



E-ISSN: 2278-4136

P-ISSN: 2349-8234

<http://www.phytojournal.com>

JPP 2023; 12(2): 190-198

Received: 05-12-2022

Accepted: 12-01-2023

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Potential antifertility and antimicrobial activities of plants used in traditional medicines: A review

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DOI: <https://dx.doi.org/10.22271/phyto.2023.v12.i2c.14650>

Abstract

Population explosion is a main cause of poverty, health problems, pollution and illiteracy across the world especially in developing countries like India. Nature always has been a source of remedies, many plants and their products have been used in modern pharmacopeia to control and manage different kinds of diseases. A number of traditional medicinal plants extracts have been explored to evaluate effects on fertility in male and female animals and some of them have promising antifertility effects, since synthetic, hormonal and other contraceptives available for fertility control have some drawbacks and side effects in users. Survey of literature enumerates those medicinal plants which show antifertility and antimicrobial properties. In present review we aim to provide information about different medicinal plants with their botanical names, common names and name of their family those have been reported with their antifertility and antimicrobial activities.

Keywords: Population, antifertility, antimicrobial, medicinal plant

Introduction

Now-a-days world's population cross the mark of 7.96 billion and in near future India will be most populous country in the world, global population has been reached at an alarming rate, since uncontrolled population growth causing a deteriorating effect on surrounding environment, socio-economic growth and poverty reduction in underdeveloped countries leading to threaten mankind existence. An emerging solution for this problem is to check fertility and birth rate for sustainable development^[1].

Health organizations, pharmaceutical companies are some resources which provide financial support for pursuing research towards new contraceptive approaches. A large number of contraceptive methods and options are available in market mostly for women, but contraception for male is still an issue. Chemical agents known so far for male contraception have a lot of side effects like spermatogenic arrest which causes irreversible sterility. Conventional medicine discovered and used for females had some unwanted and troublesome effects like obesity, cholelithiasis, gastric trouble and carcinoma of breast and cervix, asthma and venous thromboembolism^[2]. It was of utmost concern to develop a fertility regulating agent from plant origin which is ecofriendly and interferes with natural patterns of Reproduction.

To check population explosion can be done mainly by 3 measures includes-1- prevent or end pregnancies, 2- Inhibit fertilization of ovum by sperm cell [contraception] or Inhibit implantation of blastocyst [Contraception] and 3-Induced abortion of developing embryo by chemical or surgical methods^[3]. In India there is a large number of medicinal plant which shows antifertility activity. A number of surveys are conducted on medicinal plants by local population in different parts of the world. Several plant species explored and reported as antifertility potential like antispermatogenic, antiimplantation, abortifacient, oestrogenic and spermicidal activities^[4]. Traditional medicine is defined by the World Health Organization (WHO) as the body of knowledge, skills, and practices based on theories, beliefs, and experiences that are indigenous to various cultures and are used to maintain health as well as to prevent, diagnose, treat, and improve physical and mental disorders. Traditional medicinal plants continue to be utilized to treat a wide range of ailments and complaints and have played a significant role in improving global health^[93].

Since no information available on herbal contraceptives with reversibility to provide protection or maintain gap to check birth rate, so can be used during reproductive period. A novel herbal contraceptive mode of action should be on daily basis that can have a cumulative effect in body to prevent conception in future. For its effective action, barrier method should be employed^[2].

Ethanol extract of *Martynia annua* root caused antifertility effects in female rats due to suppression of testicular and epididymal sperm counts and reduced level of LH and testosterone [5].

Since ancient times, plants were used in folk medicine traditionally to prevent and cure diseases and therapeutics. A number of medicinal plants used in modern pharmacopeia potentially to antimicrobial properties. Plant extracts have been using in several medical systems to treat a variety of human illnesses as well as viral and fungus diseases. The therapeutic properties of medicinal plants are highly valuable, and they have significant potential to heal infectious disorders brought on by virulent microorganisms [94]. Although drugs prepared from plant origin are a new promising future in the direction of research. Secondary metabolites, antioxidants are some natural bioactive compounds which are present in plants. So it is desirable to use plant extract as antimicrobial agents [6]. Antimicrobials of plant origin have no side or adverse effects and an enormous therapeutic potential to cure or healing infectious diseases. The WHO [World Health Organization] considers phytotherapy in its programmes and also encourages basic procedures for validation of drugs which are of plant origin [7]. Several mushroom species are considered to have functional nutrients used for health benefits and nutritional value. Properties of mushrooms are like antioxidant, antimicrobial, DNA protective, analgesic, anti-inflammatory, cytotoxic, antiviral, anti-cancer, anti-parasitic, immunomodulation effects and hepatoprotective activity [8]. In addition to medicinal plants, some spices are also of specific importance in control of health problems and pathogenic diseases [9].

Plants caused Antifertility Activity in animals: Table 1: List of plants having antifertility potential in different animals

Hibiscus rosa-sinensis

The plant *Hibiscus rosa-sinensis* is belongs to family Malvaceae and also known as Gudhal. It contains steroids, tannins, saponins and flavonoids, cused antispermatic and antiandrogenic activity [1].

Andrographis paniculata

It is commonly known as Kirayat, belongs to family Acanthaceae. Active constituents are flavonoids, diterpenoids, phenylpropanoids, oleanolic acid. It causes termination of spermatogenesis, deterioration of seminiferous tubules and regression of Leydig cells [1].

Gossypium herbaceum

It belongs to family Malvaceae and known as Levant cotton. Chemical components include gossypol, sugar, gums, tannins and fixed oil. It induces azoospermia, oligospermia and inhibits sperm motility, decreases level of serum testosterone [1].

Butea monosperma

It belongs to family- Fabaceae, Common name- Flame of forest, Dhak. It constitute glucose, glycine, glycoside and aromatic hydroxyl compound. Reductions in the weight of ovary and anti-steroidogenic activity are observed by treating with plant extract [1].

Tinospora cordifolia

Family- Menispermaceae, commonly known as Giloya. It consists of antispasmodic, anti-inflammatory, anti-allergic,

anti-diabetic, antioxidant properties. Chemical constituents are alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides. Its 70% methanolic extract showed decrease in weight of testis, seminal vesicles, epididymis, ventral prostate and reduction in sperm motility and sperm density [4].

Curcuma longa

It belongs to family Zingiberaceae and also commonly known as Haldi, turmeric, Indian saffron used as house hold remedies for different kinds of actions. It is traditionally used as antibiotic, antimutagenic and anticancerous properties. It affects spermatogenesis and fertility in animals. Antisteroidogenic effects caused by curcumin treatment due to inhibition of 5 α -reductase [10].

Barleria prionitis

It belongs to Family- Acanthaceae, commonly known as Vajradanti. Its aerial parts [stem, leave & flower] used in fever, toothache and inflammation, antibacterial and anti-inflammatory activities also reported. Methanolic extract of roots of *Barleria prionitis* reduced sperm motility and density of cauda epididymis [11].

Aegle marmelos

It belongs to family Rutaceae and commonly known as Bael, contains constituents are skimianinc, sterol, aegelin, marmolosin, alkaloids and coumarins. Used in diarrhoea, dysentery, dyspepsia, stomachalgia. Hypoglycemic and antidiabetic activities are expressed by alcoholic extracts of the roots and fruits. Decreased testicular sperm count, epididymal sperm count and motility, and abnormal sperm count of the extract of *Aegle marmelos* have been reported [12].

Azadirachta indica

It belongs to family Meliaceae and also known as Neem. Seed oil of Neem is used as anti-diabetic, spermicidal, anti-fertility, anti-bacterial [13].

Nelumbo nucifera

Its common name is Indian Lotus and belongs to family Nelumbonaceae. Oral administration of *N. nucifera* extract caused decrease in weight of ovary, protein, and glycogen level and antiestrogenic effects in animals [13].

Carica papaya

It is commonly known as papaya and belongs to family Caricaceae. Active constituent papain induces teratogenic effects and antiovolatory activity in rats [14].

Momordica charantia

It belongs to family Cucurbitaceae and also commonly known as Bitter melon, Karela. Its active constituents includes steroids, triterpenoids, reducing sugars, alkaloids, phenolic compounds and flavonoids. The methanolic extract of seeds caused disturbances in the estrous cycle [15].

Aloe barbadensis

It is commonly known as Aloe vera and belongs to family Asphodelaceae. Evaluation of its plant extract revealed its antiimplantation, abortifacient and antiestrogenic activities [16].

Mentha arvensis

It is commonly known as Pudina, belongs to family-Lamiaceae. Treatment with petroleum ether extract of *Mentha arvensis* leaves in male albino mice caused antifertility reduced litter size [18].

Polygonum hydropiper

It is commonly called Knot weed and belongs to family Polygonaceae. Steroidal compounds of root extract of *P. hydropiper* can affect the female reproduction in rat [60].

Cassia fistula

It is commonly known as Golden shower and Amaltas. It belongs to family Caesalpiniaceae. It shows the presence of anthroquinone glycosides, flavonoids, phenolic compounds. It exhibits anti-estrogenic activity [62].

Bacopa monnieri

Its common name is Brahmi and belongs to family Plantaginaceae. Reversible suppression of spermatogenesis and fertility are affected by oral treatment of its plant extract [68].

Colebrookea oppositifolia

Common name - Indian squirrel, Family- Lamiaceae. Ethanolic extract of leaves causes decrease in weight of testes and epididymis. Treated animals showed depression in spermatogenesis [71].

Martynia annua

Plant *Martynia annua* is commonly called Devil's claws, Family- Pedaliaceae. Ethanolic extract of root treatment in rats decreased in the weight of testes, epididymis, reduction in sperm count and motility [74].

Tripterygium wilfordii

Commonly known as Thunder god wine, belongs to family Celastraceae. The active compound triptolide and other isolated ingredients induce complete infertility in the adult rats [78].

Acalypha indica

Its common name is Muktajhuri and belongs to family Euphorbiaceae. Solvent extract of whole plant with petroleum ether and ethanol extracts caused significant antiimplantation activity [79].

Crataeva nurvala

Its common name Varuna and belongs to family Cappariaceae. Ethanol and aqueous extracts of the dried stem bark showed antifertility effects in rats. It causes increased uterine weight and cornifications of vagina by extracts of the stem bark in immature rats [80].

Croton roxburghii

Its common name is Bhutala and belongs to family Euphorbiaceae. It showed significant decrease in wet weight of ovaries and arrested normal estrus cycle when treated with plant extract [81].

Piper longum

It is commonly known as Long pepper and belongs to family Piperaceae. Treatment of its active constituent Piperine markedly reduced weight of testis and accessory sex organs,

severely damaged seminiferous tubules and significant increase in serum gonadotropins [82].

Physalis alkekengi

Its common name is Ground cherry and belongs to family Solanaceae. Decrease in number of implantation sites and weight of neonates are observed by administration of plant extract [83].

Trigonella foenum graecum

Common name – Fenugreek, Methi, Family Fabaceae. Antiestrogenic and antifertility in female rats are exerted by seed extract. [84]

Melia azedarach

Its common name is Malai vembu and belongs to family Meliaceae. Treatment with Seed extract of this plant are observed to cause Pre-implantation, post implantation and total prenatal mortalities [85].

Balanites roxburghii

Its common name is Desert date and belongs to family Zygophyllaceae. Ethanol extract of *Balanites roxburghii* treatment caused abortifacient activity, reversible and dose dependent effects were observed in antifertility activity [86].

Allium cepa

Its common name is Onion and belongs to family lilliaceae. Ethanolic extract causes significant antiimplantation activity [87].

Achyranthes aspera

Commonly known as Aghada, belongs to family Amaranthaceae. Ethanol extract of the root causes antiimplantation activity in female albino rats [88].

Sesbania sesban

Its common name is Sesban and belongs to family Fabaceae. Seed powder found to cause changes in uterine structure, inhibit ovarian function and prevent the implantation [89].

Piper betle

Its common name is Betel pepper and belongs to family Piperaceae, its ethanolic extract treatment reduced reproductive organ weight, circulating level of estrogen, fertility and litter size [90].

Curcuma aromatic

Its common name is Caster manjal and belongs to family Zingiberaceae. Ethanolic and aqueous extract causes prevention of pregnancy and aqueous extract causes more antifertility effect [91].

Zizyphus jujube

Its common name is Sour Chinese date and belongs to family Rhamnaceae. Treatment with plant extract to adult female mouse arrested the normal estrus cycle at diestrus stage and caused reduction in wet weight of ovaries [92].

Antimicrobial Activity of the Plants: Table 2: List of plants having Antimicrobial potential***Melaleuca alternifolia***

Its common name is tea tree and belongs to family Myrtaceae, have antibacterial as well as antifungal activity. Essential oil

of this plant causes more sensitivity to gram positive bacteria than gram negative bacteria and fungi ^[19].

Zingiber officinale

Common name- Ginger, Family- Zingiberaceae. Significant suppression of both gram positive and gram negative bacteria was exhibited by methanolic extract of *Z. officinale* ^[20].

Dracontomelon dao

Common name- Argus pheasant tree, Family- Anacardiaceae. Ethanolic extract of sapwood of *D.dao* possess antimicrobial activity against *S. typhimurium*, *S.aureus*, *B.subtilis*, *C.albicans*, *A. Niger* ^[21].

Bryophyllum pinnatum

Its common names are Pattharcatta, air plant, cathedral bells, life plant, miracle leaf and belongs to family- Crassulaceae. It contains antibacterial and antifungal properties. Methanol and ethyl acetate extracts of *B.pinnatum* are used. Methanolic extract inhibits *Helicobacter pylori* growth and also act as an antioxidant to protect gastric mucosa against ROS (reactive oxygen species) ^[22].

Thymus vulgaris

Common name- thyme, Family- Lamiaceae. Antibacterial activity was not exhibited by plant extracts while essential oils of these plants showed antibacterial effect. Use of both extract and essential oil provide antimicrobial activity for food preservation ^[23].

Ocimum sanctum

Common name- Holy basil, Tulsi, Family- Lamiaceae. Carvacrol and terpenes are the antimicrobial agents ^[24].

Citrus aurantifolia

Common name- Key lime, Family- Rutaceae. Plant extracts was found to be effective against *E.coli* and *S.aureus* ^[24].

Golden delicious

Its five solvents *i.e.* methanol, ethanol, acetone, ethyl acetate and chloroform are used and it consist of antimicrobial property ^[25].

Citrus limon

Common name- Lemon, Family- Rutaceae. Its essential oil consist of γ -terpinene and limonene, shows antimicrobial effect ^[26].

Hibiscus sabdariffa

Common name- Roselle, Family- Malvaceae. Plant extracts of this plant shows antibacterial effects, used in treatment of various disorders like gastrointestinal infection and diarrhoea in man and skin diseases. Presence of secondary metabolites in plant extract is responsible for antibacterial effect ^[27].

Humulus lupulus

Common name- Common hop, Family- Cannabinaceae. The extract of dried flowers shows antibacterial activity against *B.subtilis*, *S.aureus*. Its chemical components are polyphenols and flavonoids ^[6].

Sida acuta

Common name- common wireweed, Family- Malvaceae. Phytochemical and GC-MS analysis of its extract revealed

presence of two major alkaloids cryptolepine and quindoline which shows antimicrobial property ^[28].

Artemisia spp

Major components include several terpenes, terpenoids and phenolic compounds, 1,8 cineole, beta pinene, thujone, artemisia ketone, camphor, caryophyllene, camphene and germacrene D. Its different oils exhibit antimicrobial and antioxidant activities ^[29].

Cassia angustifolia

Common name- Alexandrian senna, Family- Fabaceae. Its methanol, ethanol and ethyl extracts possess flavonoids *i.e.* rutin, quercimeritrin and scutellarein which are responsible for antimicrobial property. *C.angustifolia* has antibacterial activity against *E.coli*, *Klebsiella pneumonia* and *Shigella shinga* ^[30].

Syzygium aromaticum and Lemon verbena

Eugenol is most effective essential oil component in clove for its antibacterial property. Antimicrobial activity is exhibited by attacking on its phospholipid present in cell membrane. Essential oil of both the plants exhibit bacteriostatic and bactericidal activity against microorganisms ^[31].

Coffea Arabica

Common name- Arabic coffee, Family- Rubiaceae. Coffee pulp extract consist of chlorogenic acid and caffeine which shows antimicrobial activity against *S.epidermidis* and *P.aeruginosa* ^[32].

Vitis vinifera

Common name- common grape vine, Family- Vitaceae. Phytochemical analysis of its raisins revealed the presence of catechin, quercetin and rutin; these polyphenolic compounds have antibacterial and antimicrobial activity ^[33].

Terminalia chebula

Common name- Black or chebulic myrobalan, Family- Combretaceae. Antibacterial activity exhibited by acetone extract when treated against *S.typhi* and *E.faecalis*. Acetone extract was effective solvent in extracting alkaloids, phenolic, flavonoids and tannin compounds which express antibacterial activity ^[34].

Arisaema jacquemontii

It belongs to family- Araceae. Methanolic root extract of *A. jacquemontii* is a potential source of antimicrobial agents which consist of flavonoids *i.e.* reported to suppress spore germination of plant pathogens ^[35].

Thymus eigii

Constituents which contribute to its antimicrobial nature are phenolic, monoterpenes, thymol and carvacrol which are composition of its essential oil ^[36].

Punica granatum

Common name- Pomegranate, Family- Lythraceae. Pomegranate peel extract carvacrol shows inhibitory effect on

microorganisms. The mechanism of its interception is that it merges with lipophilic components of bacterial membrane which causes changes in permeability and impairs the essential functions and causes cell death [37].

Ruta chalepensis

Common name- Fringed rue, Family- Rutaceae. Essential oil of *R. chalepensis* have high content of linalyl acetate which shows antibacterial effect [38].

Cissus quadrangularis

Common name - Veldt grape, Winged treebine, Family- Vitaceae. Gram positive and gram negative bacteria exhibit blockage when treated with ethyl acetate, methanol and aqueous extract of *C. quadrangularis* [39].

Cassia auriculata

Common name-Matura tea tree, Family- Fabaceae. The methanol extract, chloroform extract and aqueous extract of

C. auriculata reveals its antimicrobial and antifungal property [40].

Allium ampeloprasum

Common name- wild leek/ Broadleaf wild leek, Family- Amaryllidaceae. Steroids, saponins, flavonoids and alkaloids are mainly present in ethanolic extract of *A. ampeloprasum* which shows inhibitory activity against microorganisms [20].

Datura metel

Common name- Indian thorn apple, Hindu datura, Family- Solanaceae. Leaf extract shows potential antibacterial effect as compared to root extract. Phytochemical compounds are saponins, flavonoids alkaloids, glycosides, steroids and terpenoids [41].

Bauhinia variegata

Commonly known as - Orchid tree, Mountain ebony, Family- Fabaceae. Different phytochemicals like alkaloids, flavonoids, tannins and other phenolic compounds in leaf extract shows wide range of antimicrobial effect against gram positive and gram negative bacteria [42].

Table 1: List of plants having antifertility potential in different animals

S. No.	Name of plant	Family	Activity	References
1.	<i>Gossypium herbaceum</i>	Malvaceae	Inhibit sperm motility.	Devi <i>et al</i> , [2015] [11]
2.	<i>Butea monosperma</i>	Fabaceae	Affects weight of ovary and antisteroidogenic	Deviet <i>et al</i> , [2015] [11]
3.	<i>Embelia ribes</i>	Primulaceae	Anti-implantation	Umadevi <i>et al</i> , [2013] [2]
4.	<i>Abrus precatorius</i>	Fabaceae	Anti-fertility	Umadevi <i>et al</i> , [2013] [2]
5.	<i>Andrographis paniculata</i>	Acanthaceae	Antifertility	Umadevi <i>et al</i> , [2013] [2]
6.	<i>Aristolochia indica</i>	Aristolochiaceae	Anti-implantation	Azmathulla <i>et al</i> , [2015] [3]
7.	<i>Fadogia agrestis</i>	Rubiaceae	Affect testicular function	Joshiet <i>et al</i> , [2011] [4]
8.	<i>Juniperus phoenica</i>	Cupressaceae	Antifertility	Joshiet <i>et al</i> , [2011] [4]
9.	<i>Leptadenia hastata</i>	Apocynaceae	Antispermatogetic	Joshiet <i>et al</i> , [2011] [4]
10.	<i>Trachyspermum ammi</i>	Umbelliferae	Male antifertility	Joshiet <i>et al</i> , [2011] [4]
11.	<i>Curcuma longa</i>	Zingiberaceae	Anti-implantation	Purohit and Bhagat, [2004] [10]
12.	<i>Cuminum cyminum</i>	Apiaceae	Anti-implantation	Verma <i>et al</i> , [2005] [11]
13.	<i>Terminalia arjuna</i>	Combretaceae	Anti-implantation	Verma <i>et al</i> , [2005] [11]
14.	<i>Barleria prionitis</i>	Acanthaceae	Antispermatogetic	Verma <i>et al</i> , [2005] [11]
15.	<i>Terminalia chebula</i>	Combretaceae	Effects on diameter of seminiferous tubules	Soniet <i>et al</i> , [2015] [12]
16.	<i>Aegle marmelos</i>	Rutaceae	Anti-fertility	Soniet <i>et al</i> , [2015] [12]
17.	<i>Azadirachta indica</i>	Meliaceae	Antispermatic	Jainet <i>et al</i> , [2015] [13]
18.	<i>Nelumbo nucifera</i>	Nymphaeaceae	Reduces weight of ovary	Jainet <i>et al</i> , [2015] [13]
19.	<i>Daucus carota</i>	Apiaceae	Anti-ovulatory	Satyavati GV [1984] [14]
20.	<i>Carica papaya</i>	Caricaceae	Antispermatogetic	Satyavati <i>et al</i> , [1984] [14]
21.	<i>Momordica charantia</i>	Cucurbitaceae	Antispermatogetic	Lotikar & Rao [1966] [15]
22.	<i>Aloe barbadensis</i>	Asphodelaceae	Anti-ovulatory	Shah <i>et al</i> , [2016] [16]
23.	<i>Albizia lebbek</i>	Fabaceae	Anti-ovulatory	Gupta <i>et al</i> , [2006] [17]
24.	<i>Mentha arvensis</i>	Lamiaceae	Anti-ovulatory	Sharma & Jacob [2001] [18]
25.	<i>Jatropha curcas</i>	Euphorbiaceae	Alter estrous cycle	Singhet <i>et al</i> , [2020] [51]
26.	<i>Vitex negundo</i>	Lamiaceae	Anti-ovulatory	Zaidan <i>et al</i> , [2005] [53]
27.	<i>Citrullus colocynthis</i>	Cucurbitaceae	Antispermatogetic	Chaturvediet <i>et al</i> , [2003] [56]
28.	<i>Allium sativum</i>	Amaryllidaceae	Antispermatogetic and Antiandrogenic	Omoso <i>et al</i> , [2010] [57]
29.	<i>Allamanda cathartica</i>	Apocynaceae	Anti-fertility	Singh & Singh [2008] [58]
30.	<i>Ficus religiosa</i>	Moraceae	Affects uterine glands	Sharma <i>et al</i> , [2013] [59]
31.	<i>Polygonum hydropiper</i>	Polygonaceae	Anti-ovulatory	Pathak <i>et al</i> , [2005] [60]
32.	<i>Piper nigrum</i>	Piperaceae	Degenerates seminiferous tubules	Pathak <i>et al</i> , [2005] [60]
33.	<i>Striga orobanchoides</i>	Scrophulariaceae	Affects uterine diameter, and endometrium thickness	Pathak <i>et al</i> , [2005] [60]
34.	<i>Dendrophthoe falcata</i>	Loranthaceae	Suppression of spermatogenesis	Pathak <i>et al</i> , [2005] [60]
35.	<i>Michelia champaca</i>	Magnoliaceae	Anti-estrogenic	Pokharkaret <i>et al</i> , [2010] [61]
36.	<i>Ruta graveolens</i>	Rutaceae	Anti-conceptive	Pokharkaret <i>et al</i> , [2010] [61]
37.	<i>Annona squamosa</i>	Annonaceae	Anti-ovulatory	Jain & Dixit [1982] [62]
38.	<i>Areca catechu</i>	Arecaceae	Anti-ovulatory	Peng <i>et al</i> [2015] [63]
39.	<i>Lepidium sativum</i>	Brassicaceae	Anti-ovulatory	Mali <i>et al</i> , [2007] [64]
40.	<i>Ensete superbum</i>	Musaceae	Anti-implantation	Kumaret <i>et al</i> , [2010] [65]
41.	<i>Anethum graveolens</i>	Apiaceae	Antifertility	Malihezaman & Sara [2007] [66]
42.	<i>Austroplenckia populnea</i>	Celastraceae	Antifertility	Mazarot <i>et al</i> , [2002] [67]

43.	<i>Bacopa monnieri</i>	Plantaginaceae	Suppression of spermatogenesis and fertility	Singh & Singh [2009] ^[68]
44.	<i>Cannabis sativa</i>	Cannabaceae	Antispermotogenic	Sailani & Moeini [2007] ^[69]
45.	<i>Capparis aphylla</i>	Capparaceae	Antispermotogenic	Sarathchandiran et al. [2007] ^[70]
46.	<i>Chromolaena odorata</i>	Asteraceae	Antiandrogenic	Gupta et al. [2001] ^[71]
47.	<i>Colebrookia oppositifolia</i>	Lamiaceae	Depression of spermatogenesis	Gupta et al. [2001] ^[71]
48.	<i>Crotolaria juncea</i>	Fabaceae	Antispermotogenic	Vijaykumar et al. [2004] ^[72]
49.	<i>Madhuca indica</i>	Sapotaceae	Antifertility	Shivavasavaiah et al. [2011] ^[73]
50.	<i>Martynia annua</i>	Martyniaceae	Antifertility	Shah et al. [2009] ^[74]
51.	<i>Mondia whitei</i>	Apocynaceae	Antispermotogenic and Antifertility	Watcho et al. [2001] ^[75]
52.	<i>Ficus racemosa</i>	Moraceae	Suppressed sperm motility	Ahmed & Urooj [2010] ^[76]
53.	<i>Moringa oleifera</i>	Moringaceae	Abortifacient	Stohs & Hartman [2015] ^[77]

Table 2: List of plants having Antimicrobial potential

S. No.	Botanical Plants	Family	Activity	References
1.	<i>Cissus quadrangularis</i>	Vitaceae	Antimicrobial	Murthy et al. [2003] ^[39]
2.	<i>Azadirachta indica</i>	Meliaceae	Antifungal, Antimicrobial	Abdalla & Abdalla [2016] ^[43]
3.	<i>Psidium guajava</i>	Myrtaceae	Antibacterial	Ugboguet al. [2022] ^[44]
4.	<i>Argemone mexicana</i>	Papaveraceae	Antimicrobial, anti-malarial	Brahmachari et al. [2013] ^[45]
5.	<i>Curcuma longa</i>	Zingiberaceae	Antifungal, Antibacterial	Luthra et al. [2001] ^[46]
6.	<i>Kigelia africana</i>	Bignoniaceae	Antibacterial, antioxidant, antiviral	Gabriel & Olubunmi [2009] ^[47]
7.	<i>Cannabis sativa</i>	Cannabaceae	Antibacterial	Farag & Kayser [2017] ^[48]
8.	<i>Terminalia arjuna</i>	Combretaceae	Antimicrobial, Anticancer, Antioxidant	Amalraj & Gopi [2016] ^[49]
9.	<i>Citrullus colocynthis</i>	Cucurbitaceae	Antimicrobial and Antiinflammatory	Hussain et al. [2014] ^[50]
10.	<i>Jatropha curcas</i>	Euphorbiaceae	Antibiotic	Singhet et al. [2020] ^[51]
11.	<i>Adansonia digitata</i>	Malvaceae	Anti-microbial, Antiviral	Kabore et al. [2011] ^[52]
12.	<i>Andrographis paniculata</i>	Acanthaceae	Antibacterial, Antihelminthic	Zaidan et al. [2005] ^[53]
13.	<i>Vitex negundo</i>	Lamiaceae	Antibacterial	Zaidan et al. [2005] ^[53]
17.	<i>Morinda citrifolia</i>	Rubiaceae	Used in cough and bacterial infections	Zaidan et al. [2005] ^[53]
14.	<i>Foeniculum vulgare</i>	Apiaceae	insect repellent	Arora & Kaur [2007] ^[54]
15.	<i>Elettaria cardamomum</i>	Zingiberaceae	Antibacterial, Antidabetic and Anticancer	Arora & Kaur [2007] ^[54]
16.	<i>Syzygium aromaticum</i>	Myrtaceae	Antifungal, Antiviral and Antibacterial	Arora & Kaur [2007] ^[54]
18.	<i>Piper nigrum</i>	Piperaceae	Antimicrobial	Dorman & Deans [1999] ^[55]
19.	<i>Origanum vulgare</i>	Lamiaceae	Antimicrobial	Dorman & Deans [1999] ^[55]
20.	<i>Myristica fragrans</i>	Myristicaceae	Antimicrobial	Dorman & Deans [1999] ^[55]

Conclusion

The list of medicinal plants which shows antifertility and antimicrobial effect used in this review as a screening of potential antifertility and antimicrobial plants and it is clear that different extracts of plants are used to show antifertility as well as antimicrobial effect. Antifertility effect is used in a dose dependent manner in birth control.

Conflict of interest: There is no conflict of interest.

Acknowledgement

The authors acknowledge the facilities provided by Head, Department of Zoology, University of Rajasthan, Jaipur, India and Council of Scientific and Industrial Research (CSIR), New Delhi for providing financial support.

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