of crude garlic (*Allium sativum*) feeding. *Asian Journal of Andrology*, 10 : 593–601, (2008)
32. Hammami, I., Amara, S., Benahmed, M., El May, M.V., Mauduit, C. Chronic crude garlic-feeding modified adult male rat testicular markers: mechanisms of action. *Reprod Biol Endocrinol*, 7: 65, (2009).
33. Omotoso, G.O., Oyewopo, A.O., Kadir, R.E., Olawuyi, S.T., Jimoh, A.A.G. Effects of aqueous extract of *Allium Sativum* (Garlic) on semen parameters in wistar rats. *The Internet Journal of Urology* 7(2), (2010).
34. Gupta, R.S., Kachhawa, J.B., Chaudhary, R. Antifertility effects of methanolic pod extract of *Albizia lebeck* (L.) Benth in male rats. *Asian J. Androl*, 6(2): 155-9, (2004).
35. Gupta, R.S., Chaudhary, R., Yadav, R.K., Verma, S.K. and Dobhal, M.P. Effect of saponins of *Albizia lebeck* (L) Benth. Bark on the reproductive system of male albino rats. *J. Ethnopharmacol.*, 96: 31-36, (2005)
36. Akbarsha, M.A. and Murugaian, P. Aspects of male reproductive toxicity/ male antifertility property of andrographilode in albino rats: Effect on the testis and the cauda epididymal spermatozoa. *Phytother. Res.*, 14 (6): 432-435, (2000).
37. Shaikh, P.D., Manivannan, B., Pathan, K.M., Kasturi, M., Ahamed, R.N. Antispermatic activity of *Azadirachta Indica* leaves in albino rats. *Current Science*, 64(9): 688-701, (1993).
38. Joshi, A.R., Ahamed, R.N., Pathan, K.M., Manivannan, B. Effect of *Azadirachta indica* leaves on testis and its recovery in albino rats. *Indian J. Exp. Biol.*, 34(11): 1091-4, (1996) .
39. Mahmoudi, M.M., Morowati, M., Ghazi Khansari, M., Nasrollazadeh, B., Minaie, B. Sterility effects of Neem (*Azadirachta indica*) extract on male rat. *J. Reprod. Infertil.*, 3(2) : 4-13, (2002)
40. Kasturi, M., Ahamed, R.N., Pathan, K.M., Manivannan, B., Aladakatti, R.H. Ultrastructural changes induced by leaves of *Azadirachta indica* (Neem) in the testis of albino rats. *J Basic Clin Physiol Pharmacol.*, 13(4): 311-28, (2002).
41. Biswas, K., Chattopadhyay, I., Banerjee, R.K., Bandyopadhyay, U. Biological activities and medicinal properties of neem (*Azadirachta indica*). *Current Science*, 82(11): 1336-1345, (2002).
42. Aladaki, R.H., Ahamed, R.N. Ultra structural changes in Leydig cells and cauda epididymal spermatozoa induced by *Azadirachta indica* leaves in albino rats. *Phytother. Res.*, 19: 756-766, (2005).
43. Shaikh, M.A., Naqvi, S.N.H., Chaudhry, M.Z. Effect of neem oil on the structure and function of the mature male albino rat testes. *Braz. J. Morphol. Sci.*, 26(1) 49-54, (2009).
44. Debnath, M., Malik, C.P., Bisen, P.S.. Micropropagation: A Tool for the Production of High Quality Plant-based Medicines. *Current Pharmaceut Biotechnol*, 7: 33-34, (2006).
45. Santra, K.B. and Manna, C.K. Antifertility effect of leaf extract of neem (*Azadirachta indica*) on the male wild Indian house rat (*Rattus rattus*).

- Pharmacologyonline, 2: 1025-1037, (2009).
46. Singh, A., Singh, S.K.: Evaluation of antifertility potential of Brahmi in male mouse. *Contraception*, 79(1): 71-79, (2009).
 47. Verma, P.K., Sharma, A., Joshi, S.C., Gupta, R.S., Dixit, V.P. Effect of isolated fractions of *Barleria prionitis* root methanolic extract on reproductive function of male rats: preliminary study. *Fitoterapia*, 76 : 428-432, (2005).
 48. Gupta, R.S., Kumar, P., Dixit, V.P., Dobhal, M.P. Antifertility studies of the root extract of the *Barleria prionitis* Linn in male albino rats with special reference to testicular cell population dynamics. *J. Ethnopharmacol.*, 70(2): 111-117, (2000).
 49. Kushwaha Sonalika, Agarwal Meera and Sharma Priyanka (2012): Influence of aqueous extract of *Calendula officinalis* (flower) on the reproductive function of adult male rats. *Asian Journal of Science and Technology*, 4(12): 020-023, (2012).
 50. Agrawal, M., Sharma, P. and Kushwaha, S. Antifertility efficacy of 50% ethanolic extract of *Calendula officinalis* in male rats. *Int. J. Pharm Pharm Sci.*, 3(5): 192-196, (2011).
 51. Pathak, N., Mishra, P.K., Manivannan, B., Lohiya, N.K. Sterility due to inhibition of sperm motility by oral administration of benzene chromatographic fraction of the chloroform extract of the seeds of *Carica papaya* in rats. *Phytomedicine*, 7: 325-333, (2000).
 52. Manivannan, B., Mishra, P.K., Pathak, N., Sriram, S., Bhande, S.S., Panneerdoss, S. Ultrastructural changes in the testis and epididymis of rats following treatment with the benzene chromatographic fraction of the chloroform extract of the seeds of *Carica papaya*. *Phytotherapy Research*, 18: 285-289, (2004).
 53. Verma, R.J., Nambiar, D., Chinoy, N.J. Toxicological effects of *Carica papaya* seed extract on spermatozoa of mice. *Journal of Applied Toxicology*, 26: 533–535, (2006).
 54. Lohiya, N.K., Manivannan, B., Goyal, S., Ansari, A.S. Sperm motility inhibitory effect of the benzene chromatographic fraction of chloroform extract of the seeds of *Carica papaya* in langur monkeys. *Asian J. Androl.*, 10(2): 298-306, (2008) .
 55. Oyekunle, O.A., Omope, M.M. Evaluation of andrological indices and testicular histology following chronic administration of aqueous extract of *Carica papaya* leaf in Wistar rat. *African Journal of Pharmacy and Pharmacology*, 4(5): 252-255, (2010).
 56. Mali, P.C., Chaturvedi, M., Ansari, A.S., Dixit, V.P. Antispermato-genic Effects of an Ethanol Extract of *Citrullus colocynthis* Root in Male Albino Rats. *Informa Healthcare*, 39(2): 113-119, (2001).
 57. Chaturvedi, M., Mali, P.C., Ansari, A.S. Induction of reversible antifertility with a crude ethanolic extract of *Citrullus colocynthis* Schrad fruit in male rats. *Pharmacology*, 68(1): 38-48, (2003).
 58. Purohit, A., Bhagat, M. Contraceptive effect of *Curcuma longa* (L.) in male albino rat. *Asian J. Androl.*, 6(1): 71-4, (2004).
 59. Mishra, R.K., Singh, S.K. Reversible antifertility effect of aqueous rhizome extract of *Curcuma longa* L. in male laboratory mice. *Contraception*, 79(6): 479-87, (2009).
 60. Gupta RS, Kachhawa JB. Evaluation of contraceptive activity of methanol extract of *Dendrophthoe falcata* stem in male albino rats. *J Ethnopharmacol.* 112(1):215-8, (2007).
 61. Gupta, R.S., Kachhawa, J.B., Sharma, A. Effect of methanolic extract of *Dendrophthoe falcata* Stem on Reproductive Function of Male Albino Rats. *J. Herb Pharmacother*; 7(2):1-13, (2007).
 62. Naseem, M.Z., Patil, S.R., Patil, S.R., Ravindra, Patil R.S. Antispermato-genic

- and androgenic activities of *Momordica charantia* (Karela) in albino rats. *J. Ethnopharmacol*, 61(1): 9-16, (1998).
63. Yama, O.E., Osinubi, A.A., Duru, F.I., Noronha, C.C., Okanlawon, A.O. Contraceptive effect of methanolic extract of *Momordica Charantia* seed in male sprague-dawley rats. *Asian J. Pharm. Clin. Res.*, 4(2): 22-26, (2011).
64. Prakash, P. & Gupta, N. Therapeutic use of *Ocimum santum* Linn. (Tulsi) with a note on eugenol and its pharmacological action: a short review. *Indian J. Physiol. Pharmacol*, 49(2): 125-131, (2005).
65. Ahmed, M., Ahamed, R.N., Aladakatti, R.H., Ghosesawar, M.G. Reversible antifertility effect of benzene extract of *Ocimum sanctum* leaves on sperm parameters and fructose content in rats. *J. Basic Clin. Physiol. Pharmacol.* 13(1): 51-9, (2002).
66. Olufisayo, O.L. and Oluremi, E.F. Effects of crude aqueous extract of *Ocimum gratissimum* leaves on testicular histology and spermogram in male albino rats. (Wistar strain) 2(3-4): 42-46, (2008).
67. Obianime, A.W., Aprioku, J.S., Esomonu, C.T.O. Antifertility effects of aqueous crude extract of *Ocimum gratissimum* L. leaves in male mice. *Journal of Medicinal Plants Research* 4(9) : 809-816, (2010).
68. Mishra, R.K., Singh, S.K. Antispermato-genic and antifertility effects of fruits of *Piper nigrum* L. in male mice. *Indian Journal of Experimental Biology*, 47: 706-712, (2009).
69. D'cruz, S.C., Mathur, P.P. Effect of piperine on the epididymis of adult male rats. *Asian J Androl*, 7(4): 363-368, (2005).
70. Nusier, M.K., Bataineh, H.N., Daradkah, H.M. Adverse Effects of Rosemary (*Rosmarinus officinalis* L.) on Reproductive Function in Adult Male Rats. *Exp. Biol. Med.* (Maywood). 232(6) : 809-13, (2007).
71. Mishra, R.K., Singh, S.K. Safety assessment of *Syzygium aromaticum* flower bud (clove) extract with respect to testicular function in mice. *Food Chem Toxicol.* 46(10): 3333-8, (2008).
72. Satishgouda, S., Patil, S.J., Vishwanath, T., Patil, S.B. Contraceptive effect of *Terminalia bellirica* (Bark) extract on male albino rats. *Ital. J. Pharma.*, 2: 1278-1289, (2009).
73. Patil, S.J., Satishagouda, S., Vishwanatha, T., Patil, S.B. (2010): Effect of *Terminalia bellirica* barks extracts on activities of accessory reproductive ducts in male rats. *International Journal of Pharmaceutical Sciences Review and Research*, 1(2): 75-79.
74. Jahan, S., Rasool, S., Khan, M.A. Antifertility effects of ethanolic seed extract of *Abrus precatorius* L. on sperm production and DNA integrity in adult male mice. *Journal of Medicinal Plants Research*, 3(10): 809-814, (2009).
75. Sandhyakumari, K., Boby, R.G., Indira, M. Impact of feeding ethanolic extract of *Achyranthes aspera* Linn. on reproductive function in male rats. *Ind. J. Expt. Biol.*, 40: 1307-1309, (2002).
76. Sharma, A., Mathur, A., Verma, P., Joshi, S.C., Dixit, V.P. Effects of *Actinopterys dichotoma* (SW) on reproductive function of male rat. *J. Endocrinol. Reprod*, 3 : 47-59, (1999).
77. Sur, T.K., Pandit, S., Paramanik, T. and Bhattacharyya, D. Effect of *Aegle marmelos* leaf on rat sperm motility: An in vitro study. *Indian J. Pharmacol.*, 34 : 276-277, (2002).
78. Singh, A., Singh, S.K. (2008) : Reversible antifertility effect of aqueous leaf extract of *Allamanda cathartica* L. in male laboratory mice. *Andrologia*, 40(6) : 337-345.
79. Oyewopo, A.O., Oremosu, A.A., Akang, E.N., Noronha, C.C., Okanlawon, A.O. Effects of aloe vera (*Aloe barbadensis*) aqueous leaf extract on testicular weight, sperm count and motility of adult male sprague-dawley rats. *Journal of American Science*, 7(4) : 31-34, (2011).

80. Gupta, R.S., Sharma, R., Sharma, A. Effect of *Alstonia scholaris* bark extract on testicular function of wistar rats. *Asian J. Androl.*, 4(3) : 175-178, (2002).
81. Seetharam, Y.N., Sujeeth, H., Jyothishwaran, G., Barad, A., Sharanabasappa, G., Umareddy, B. Antifertility effect of ethanolic extract of *Amalakyadi churna* in male albino mice. *Afr J. Med. Sci.*, 5(3) : 247-250, (2003).
82. Malihezaman, M., Sara, P. Effects of aqueous extract of *Anethum graveolens* on male reproductive system of rats. *J. Boil. Sci.*, 7: 815-818, (2007).
83. Mazaro, R., Stasi, L.C., Kempinas, W.G. Effects of the hydromethanolic extract of *Austroplenckia populnea* (Celastraceae) on reproductive parameters of male rats. *Contraception*, 66(3): 205-209, (2002).
84. Kabeh, J.D., Jalingo, M.G.D.S.S. Exploiting *Neem* (*Azadirachta Indica*) Resources for Improving the Quality of Life in Taraba State, Nigeria. *Int. J. Agri. Biol.*, 9(3): 530–532, (2007).
85. Pankajakshy, A., Madambath, I. Spermatotoxic effects of *Cananga odorata* (Lam): a comparison with gossypol. *Fertil Steril*, 91(5) : 2243-2246, (2009).
86. Sarathchandiran, I., Manavalan, R., Akbarsha, M.A., Kadalmani, B., Karar, P.K. Studies on spermatotoxic effect of ethanolic extract of *Capparis aphylla* (Roth). *J. Boil. Sci.*, 7 : 544-548, (2007).
87. Kusemiju, O., Noronha, C., Okanlawon, A. Effects of crude extract of the bark of *Carica papaya* on the seminiferous tubules of male Sprague-Dawley rats. *Niger. Postgrad. Med. J.* 9(4) : 205-209, (2002).
88. Mathur, R., Chauhan, S. Antifertility efficacy of *Catharanthus roseus* Linn: a biochemical and histological study. *Acta Eur. Fertil.*, 16(3) : 203-205, (1985).
89. Souad, K., Ali, S., Mounir, A., Mounir, T.M. Spermicidal activity of extract from *Cestrum parqui*. *Contraception*, 75(2) : 152-156, (2007).
90. Yakubu, M.T., Akanji, M.A., Oladiji, A.T. Evaluation of antiandrogenic potentials of aqueous extract of *Chromolaena odoratum* (L.) K.R. leaves in male rats. *Andrologia*, 39(6) : 235-43, (2007).
91. Onyeka, C.A., Aligwekwe, A.U., Olawuyi, T.S., Nwakanma, A.A., Kalu, E.C., Oyeyemi, A.W. Antifertility effects of ethanolic root bark extract of *Chrysophyllum albidum* in male albino rats. *Int. J. Appl. Res. Nat. Prod.*, 5(1): 12-17, (2012).
92. Vijaykumar, B., Sangamma, I., Sharanabasappa, A., Patil, A., Saraswati, B. Antispermato-genic and hormonal effects of *Crotalaria juncea* Linn. seed extracts in male mice. *Asian J Androl.*, 6(1) : 67-70, (2004).
93. Sharma, J., Sharma, S., Jain, R. Antifertility activity of *Cuminum cyminum* on reproductive organs of male albino rats (*Rattus norvegicus*). In: National Symposium Reproductive Biology and Comparative Endocrinology 2001, Vadodara, Gujarat, pp. 69, (2001).
94. Kassem, A., Al-Aghbari, A., AL-Habori, M., Al-Mamary, M. Evaluation of the potential antifertility effect of fenugreek seeds in male and female rabbits. *Contraception*, 73(3) : 301-306, (2006).
95. Moundipa, F.P., Kamtchouing, P., Koueta, N., Effects of aqueous extracts of *Hibiscus macranthus* and *Basella alba* in mature rat testis function. *J. Ethnopharmacol.* 65:133-139, (2009).
96. Reddy, C.M., Murthy, D.R., Patil, S.B. Antispermato-genic and androgenic activities of various extracts of *Hibiscus rosa sinensis* in albino mice. *Indian J. Exp. Biol.*, 35 : 1170-4, (1997).
97. Shkukani, H., Salhab, A., Disi, A., Shomaf, M., Quadan, F. Antifertility effect of ethanolic extract of *Juniperus phoenica* (L.) in male albino rats. *Journal of Herbal Pharmacotherapy* 7(3/4) : 179-189, (2008).
98. Gonzales, G.F., Ruiz, A., Gonzales, C., Villegas, L., Cordova, A. Effect of *Lepidium meyenii* (maca) roots on

- spermatogenesis of male rats. Asian J. Androl, 3 : 231-233, (2001).
99. Bayala, B., Telefo, P.B., Bassole, I.H.N., Tamboura, H.H., Belemtougri, R.G., Sawadogo, L. Anti-spermatogenic activity of *Leptadenia hastata* (Pers.) Decne leaf stems aqueous extracts in male wistar rats. Journal of Pharmacology and Toxicology, 6(4): 391-399, (2011).
 100. Mali, P.C., Ansari, A.S. and Chaturvedi, M. Antifertility effect of chronically administered *Martynia annua* root extract on male rats. J. Ethnopharmacol., 82: 61-67, (2002).
 101. Shivabasavaiah, Krishna Ram, H., Pavana, T., Ramyashree, M., Ramya, M.C., Manjunath, R. Antifertility Effects of *Madhuca Indica* Leaves in male swiss albino rats. Journal of Pharmacy Research, 4(2) : 323-326, (2011)
 102. Sharma, N., Jacob, D. Antifertility investigation and toxicological screening of the petroleum ether extract of the leaves of *Mentha arvensis* L. in male albino mice. J. Ethnopharmacol., 75(1): 5-12, (2001).
 103. Watcho, P., Donfack, M.M., Zelefack, F., Nguenefack, T.B., Wansi, S., Ngoula, F., Effects of the hexane extract of *Mondia whitei* on the reproductive organs of male rat. Afr. J. Trad. Comp. Alt. Med., 2(3): 302-311, (2005).
 104. Yinusa, R., Akinsomisoye, O.S., Salman, T.M. Antispermatic activity of *Morinda lucida* extract in male Rats. Asian J. Androl., 7: 405-410, (2005).
 105. Paradin, R., Sodikhepour, H.R., HairiRohooni, S.A. Evolution of antifertility effect, recovery of the seed oil constituents of Iranian species of *Melia azoddao* *Azadirachta* Linn. in male rats., (2005).
 106. Etta, H.E., Basse, U.P., Eneobong, E.E., Okon, O.B. Anti-spermatogenic Effects of Ethanol Extract of *Mucuna Urens*. Journal of Reproduction and Contraception, 20(3): 161-168, (2009).
 107. Leigh, O.O, Fayemi, O.E. Effects of aqueous extract of *Ocimum gratissimum* leaves on testicular histology and spermogram in the male albino rat (Wistar strain). Vet Res, 2: 42-46, (2008).
 108. Gupta, R.S., Rehwani, H., Khushalani, V., Tanwar, K. and Joshi, Y.C. Antispermatic effects of *Parkinsonia aculeata*. Stembark in Male Rats. Pharmaceutical Biology, 45(1) : 1-8, (2007).
 109. Kamtchouing, P., Fondio, G.Y.M., Dimo, T. and Jatsa, H.B. Evolution of endrogenic activity of *Zingiber officinale* and *Pentadiplandra brazzena* in male Rats. Asian J. of Andrology, 4: 299-301, (2002).
 110. Sarkar, M., Gangopadhyay, P., Basak, B., Chakrabarty, K., Banerji, J., Adhikary, P. The reversible antifertility effect of *Piper betle* Linn. on Swiss albino male mice. Contraception, 62(5) : 271-274, (2000).
 111. Sandhyakumary, K., Bobby, R.G., Indira, M. Antifertility effects of *Ricinus communis* (Linn) on rats. Phytother Res., 17(5) : 508-11, (2003).
 112. Khouri, N.A., El-Akawi, Z. Antiandrogenic activity of *Ruta graveolens* L in male Albino rats with emphasis on sexual and aggressive behavior. Neuro Endocrinol Lett., 26 : 823-9, (2005).
 113. Venkatesh, V., Sharma, J.D. A Comparative Study of Effect of Alcoholic Extracts of *Sapindus emarginatus*, *Terminalia bellerica*, *Cuminum cyminum* and *Allium cepa* on Reproductive Organs of Male Albino Rats. Asian J. Exp. Sci., 16 : 51-63, (2002).
 114. Verma, P.K., Sharma, A., Mathur, A., Sharma, P., Gupta, R.S., Joshi, S.C. Effect of *Sarcostemma acidum* stem extract on spermatogenesis in male albino rats. Asian J. Androl., 4(1) : 43-7, (2002).
 115. Sharma, A., Verma, P.K., Dixit, V.P. Effect of *Semecarpus anacardium* fruits on reproductive function of male albino rats. Asian J. Androl., 5(2) : 121-124, (2003).

116. Gupta, R.S., Kanwar, M., Rehwani, H., Verma, S.K., Dobhal, M.P.: Contraception efficacy of *Strychnos potatorum* seed extract in male albino rats. *Asian J. Exp. Sci.*, 20: 181-187, (2006).
117. Mathur, N., Jain, G.C., Pandey, G. Effect of *Tecoma stans* leaves on the reproductive system of male albino rats. *Int. J. Pharmacol.*, 6(2): 152-156, (2010).
118. Rao, M.V. Effects of alcoholic extract of *Terminalia belerica* fruit extract on male reproductive functions. *Arch Biol.*, 100: 37-46, (1989).
119. Gupta, R., Kachhawa, J.B.S., Gupta, R.S., Sharma, A.K., Sharma, M.C., Dobhal, M.P. Phytochemical evaluation and antispermatogenic activity of *Thevetia peruviana* methanol extract in male albino rats. *Human Fertility*, 14(1) : 53-59, (2011).
120. Dubey, R., Dubey, K., Sridhar, C., Jayaveera, K.N. Sperm immobilization activity of aqueous, methanolic and saponins extract of bark of *Ziziphus Mauritiana*. *Der Pharmacia Sinica*, 2(2): 11-16, (2011).