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Medicinal plants with potential antifertility activity- A review of sixteen years of herbal medicine research (1994-2010)

Priya G.[1], Saravanan K.[2]* and Renuka, C.[3]

PG & Research Department of Zoology, Nehru Memorial College (Autonomous), Puthanampatti-621 007, Tiruchirappalli district, Tamilnadu, South India.

[1]Cell number: +918220595631
[2]Cell number: +919443757052
[3]cell number: +919791673056
Corres. Author: kaliyaperumalsaravanan72@gmail.com

Abstract: The use of plants as abortifacient and as contraceptive was well known to the ancient physicians of India. Various medicinal plant extracts have been tested for their antifertility activity both in male and female animal models. This review presents the profiles of plants with antifertility, reported in the literature from 1994-2010. The profiles presented include information about the scientific name, family, the degree of antifertility activity and the active agents. Totally 50 species are listed in the present review.
Key Words: Antifertility activity, Medicinal plants.

INTRODUCTION:

Many ethnobotanical surveys on medicinal plants used by the local population have been performed in different parts of the world including Morocco, Saudi Arabia, Taiwan and Trinidad and Tobago[1,2,3,4]. Several plant species have been described as antifertility agents[3]. The practice of traditional medicine for the control of fertility in most parts of Ethiopia, India and most parts of the world is based on the uses of plant medicines for many years. Several medicinal plants have been used as dietary adjunct and in the treatment of numerous diseases including for inducing infertility without proper knowledge of their function [5]. Although several herbal plants possess different types of antifertility activities such as anti implantation, Abortification, Ecobolic, Oestrogenic and Spermicidal, a large number of medicinal plants posses some degree of toxicity[5].

The aim of this review is to collate all available data on plants with antifertility effects reported in the Medline (Pub med) during the 1994-2010 periods. All available data on plants with antifertility effects reported in the Medline (Pubmed) during the 1994-2010 periods were collected. The list of potential antifertility plants is presented with their photo, scientific name, family and the names of the country in which they are available are indicated. The description of methods used in the experiment model animals, and the effect of antifertility, doses, toxicity and active ingredients are also included. Plants which did not show any significant antifertility effect were not included.

Totally 50 plants are reported in this review are having different antifertility activities. They come under 47 genera and 32 families. The collected information are given below and also summarized in the table 1.

1. **Sage leaf alangium, *Alangium salvifolium*** (ALANGIACEAE) [Fig. 1]

Stem bark of this plant is used both as contraceptive and abortifacient. Extracts of this plant possess antiprogesterogenic activity[6].

2. Aaghada, *Achyranthes aspera* **(**AMARANTHACEA) [Fig.2]

Achyranthus aspera Linn is an abundant indigenous herb in India. It is traditionally being used as an abortifacient. The ethanol extract of the root was screened for antifertility activity in proven fertile female albino rats and 83.3% anti implantation at 200 mg/kg body weight and given orally on days 1-7 of pregnancy[7].

3. Ylang, *Cananga odorata* **(**ANNONACEAE) [Fig. 3]

The 50% ethanolic extract of the root bark *C. odorata* administered orally at the dose of 1g/kg body weight/day for 60 days resulted in decreased epididymal sperm motility, sperm count in and abnormality in sperm morphology in male albino rats. Moreover, the testicular glycogen, the activities of 3β hydroxy steroid dehydrogenase, glucose 6-phosphate dehydrogenase, malic enzymes, sorbitol dehydrogenase in seminal vesicle, fructose in seminal plasma and serum testosterone were significantly decreased. While testicular cholesterol level, the concentration of the fecal bile acids, urinary excretion of 17 ketosteroids, the activities of 17β hydroxyl steroid dehydrogenase, epididymal lactate dehydrogenase and that of testicular HMG CoA reductase were increased in treated group when compared to control[8]. Hence it is revealed that the ethanolic extract of *C.odorata* possesses the strong spermatotoxic effects in male albino rats.

4. Turmeric, *Carum carvi* **(**APIACEAE) [Fig. 4]

Aqueous and ethanolic extract of rhizome of *Curcuma longa* and seeds of *Carum carvi* were administered orally to female rat for 30 consecutive days. The female albino rats after Oral administration of different doses of aqueous and ethanolic extracts of *Carum carvi* and *Curcuma longa,* showed a significant antifertility activity[9]. FSH and LH level was significantly decreased in both drugs while amount of estrogen in ethanolic extract of both the drugs treated animals was found to be increased[9].

5. Cumin, *Cuminum cyminum* (APIACEAE) [Fig. 5]

Seed extracts of *Cuminum cyminum, f*ruit extracts of *S. emarginatus, T. belerica* and *Allium cepa* (50mg/day/rat) were fed orally to male albino rats for 60 days. The body weight was not affected but the weight of reproductive organs was decreased. The sperm motility of cauda epidymis and sperm count of cauda epididymis and testis declined significantly leading to negative fertility test. Androgen dependent parameters (protein, sialic acid, fructose and ascorbic acid) were lowered, revealing reduction in the circulating androgen[10].

6. Wild carrot, *Daucus carota* **(** APIACEAE) [Fig. 6]

The petroleum ether extract and fraction 5(fatty acids) of wild carrot seeds arrested the normal estrus cycle of adult mouse and reduced the weight of ovaries significantly. The cholesterol and ascorbic acid content in ovaries were significantly elevated due to the treatment with extract and fraction 5(fatty acids) of carrot seeds. The significant inhibition of ovarian steroidogenesis enzymes, Δ5, 3β- hydroxyl steroid dehydrogenase and glucose-6-phosphate dehydrogenase[11].

7. Yarrow, *Achillea millefolium* **(**ASTERACEAE) [Fig.7]

Animals treated with the ethanolic extract (200 mg/kg/day, intraperitoneally, for 20 days) and a hydroalcoholic extract (300 mg/kg/day, orally, for 30 days) of *Achillea millefolium* flowers had an increased number of metaphases in the germ epithelium that might be due to cytotoxic substances or substances stimulating cell proliferation which alter the normal spermatogenesis[12].

8. Haemorrhage plant, *Aspilia africana* **(**BIGNONIACEAE) [Fig. 8]

Significant decrease in the body weight of the treated rats and the oestrous cycle was altered after the commencement of *Aspilia africana* leaf extract. This was indicated by the prolonged protestors and a reduced number of ova observed in the oviduct from the treated rats compared with control. Further, the extract caused inflammation of the fallopian tube, degeneration in the ovarian cortex in the stroma cells of the ovary and disruption of the endometrium of the uterus. Aqueous extract of *Aspilia Africana* leaf has antifertility effect by altering oestrous cycle and causing a dose dependent adverse effect on ovulation in wistar strain rats[13].

9. Thunder god vine, *Tripterygium wilfordii* (CELASTRACEAE) [Fig. 9]

The antifertility effect of triptolide and other related compounds isolated from *Tripterygium wilfordii*, has been demonstrated in male rats. Triptolide, induces complete infertility in the adult rats, has minimal adverse effects on the testes and acts primarily on the epididymal sperm making triptolite an attractive lead as a post-testicular male contraceptive[14].

10. Dhak-ki-be, *Rivea hypocrateriformis* **(**CONVOLVULACEAE) [Fig. 10]

The ethanol extract of *Rivea hypocrateriformis* was administered orally at the dose levels of 200 and 400 mg/kg body weight to adult rats and resulted in an irregular oestrous cycle with shortened estrus and metestrus, and with lengthened proestrus in non-dose dependent manner. Significant decreases in number of graffian follicles and corpora lutea and significant increases in number of atretic follicles in treated rats during experimental period indicated the antiovulatory effect of the extract[15].

11. Wild caper, *Capparis aphylla* (CAPPARACEAE) [Fig. 11]

The data revealed that functional sterility could be induced in male rats by whole plant ethanolic extract of *C. aphylla* treatment, which promises to be potential male contraceptive[16].

12. Varuna, Crataeva nurvala (CAPPARIDACEAE) [Fig.12]

The ethanol and aqueous extracts of the dried stem bark of the plant *Crataeva nurvula* have been found to possess significant anti fertility effects in rats. Both ethanol and aqueous extracts exhibited partial and complete resorption of implants at 300 and 600 mg/kg b.wt dose levels, respectively. In estrogenic activity study, both the extracts increased uterine weight and caused opening and cornification of vagina in immature rats[17].

13. Papaya, *Carrica papaya* **(**CARICACEAE) [Fig.13]

Aqueous extracts and benzene extracts given orally to female rats causes infertility and irregular oestrous cycles. Ethanol seed extract decreases sperm motility, testis mass and sperm count. Studies with aqueous seed extracts also decreased fertility in male rats. The fertility of the male and female rats returned to normal after withdrawal of treatments[18].

14. Snake gourd, *Trichosanthes cucumerina* **(**CUCURBITACEAE) [Fig.14]

It is one of the commonly used vegetables in south India. The ethanol extract of *T. cucumerina* at the doses 200 and 400 mg/kg body weight affected the normal oestrous cycle showing a significant increase in estrus and metestrus phase and decrease in diestrus and proestrus phases. The extract also significantly reduced the number of healthy follicles and corpora lutea and increased the number of regressing follicles. Serum FSH and LH levels were significantly reduced in the treated group. In acute toxicity test, neither mortality nor change in the behavior or any other physiological activities in mice were observed in the treated groups. In chronic toxicity studies, no mortality was recorded and there were no significant differences in the body and organ weights were observed between controls and treated rats[19].

15. Muktajhuri, *Acalypha indica* (EUPHORBIACEAE) [Fig. 15]

Four successive solvent extracts of the whole plant *Acalypha indica* were tested for post-coital antifertility activity in female albino rats. Of these, the petroleum ether and ethanol extracts were found to be most effective in causing significant antiimplantation activity. The antifertility activity was reversible on withdrawal of the treatment of the extract. Both the extracts at 600 mg/kg body weight showed oestrogenic activity[20].

16. Tree spinach, *Chidoseolous aconitifolius* (EUPHORBIACEAE) [Fig. 16]

Phytochemical screening of the extract revealed the presence of alkaloids, saponins, phenolics, tannins, flavonoids, anthraquinones, phlobatannins and triterpenes. Administration of the extract produced significant increase ($p<0.05$) in the serum prolactin concentration whereas those of estradiol, progesterone, follicle stimulating and luteinizing hormones were significantly reduced. The alterations in the female rat reproductive hormones by the extract are indications of adverse effect on the maturation and ovulation of follicles. Consequently, the extract may impair fertility and conception in female rats. Thus, the *Chidoscolous aconitifolius* leaf extract may be explored as a female contraceptive[21].

17. Bhutala, *Croton roxburghii* (EUPHORBIACEAE) [Fig. 17]

Treatment of *C. roxburghii* extract arrested the normal estrus cycle of adult female mouse at diestrus stage and reduced the wet weight of ovaries significantly. Cholesterol and ascorbic acid content in ovaries of crude extract-treated mice were significantly elevated. The significant inhibition ofΔ^{5}-3β-hydroxysteroid dehydrogenase (Δ^{5}-3β- HSD) and glucose-6- phosphate dehydrogenase (G-6-PDH), the two key enzymes involved in ovarian steroigenisis, were also observed in mouse after 18 days of treatment. Normal estrus cycle and ovarian steroidogenisis were restored after withdrawal of treatment[22].

18. Goonj, *Abrus precatorius* (FABACEAE) [Fig. 18]

A. precatorius is one of the folk medicinal plants widely used as an antifertility agent in various places of Pakistan. The intraperitoneal administration of 20 and 60 mg/kg of ethanolic seed extract of *A. precatorius* caused a decrease in daily sperm

production. The reversibility in sperm production was observed in all the treated animals after 20 days of withdrawal of treatment. Jahan[23] suggests that the role of seed extract of *A.precatorius* as an Antifertility agent or contraceptive with a risk of DNA damage in spermatozoa and may lead to teratogenic effects.

19. Golden shower, *Cassia fistula* (FABACEAE) [Fig.19]

Cassia fistula suppresses fertility in male rats. Oral administration of petroleum ether extract of *Cassia fistula* to mated female rats on days 1-5 of pregnancy resulted in a decline in the fertility index, numbers of uterine implants and live fetuses in a dose dependent manner as was confirmed by laparotomy on day 15 day of pregnancy. The extract (100mg/kg b.wt.) exhibited weak estrogenic activity when given alone and tested in immature bilaterally ovariectomized female albino rats, It indicates that the petroleum ether extract of *Cassia fistula* seeds possesses pregnancy terminating effect by virtue of antiimplantation activity[24,25].

20. Calliandra brevipes, *Derris brevipes* (FABACEAE) [Fig.20]

The ethanolic extract of *Derris brevipes* exhibited 40% antiimplantation activity, when given orally at 600mg/kg body weight. The rats, which continued their pregnancy, did not deliver any litters after their full term. Hence, the combined antifertility (antiimplantation and abortifacient) activity of the ethanolic extract was 100 percent[26].

21. Common sesban, *Sesbania sesban* (FABACEAE) [Fig. 21]

The different doses of *Sesbania sesban* seed powder inhibit the ovarian function, change the uterine structure and prevent the implantation, thus, control the fertility of female albino rats. The root extracts of *Sesbania sesban* showed oleanolic acid 3-β-D-glucuronide spermicidal activity [27].

22. Fenugreek, *Trigonella foenum graecum* (FABACEAE) [Fig.22]

The biochemical parameters *viz*., protein, sialic acid, glycogen and ascorbic acid were reduced in ovary and uterus; however the concentration of cholesterol was increased in ovary and uterus; however the concentration of cholesterol was increased in ovary and uterus after fenugreek treatment. *T.foenum-graecum* seeds extract exerts antiestrogenic and antifertility activity in female rats[28].

23. Hore hound, *Ballota undulate* (LABIATAE) [Fig.23]

Long term treatment with *Ballota undulate* might lead to diversified negative effects on fertility and pregnancy in female rats[29].

24. Indian squirrel, *Colebrookia oppositofolia* (LAMIACEAE) [Fig. 24]

Oral feeding of male rats with the ethanolic leaf extract of *Colebrookia oppositifolia* at dose levels of 100 and 200 mg/kg for 8-10 weeks did not cause body weight loss, while the weights of testes and epididymides were significantly decreased. Seminal vesicles and ventral prostate showed a significant reduction at the higher dose only. Treated animals showed a notable depression of spermatogenesis[30].

25. Pudina, *Mentha arvensis* (LAMIACEAE) [Fig.25]

In male albino mice, the petroleum ether extract of the leaves of *Mentha arvensis* L., at the doses 10 and 20 mg/mouse per day for 20, 40 and 60 days, when administered orally, showed a dose and duration dependent reduction in the number of offspring of the treated male mated with normal females. Negative fertility was observed in both dose regimens after 60 days of treatment. The petroleum ether extract of the leaves of *M. arvensis* possess reversible antifertility property without adverse toxicity in male mice[31].

26. Tulasi, *Ocimum gratissimum* (LAMIACEAE) [Fig. 26]

Ocimum gratissimum is widely used in folk medicine for several conditions because of its high medicinal value and therefore calls for its toxicological screening. *O. gratissimum* caused no significant effect on the serum levels of the hormones studied. However, sperm count and motility were decreased, while the percentages of abnormal sperm cells, sperm debris and primordial cells were increased dose and time-dependently[32].

27. Nirmali, *Strychnos potatorum* (LOGANIACEAE) [Fig. 27]

The treatment of *S. potatorum* extract did not bring any body weight loss, whereas, the weight of testes, epididymides, seminal vesicle and ventral prostate were decreased significantly. Reduced sperm count and motility resulted in suppression of fertility by 91.81%. *Strychnos potatorum* seed possesses suppressive effects on male fertility and could be useful in development of male contraceptive agent. However further studies are needed[33].

28. Onion, *Allium cepa* (LILLIACEAE) [Fig. 28]

The ethanolic extract of *Allium cepa* showed significant antifertility activity pretreatment with ethanolic extract showed significant inhibition of

number of implant site at a dose of 300 mg/kg. There was no change in ovulation, hence the antifertility activity observed in the present study with *Allium cepa* can be attributed largely to its antiimplantation activity[34].

29. Honey suckle mistletoe, *Dendrophthoe fallata* **(**LORANTHACEAE) [Fig.29]

Analysis of vaginal smears revealed that all animals were cycling, although the length of the diestrus was longer in *Dendrophthoe fallata* extract treated groups. In post coital testing, the extract was found to be more effective in causing significant antiimplantation activity and reduction in the number of litters born. The extract also exhibited weak estrogenic activity when given alone, and when ethinyl estradiol, it exhibited slight antiestrogenic activity in immature ovariectomized rats. All observation suggests that the extract has antifertility effect and it safe at effective doses employed in the study[35].

30. Neem, *Azadirachta indica* **(**MELIACEAE) [Fig. 30]

The seed oil of *Azadirachta indica* is used in traditional medicine for its antidiabetic, spermicidal, antifertility, antibacterial, and wound healing properties. There was a significant reduction in the number of normal single layered follicles and follicles in various stages of follicular development in treatment with *A. indica*[36].

31. Malai Vembu, *Melia azadarach* (MELIACEAE) [Fig. 31]

Average number of embryos and implantation losses in the pregnant animals treated with *M. azadarach* seed extract was also studied. Pre-implantation, post-implantation and total prenatal mortalities were increased in rats treated with seed extract during early ($D_1 - D_7$) and late (D_7-D_{18}) stages of gestation period at dose of 5,10 and 20 mg kg^{-1} body wt day^{-1}. Thus, in conclusion, the application of this plant extract in rodent control programme may help to elevate the socioeconomic status of the society [37].

32. Abuta, *Cissampelos pareira* **(**MENISPERMACEAE) [Fig. 32]

Cissampelos pareira is one of the folk medicinal plants commonly used as antifertility agent in some places of India. *Cissampelos pareria* leaf extract, when administered orally, altered the oestrous cycle pattern in female mice, prolonged the length of oestrous cycle with significant increase in the duration of diestrus stage and reduced significantly the number of litters in albino mice. The analysis of the principal hormones involved in oestrous cycle regulation showed that the plant extract altered gonadotropin release (LH, FSH and prolactin) and estradiol secretion. The oral LD_{50} of the extract was found to be 7.3 g/kg in mice[38].

33. Lotus, *Nelumbo nucifera* **(**NELUMBONACEAE) [Fig. 33]

Nelumbo nucifera has been used as antifertility agent in females by the local tribals of Rajasthan, India. Oral administration of *N. nucifera* extract brought about a significant decline in the weight of ovary, protein and glycogen level, however cholesterol level increased significantly. In addition, the dioestrous phase of the oestrous cycle was found to be prolonged. These results suggest that *N. nucifera* has the anti-estrogenic nature without altering the general physiology of the female rats[39].

34. Devils's claws, *Martynia annua* **(**PEDALIACEAE) [Fig. 34]

Significant decreases in the weights of testes, epididdymides, seminal vesicle and ventral prostate were observed in ethanol extract of *Martynia annua* root treated animals. A dose related reduction in the testicular sperm count, epididymal sperm count and motility, number of fertile males, ratio between delivered and inseminated females and number of pups were observed. Significant reduction in serum concentration of luteinizing hormone and testosterone were observed. It is concluded that the 50% ethanol extract of *M.annua* root produced dose related effects on male reproduction without altering general body metabolism[40].

35. Betel pepper, *Piper betle* **(**PIPERACEAE) [Fig. 35]

P.betel extract treatment caused reduction in reproduction organ weight, circulating level of estrogen, fertility, number of litters, serum glucose concentration, enzyme activity of acid phosphatase, SGOT and SGPT as compared to control value. The estrus cycle was irregular and prolonged in treated group of rats indicative of anestrus condition, which resulted in infertility. The data suggests that the *P. betel* ethanolic extract exerted antifertility and antiestrogenic effects in female rats. The effects brought by *P.betle* extract is non-toxic and transient[41].

36.Long pepper, *Piper longum* **(**PIPERACEAE) [Fig. 36]

A 10 mg dose of piperine treatment caused a significant reduction in the weights of testis and accessory sex organs. Histological studies revealed that piperine at a 10 mg dose, it caused severe damage to the semiferous tubule, decrease in seminiferous tubular and leydig cell nuclear diameter and desquamation of spermatocytes and spermatids. A 10

mg dose of piperine also caused a marked increase in serum gonadotropins and a decrease in intratesticular testosterone concentration, despite normal serum testosterone titres[42].

37. Black pepper, *Piper nigrum* (PIPERACEAE) [Fig. 37]

In mice treated with 100mg dose for 90 days, degenerative changes were observed in all the tubules. Affected seminiferous tubules showed intraepithelial vacuolation, loosening of germinal epithelium, occurrence of giant cells, and mixing of spermatids of different stages of spermatogenesis; in severe cases, the tubules were lined by mainly a layer of sertoli cells. The treatment also had adverse effects on sperm parameters, levels of sialic acid and fructose, and on litter size[43].

38. Knot weed, *Polygonum hydropiper* **(**POLYGONACEAE) [Fig. 38]

Polygonum hydropiper is a wile plant found in Assam, a North-Eastern province of India. Tradition prevails among the folk women of Assam to use the root of this herb for fertility control. Adult cycling female rats were administered through oral route the crude root extract at a dose of 1g/kg body weight/day for 12 days. On termination of treatment the rats were allowed to mate with males and to complete the full term of gestation. The oestrous cycle of the extract treated rats became irregular, resulting in failure of gestation. The oestrous cycle was restored following the recovery period. However, the number of newborn pups was significantly lesser than in the controls. The results reveal that the root of *polygonum hydropiper* contains steroidal/estrogenic compounds which can affect the female reproduction in rat[44].

39. Tult, *Rumex steudelii* **(**POLYGONACEAE) [Fig.39]

The methanolic extract of the roots of this plant were investigated for their antifertility activity in female rats and oral LD_{50} was determined in mice. The extract reduced significantly the number of litters. It also produced antifertility effect in a dose dependent manner and the contraceptive effect was manifested for a define period of time. Furthermore, the extract prolonged significantly the estrus cycle and the dioestrous phase of the rats. The oral LD_{50} of the extract was found to be 5g/kg in mice. Thus, the extract has antifertility effect[45, 46].

40. Sour Chinese date, *Zizyphus jujube* **(**RHAMNACEAE) [Fig.40]

Z. jujube extract arrested the normal estrus cycle of adult female mouse at diestrus stage and reduced the wet weight of ovaries significantly. Cholesterol and ascorbic acid content in ovaries of crude extract-treated mice were significantly elevated. The significant inhibition of Δ^5-3β- hydroxysteroid dehydrogenase (Δ^5-3β- HSD) and glucose-6-phosphate dehydrogenase (G-6-PDH) in extract treated mice[22].

41. Bilva, *Aegle marmaelos* **(**RUTACEAE) [Fig. 41]

The *Aegle marmelos* has effects on male rat reproduction, affecting the sexual behavior and epididymal sperm concentration[47].

42. Common rue, *Ruta graveolens* **(**RUTACEAE) [Fig.42]

The *Ruta graveolens* is currently used by the Jordanian populations systemically for its antispasmodic, diuretic, sedative, and analgesic effects and externally for its antirheumatic effect. The aqueous extracts of *Ruta greveolens* solution was fed orally to male albino rats at a dose of 500 mg/kg body weight for 60 days decreases the sperm motility and density in cauda epidydimides and testicular ducts. Treated rats testicular cell population showed a decrease in number of spermatocytes and spermatids. Serum hormonal assay indicates a decrease in testosterone and follicular stimulating hormone levels in treated rats[48].

43. Brahmi, *Bacopa monnieri* **(**SCROPHULARIACEAE) [Fig.43]

The oral treatment of brahmi causes reduction in motility, viability, morphology, and number of spermatozoa in cauda epididymis. Histologically, testes in mice treated with the plant extract showed alterations in the semiferous tubules, and the alterations included intraepithelial vacuolation, loosening of germinal epithelium, and exofoliation of germ cells and occurrence of giant cells. The treatment had no effect on levels of testosterone, alanine aminotranferase and creatinine in blood serum, hematological parameters and on liver and kidney histoarchitecture. Brahmi treatment causes reversible suppression of spermatogenesis and fertility, without producing apparent toxic effects [49].

44.Witches weed, *Striga orobanchioides* (SCROPHULARIACEAE) [Fig. 44]

Graded doses of these compounds *viz.,* apigenin and luteolin isolated from *S. orobanchioides* when administered from day 1to 4 of pregnancy shows dose-dependent and significant antiimplantation activity[50].

45. Perumaram, *Ailanthus excella* (SIMARAUBACEAE) [Fig.45]

Hydroalcoholic extract treatment showed a strong antiimplantation (72%) and abortifacient activity

(56%). The extract shows furthermore, significant ($P<0.05$) increase in uterine weight in immature ovariectomised rats. Simultaneous administration of extract with ethinyl estradiol cause significant antiestrogenic activity. All these observations suggest that hydroalcoholic extract of *A. excella* has antifertility effect[51].

46. Surinam wood, *Qussia amara*
(*SIMAROUBACEAE*) [Fig. 46]

The methanolic extract of the bark of *Q. amara* causes several derangements in the cauda epididymidal sperm including a hither to unreported one [52].

47. Ground cherry, *Physalis alkengi*
(SOLANACEAE) [Fig.47]

P. alkekengi has been used as an abortive plant in Iranian traditional medicine for many years. Administration of *P. alkekengi* extract on days 1 to 5 pregnancy significantly decreases the number of implantation sites number and weight of neonates[53].

48. Desert date, B*alanites roxburghii*
(ZYGOPHYLLACEAE) [Fig.48]

Ethanol extract treatment of *B. roxburghii* causes significant abortifacient activity. The antifertility activity was found to be dose dependent and reversible on withdrawal of the treatment. The histological studies of the uterus and ovary were carried out to confirm the estrogenic activity. Acute toxicity studies of the crude extracts in mice revealed the non-toxic nature of the crude extracts[54].

49. Caster manjal, *Curcuma aromatica*
(ZIGIBERACEAE) [Fig.49]

The ethanolic and aqueous extract of *C. aromatic* at two different doses of 200 mg/kg $^{-1}$ and 400 mg/ kg $^{-1}$b.w. prevents the pregnancy. The aqueous extract is found to possess more significant antifertility activity compared to alcoholic extract[55].

50. Haldi, *Curcuma longa* (ZINGIFERACEAE) [Fig.50]

Rhizome of *Curcuma longa* and seeds of *Carum carvi* a folk medicinal plant used as have antifertility potentials. The female albino rats after oral administration of different doses of aqueous and ethanolic extracts of *Carum carvi* and *Curcuma longa,* showes a significant antifertility activity[9, 56].

Table. 1. List of medicinal plants with their antifertility activity.

S.No	Common Name	Botanical Name	Family	Plant Parts used
Antioestrogenic activity				
1.	Turmeric	*Carum carvi*	Apiaceae	Rhizome
2.	Wild carrot	*Daucus carota*	Apiaceae	Dry seed
3.	Varuna	*Crataeva nurvala*	Capparidaceae	Stem bark
4.	Papaya	*Carica papaya*	Caricaceae	Fruits, seeds
5.	Mukajhuri	*Acalypha indica*	Euphorbiaceae	Whole plant
6.	Bhutala	*Croton roxburghii*	Euphorbiaceae	Bark
7.	Fenugreek	*Trigonella foenum gracum*	Fabaceae	Seed
8.	Honey suckle mistletoe	*Dendrophthoe falcate*	Loranthaceae	Aerial parts
9.	Abuta	*Cissampelos pareira*	Menispermaceae	Leaves
10.	Lotus	*Nelumbo nucifera*	Nymphaeaceae	Seeds
11.	Betel pepper	*Piper betel*	pedaliaceae	Petiol
12.	Knot weed	*Polygonum hydropiper*	Polygonaceae	Root, Powder
13.	Sour Chinese date	*Zizyphus jujuba*	Rhamnaceae	bark
14.	Caster	*Curcuma aromatic*	Zingiberaceae	Rhizome
15.	Haldi	*Curcuma longa*	Zingiberaceae	Rhizome
Antiimplantation activity				
1.	Aaghada	*Achyranthus aspera*	Amranthaceae	Root
2.	Papaya	*Carica papaya*	Caricaceae	Fruits, seeds
3.	Common sesban	*Sesbania sesban*	Fabaceae	Seeds
4.	Golden shower	*Cassia fistula*	Fabaceae	Pods, seeds
5.	Calliandra brevipes	*Derris brevipes*	Fabaceae	Powder root
6.	Hore hound	*Ballota undulate*	Labiatae	Leaves, flower
7.	Onion	*Allium cepa*	Liliaceae	Bulb
8.	Honey suckle mistletoe	*Dendrophthoe falcate*	Loranthaceae	Aerial parts
9.	Malai vembu	*Melia azedarach*	Meliaceae	Seed

10.	Ground cherry	*Physalis alkekengi*	Piperaceae	Plants
11.	Witches weed	*Striga orobanchioides*	Scrophulariaceae	plant
12.	Perumaram	*Ailanthus excelsa*	Simaroubaceae	Leaf, stem,
Abortifacient activity				
1.	Aaghada	*Achyranthus aspera*	Amranthaceae	Root
2.	Calliandra brevipes	*Derris brevipes*	Fabaceae	Powder root
3.	Honey suckle mistletoe	*Dendrophthoe falcate*	Loranthaceae	Aerial parts
4.	Perumaram	*Ailanthus excelsa*	Simaroubaceae	Leaf, stem, bark
5.	Desert date	*Balanites roxburghii*	zygophyllaceae	Fruits
Contraception activity				
1.	Sage leaf alangium	*Alangium salvifolium*	Alangiaceae	Stem bark
2.	Wild caper	*Capparis aphylla*	Capparidaceae	
3.	Thunder god vine	*Tripterygium wilfordii*	Celastraceae	Root
4.	Thunder god vine	*Tripterygium wilfordii*	Celastraceae	Root
5.	Tree spinach	*Cnidoscolous aconitifolius*	Euphorbiaceae	Leaves
6.	Goonj	*Abrus precatorius*	Fabaceae	Seeds
7.	Pudina	*Mentha arevensis*	Lamiaceae	Leaves
8.	Nirmali	*Strychnos potatorum*	Loganiaceae	Seed
9.	Tult	*Rumex steudeli*	Polygonaceae	Root
10.	Desert date	*Balanites roxburghii*	zygophyllaceae	Fruits
11.	Ylang	*Cananga odorata*	Annonaceae	Root, bark
12.	Cumin	*Cuminum cyminum*	Apiaceae	Seed
13.	Yarrow	*Achillea millefolium*	Asteraceae	Flowers
14.	Goonj	*Abrus precatorius*	Fabaceae	Seeds
15.	Tulasi	*Ocimum gratissimum*	Labiataceae	Leaves
16.	Indian squirrel tail	*Colebrookia oppositifolia*	Lamiaceae	leaf
17.	Neem	*Azadirachta indica*	Meliaceae	Seed
18.	Devils claws	*Martynia annua*	Pedaliaceae	Roots
19.	Long pepper	*Piper longum*	Piperaceae	Seed
20.	Black pepper	*Piper nigrum*	Piperaceae	Fruit powder
21.	Bilva	*Aegle marmelos*	Rutaceae	Leaf
22.	Common rue	*Ruta graveolens*	Rutaceae	plant powder
23.	Brahmi	*Bacopa monnieri*	Scrophulariaceae	plant
24.	Surinam wood	*Quassia amara*	Simaroubaceae	bark, leaves
Antiostrogenic activity				
1.	Mukajhuri	*Acalypha indica*	Euphorbiaceae	Whole plant
2.	Vendayam	*Trigonella foenum gracum*	Fabaceae	Seed
3.	Honey suckle mistletoe	*Dendrophthoe falcate*	Loranthaceae	Aerial parts
4.	Lotus	*Nelumbo nucifera*	Nymphaeaceae	Seeds
5.	Betel pepper	*Piper betel*	pedaliaceae	Petiol
Antiovulatory activity				
1.	Haemorrhage plant	*Aspilia Africana*	Asteraceae	Leaves
2.	Dhak-ki-be	*Rivea hypocrateriformis*	Convolvulaceae	Aerial parts.
3.	Snake gourd	*Trichosanthus cucumerina*	Cucurbitaceae	Plant


Fig.1:*Alangium salvifolium*


Fig.2:*Achyranthes aspera*


Fig.3: *Cananga odorata*


Fig.4: *Carum carvi*


Fig.5:*Cuminum cyminum*


Fig.6: *Daucus carota*


Fig.7:*Achillea millefolium*


Fig.8:*Aspilia Africana*


Fig.9:*Tripterygium wilfordii*


Fig.10:*Rivea hypocrateriformis*


Fig.11:*Capparis aphylla*


Fig.12:*Crataeva nurvala*


Fig.13:*Carrica papaya*


Fig.14:*Trichosanthes cucumerina*


Fig.15:*Acalypha indica*


Fig.16:*Chidoseolous aconitifolius*


Fig.17:Croton roxburghii


Fig.18:Abrus precatorius


Fig.19:Cassia fistula

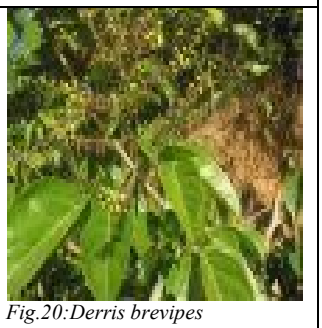
Fig.20:Derris brevipes


Fig.21:Sesbania sesban


Fig.22:Trigonella foenum graecum


Fig.23:Ballota undulate


Fig.24:Colebrookia oppositofolia


Fig.25:Mentha arvensis


Fig.26:Ocimum gratissimum


Fig.27:Strychnos potatorum


Fig.28: Allium cepa


Fig.29:Dendrophthoe fallata


Fig.30:Azadirachta indica


Fig.31:Melia azadarach


Fig.32:Cissampelos pareira


Fig.33:Nelumbo nucifera

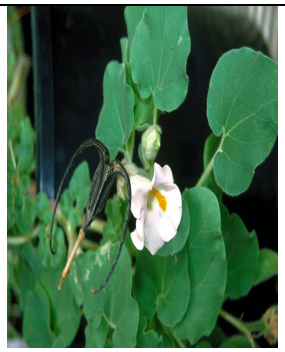
Fig.34:Martynia annua


Fig.35: Piper betle


Fig.36: Piper longum


Fig.37: Piper nigrum


Fig.38:Polygonum hydropiper

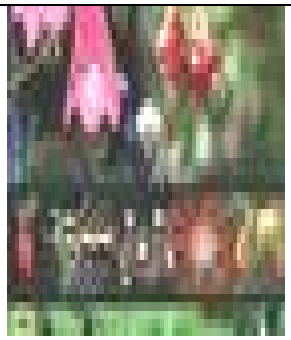
Fig.39:Rumex steudelii


Fig.40:Zizyphus jujube


Fig.41:Aegle marmaelos

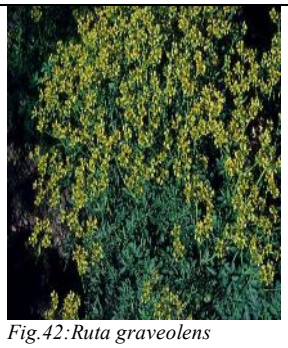
Fig.42:Ruta graveolens


Fig.43:Bacopa monnieri


Fig.44:Striga orobanchioides


Fig.45:Ailanthus excella


Fig.46:Qussia amara


Fig.47:Physalis alkengi


Fig.48:Balanites roxburghii


Fig.49:Curcuma aromatica


Fig.50:Curcuma longa

CONCLUSION: The list of medicinal plants used as antifertility agents presented in this review is useful to researchers, as well as practitioners. This list is best used only as a preliminary screening of potential antifertility plants, not as a definitive or complete list of antifertility plants.

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