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Impact of Medicinal Plants on Antifertility Activities: A Review

By Venkataramanaiah Poli & Srinivasulu Reddy Motireddy

Sri Venkateswara University

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Impact of Medicinal Plants on Antifertility Activities: A Review

Venkataramaiah Poli ^a & Srinivasulu Reddy Motireddy ^a

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Conclusion: In conclusion, it is evident that medicinal plants serve a significant role as antifertility agents, prompting further investigation into the specific plants responsible for these effects.

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I. INTRODUCTION

One of the most important modern phenomena that demands careful thought is the astounding rise in the world's population. Between 6 and 7 billion people are thought to live on the planet today. The exponential growth of their populations is a significant problem for developing countries like India. An imbalance in socioeconomic infrastructure is likely to result from this population boom's negative effects on social and economic policies. Since human fertility is limited, controlling it becomes a vital and pressing biosocial and medical concern. Many medications, including hormonal and other compounds, have been developed in response to the need for fertility control. To mitigate the potential adverse effects associated with chemically synthesized drugs, there is a preference for indigenous plants, which are not only cost-effective and readily available but also considered safe (1).

Author ^a: Department of Zoology, Research Scholar, Sri Venkateswara University, Tirupati-517502, Andhra Pradesh, India.

e-mail: ramanasvu10@gmail.com

Author ^a: Department of Zoology, Faculty of Natural Sciences (Professor), Sri Venkateswara University, Tirupati-517502, Andhra Pradesh, India. e-mail: profmsrsvu@gmail.com

Often known as oral contraceptives, antifertility agents are medications that control fertility (2). These drugs affect women's ovulation and menstrual cycles. Estrogen and progesterone are commonly found in birth control pills. The active ingredients in these antifertility medications work on females by blocking ovulation and implantation, preventing fertilization, and either killing the zygote or causing abortion. These substances function in males by influencing gonadotropins and sperm viability, lowering testosterone levels, or suppressing spermatogenesis (3). Population growth presents serious problems for natural, social, and economic resources (4). The pressing need for efficient contraceptive methods is highlighted by the growing population in developing countries (5).

It has long been known that medicinal plants are useful tools for treating a variety of human health conditions. These plants have been used for centuries to treat physical and mental illnesses; in developing nations, about 80% of medical treatments are used. 6. This field is aided by phytoestrogens, which are novel compounds present in a variety of plants. Furthermore, a number of medications, such as testosterone, gossypol, tamoxifen, and triptolide, are being investigated as antifertility agents (7). Oral contraceptives, also referred to as antifertility agents, are medications that control fertility (2). These drugs affect women's ovulation and menstrual cycles. Estrogen and progesterone are commonly found in birth control pills. The active ingredients in these antifertility medications work on females by blocking ovulation and implantation, preventing fertilization, and either killing the zygote or causing abortion. These substances affect gonadotropins and sperm viability, lower testosterone levels, or inhibit spermatogenesis in males. Many developing nations are currently controlling their populations (3). By interfering with a number of normal reproductive processes in both males and females, antifertility medications reduce fertility. 100% effectiveness, reversibility of effects, lack of side effects, and ease of use are the best qualities in a contraceptive agent (8). Due to a lack of written records, a lack of scientific validation, and comparatively low economic resources within these traditions, these traditional knowledge systems have started to deteriorate over time.

It has been determined that a wide variety of plant species can influence fertility (9). Traditional

medicine has long used plant-based remedies to manage fertility in many places, such as Ethiopia and India. Numerous medicinal plants have been used to treat a range of conditions, including infertility, in addition to being used as dietary supplements, frequently without a thorough understanding of their mechanisms (10). A considerable number of herbal plants also show varied degrees of toxicity, even though many of them have a variety of antifertility qualities, including oestrogenic, spermicidal, ecbolic, abortifacient, and anti-implantation effects (10). Numerous products made from plants have the ability to reduce fertility in both men and women, which raises the possibility that they could be developed as forms of birth control. Only a small number of native plants have had their antifertility effects thoroughly studied, despite evidence that many of them can prevent conception. To find new oral active non-steroidal contraceptive agents, the World Health Organization (WHO) formed a task force on plant research. Numerous medicinal plant extracts have been tested for their ability to prevent infertility in both sexes (11).

It is not a new idea to create safe and efficient oral fertility-regulating substances for human use that are derived from higher plants. Almost all indigenous cultures have used a variety of plants to try to manage population growth for centuries. Many plants have the ability to regulate fertility. There are currently initiatives underway to turn these plants into antifertility products. Economically disadvantaged populations could greatly benefit from plant-based contraceptive methods, such as crude extracts or scientifically validated composite preparations, as these options would be more affordable. The possible abortifacient and antifertility effects of many plants, including those traditionally used in folk contraceptives, are the subject of extensive research worldwide (12). In light of the negative consequences of traditional approaches, fertility control, including contraception and infertility treatment, is an important component of reproductive health for both men and women (13). Numerous efficient techniques for causing infertility have been investigated over time, such as hormonal, chemical, and immunological approaches (14). However, women are less likely to accept chemical methods because they frequently result in a number of side effects, including obesity, gallstones, gastrointestinal problems, and an increased risk of breast and cervical cancers, asthma, and thromboembolism. Hormonal contraceptives are also linked to an increased risk of cancer. Because of their negligible or nonexistent adverse effects, scientists are therefore becoming more interested in plant-derived products as a major source of naturally occurring fertility-regulating agents (15). Health, population growth, and women's empowerment are all directly correlated with the rising use of contraceptive methods

(16). In both males and females, a variety of herbal plants have antifertility effects (17).

In recent years, population control has become more and more important. There are many different synthetic contraceptive methods available, but the side effects that come with them frequently limit their long-term use. Both male and female populations have been the focus of efforts to prevent conception. The goal of research in the field of male contraception is to find spermicidal agents that work. On the other hand, female contraception consists of several steps that can be controlled with medication, such as ovulation, fertilization, implantation of the fertilized ovum, and the final maturation of the fetus. As a result, methods to interfere with fertilization have mostly focused on these phases using different substances that are said to be abortifacient, antiovulatory, or anti-implantation. Although there are currently alternatives like steroid pills, injections, IUDs, barrier methods, and sterilization techniques, the changing lifestyle and growing population challenge suggest that the perfect contraceptive solution has not yet been found (18). The exponential growth of the human population, which can negatively impact economic policies and destabilize financial structures, is one of the major issues facing developing countries. Thus, it is crucial to keep an eye on population growth (19). The demand for herbal remedies made from medicinal plants has increased due to the high cost of new medications, their inaccessibility in remote areas, and the many negative effects of current synthetic fertility control methods, including weight gain, hypertension, hormonal imbalances, and an increased risk of cancer. According to research, women use contraceptives at a higher rate than men worldwide, especially in rural and developing areas where access to contemporary contraceptives is restricted. For women, especially those living in rural areas of developing nations with high population densities like Bangladesh, China, India, and Africa, herbal contraceptives provide an affordable and easily accessible alternative. These substitutes are distinguished by their lower adverse effects and possible efficacy. However, because herbal medicines may pose minor risks, extensive testing is necessary to determine their safety and efficacy (20).

Pharmaceuticals that control fertility are known as oral contraceptives, or antifertility drugs (2). These medications affect the menstrual cycle and female ovulation. A combination of progesterone and estrogen is commonly found in birth control pills. When a contraceptive stops women from ovulating, implantation, fertilization, zygote destruction, or abortion, it is considered effective. It also has an effect on gonadotrophin levels or sperm viability, suppresses testosterone, and stops male spermatogenesis. At the moment, many developing nations are taking action to curb population growth (21). By preventing the

production of prostaglandins, drugs like oxyphenbutazone, indomethacin, and acetylsalicylic acid have shown antifertility effects in studies involving albino male and female rabbits. In particular, indomethacin and oxyphenbutazone affect reproductive processes in male rabbits. In many developing countries, the trend of population control is common. Additionally, it has been demonstrated that the aforementioned compounds in albino rabbits decrease prostaglandin synthesis and have antifertility effects. Oxyphenbutazone and indomethacin have a significant impact on male rabbit reproductive processes (22). Because they are less toxic and have been used for a long time in traditional medical practices like Ayurveda, people are increasingly choosing plant-derived medications over synthetic ones. To encourage family planning, a variety of contraceptive methods have been promoted. However, there is now more interest in indigenous herbs for their possible contraceptive qualities due to the serious side effects linked to synthetic steroidal contraceptives. Consequently, it is essential to explore suitable native plant products that could serve as alternatives to conventional tablets (23).

In many parts of the world, such as Morocco, Saudi Arabia, Taiwan, and Trinidad and Tobago, ethnobotanical research on medicinal plants used by local populations has been carried out. Several plant species have been found to have antifertility properties. The use of plant-based remedies has long been a part of traditional medicine practices for fertility control in many parts of Ethiopia, India, and the rest of the world. Without a thorough understanding of their mechanisms, a variety of medicinal plants have been used as dietary supplements and to treat a wide range of illnesses, including infertility. A sizable fraction of these medicinal plants also show varied degrees of toxicity, even though many herbal plants have a variety of antifertility qualities, including anti-implantation, abortifacient, estrogenic, and spermicidal effects (24). Since the dawn of civilization, traditional plants have been essential to human society, helping to fight off a variety of illnesses. Historically, natural products—including plants, animals, and minerals—have been the cornerstone of disease treatment. Nearly 80% of developing countries, according to the World Health Organization, struggle to obtain synthetic drugs and must instead rely on traditional medicines, which are mostly made from plants, to meet their basic medical needs (25).

Although estrogen and progesterone-containing contraceptives are currently widely used and effective for family planning, many countries have banned the use of hormonal contraceptives due to the serious side effects of synthetic steroidal contraceptives, including gonadal toxicity, temporary or permanent infertility, testicular germ cell cancer, breast and prostate cancer, brain developmental issues, endometriosis, obesity, cholelithiasis, gastrointestinal disturbances, asthma,

venous thromboembolism, and early puberty. The dangers associated with these drugs have led to research into novel compounds made from medicinal plants that could replace conventional antifertility drugs.

The objective of the current study is to review the antifertility properties of various medicinal plants.

II. MATERIALS AND METHODS

The information presented in this review is the outcome of a comprehensive bibliographic investigation, which involved the analysis of classical textbooks, scientific journals, and consultation of globally recognized databases. Peer-reviewed articles were collected from various sources, including SCOPUS, PUBMED, GOOGLE SCHOLAR, and INFLIBNET.

a) *Reproductive Systems*

The conceptional framework is a sex organ inside a life form that works with the end goal of sexual propagation. Numerous non-living substances, for example, liquids, hormones, and pheromones, are the most significant types of gear for regenerative frameworks (26).

i. *Male Reproductive System*

The different sex organs that play a major role in human generation are part of the male conceptual framework. These organs are located inside the pelvis and outside the body. An ovum in the female's body is fertilized by the sperm and semen produced by the penis and gonads, the main male sex organs. The fertilized ovum grows into a fetus, which is subsequently born as an infant (26).

ii. *Female Reproductive System*

The inner and outer sex organs make up the female conceptual framework. It is attempting to increase the number of new generations. When the female human reproductive system matures after being immature at birth. One can produce gametes and carry a fetus to term through puberty. The ovaries, fallopian tubes, and uterus are the internal sex organs. Undeveloped organisms that develop into fetuses are called uterus or belly obliges. Additionally, the uterus produces uterine and vaginal discharges that facilitate sperm transit to the Fallopian tubes. The egg cells are made in the ovaries. Genitals and vaginal openings are other names for the external sex organs. The cervix is where the vagina and uterus are joined (26).

b) *Antifertility*

Antifertility agents are substances that can inhibit ovulation or fertilization, ultimately leading to the termination of a pregnancy (27). Medications designed to prevent fertilization are referred to as having antifertility effects, which are also known as contraceptive effects. Contraception encompasses

methods that disrupt the natural processes of ovulation, fertilization, and the implantation of the ovum, thereby preventing pregnancy (28).

A concise overview of plants exhibiting antifertility properties, along with their active components, is presented in *Table 1*. The investigation of various antifertility medicinal plants led to the conclusion that the efficacy of different plant parts is ranked as follows: Leaf > Seed > Whole Plant > Root > Aerial Part = Bark > Stem > Fruit = Flower > Tuber > Stem Bark > Rhizome. The leaves demonstrate the highest potential for antifertility activity, while the rhizome shows the least potential (see *Figures 1 and 2*).

c) Medicinal plants used as antifertility agents

i. Antiovulation Activity

Polygonum hydropiper Linn (Marsh Pepper) belongs to the family Polygonaceae, which is in part valued for its roots and leaves and adds such active ingredients as formic acid, acetic acid, beldianic acid, tannin, essential oil, and oxymethyl-anthraquinones. It is used in situations involving diarrhea, skin problems, hemorrhoids, and dyspepsia. It is used in folk medicine as an anti-cancer and anti-rheumatic agent. Biologically, these constituents can have antioxidant, antimicrobial, anti-inflammatory, and antifertility effects in humans. In one study, Kapoor *et al.* (1974) (30) have reported on the anti-ovulatory activity in this plant. Their study using three varieties of extracts (petroleum, aqueous, and alcohol) was conducted to examine the antifertility activity of this particular plant. Antifertility activity was noticed in rabbits with copper-induced ovulation. Petroleum ether extract of the roots of *Polygonum hydropiper* was detected adequately in inhibiting ovulation in 60% of the animals. All the other extracts prohibited ovulation in 40% or less of the animals (30).

ii. Anti-Implantation Activity

Ailanthus excelsa Roxb is a deciduous tree from the Simaroubaceae family and is widely distributed in Asia and northern Australia. Its native origin is China and is known as the "tree of heaven" (6). In Maharashtra, the above plants were used traditionally for anti-implantation and abortification activity (*Table 2*). *Ailanthus excelsa* Roxb is a deciduous tree from the Simaroubaceae family and is widely distributed in Asia and northern Australia. Its native origin is China and is known as the "tree of heaven" (6). In Maharashtra, the above plants were used traditionally for anti-implantation and abortification activity (*Table 2*). *Ailanthus excelsa* Roxb is an abscission tree from the Simaroubaceae family and is

extensively distributed in Asia and northern Australia. Its ancient origin is China and is known as the "tree of heaven" (32). In Maharashtra, the above plants were used habitually for anti-implantation and abortifacient activity.

The anti-implantation activity was purposive according to the method of Olagbende-Dada Stella O *et al.*, 2009 (33). Eighteen mature, female, colony-bred Wistar albino rats were divided into three groups (6 female rats per group). One group was used as a control, and the other two groups were used as a test group. Female rats in the proestrous phase were kept with males with confirmed fertility in a ratio of 2:1. The female rats were examined in the following morning for verification of copulation; the vaginal smear was examined for thick clumps of spermatozoa. The day on which the spermatozoa were found in the smear was observed the first day of pregnancy (Day 1). A 150 mg/kg of body weight and 300 mg per kg of body weight of the extract was administrated intragastrically for 10 days from day 1 to day 10 of pregnancy for the test group and equal volume of vehicle for the control group. On day 11, all groups of rats were laparotomized under light ether anesthesia to determine the number of implantation sites in the horns of the uteri. The presence of a difference in the mean number of propagation sites between the extract and the control was taken as a positive response.

iii. Antispermatic Activity

Plumbago zeylanica belongs to the family Plumbaginaceae, and its antifertility ingredients include roots and leaves. Its active rules are plumbagin, isoshinanolone, transcinnamic acid, vanillic acid, betasitosterol, 4-hydroxybenzaldehyde, and plumbagin acid, and it is used to cure piles, leukoderma, and other skin diseases. It developed to foster diverse biological activities, including anti-Helicobacter pylori, antidiabetic, antioxidant, and antifertility. An earlier rat study was initiated using the plant's ethanol extract. When the applied extract dosage was 159 mg/kg, seminiferous tubule diameters became smaller, and spermatocyte and spermatid production was reduced. Furthermore, a decline in immature and mature Leydig cells occurred, and degenerating cells were significantly increased. Lastly, the testicular cell population was decreased. Overall, this study showed palpable plant-based antifertility activity (34).

iv. Abortifacient Activity

Plumeria rubra L. are secreting latex trees and shrubs that belong to the Apocynaceae family. The commixture of bark & roots of *Plumeria rubra* is traditionally used to treat asthma, ease constipation, stimulate menstruation, and reduce fever, and the latex is used to soothe irritation (35). In India, however, its fruit is used as an abortifacient (36).

The plant extracts were checked in female albino rats for abortifacient activity as per Khanna *et al.* (1969) (37). The female rats in the pro-estrous stage were caged with males of proven fertility in the ratio of 2:1 in the evening and examined the successive day for the evidence of copulation. Rats exhibiting a thick clump of spermatozoa in their vaginal smear were partitioned, and that day was designated as day 1 of pregnancy. These rats were irregularly distributed into 13 groups, one control group and 12 experimental groups of 6 animals each. On the day of pregnancy, animals were laparotomized below light ether anesthesia using sterile conditions. The two horns of uteri were inspected to determine the implantation sites. Thereafter the abdominal wound was sutured in layers (38).

d) Hormonal Control of Fertility

The birth control pill, the most effective form of birth control, is based on the oral administration of steroids. Either progestins and estrogens are used together, or progestins are used alone, as with the minipill. Furthermore, different combinations of steroids can be given intrauterine or as long-acting injectable preparations. Estradiol and progesterone are not suitable for use in oral pills because they are metabolized in the liver and gastrointestinal tract. Therefore, different synthetic progestins like norethindrone, norethindrone acetate, norgestrel, ethinodiol diacetate, or norethynodrel are used in conjunction with synthetic estrogens like mestranol or ethinyl estradiol. The hormones are administered in a cyclical manner for 21 days, starting on the fifth day of the menstrual cycle and ending with either no pills or a placebo for 7 days. Through negative feedback effects on the hypothalamus, the high levels of progestin and estrogen prevent ovulation and the midcycle LH surge. While FSH levels are typically suppressed, irregular LH peaks can occasionally be seen. Estrogens are still secreted, but ovarian progesterone production is reduced. Depending on the type and dosage of the contraceptive, the effects on the endometrium can vary. Within a few days of beginning daily intake, there is a rapid progression from proliferation to early secretory changes, which are followed by regressive changes (39).

e) Mechanism of Action of Antifertility Plants

It has been reported that medicinal plants have antifertility effects through a variety of mechanisms. Their impact on sex hormones, specifically for reducing fertility, regulating the menstrual cycle, alleviating dysmenorrhea, treating enlarged prostate, menopausal symptoms, breast pain, etc., is one of their main functions (40). Furthermore, by peripherally modulating follicle-stimulating hormone (FSH) and luteinizing hormone (LH), plants with estrogenic qualities can directly affect pituitary action, reducing their secretions and preventing ovulation (41). On the other hand, plants

that have anti-estrogenic properties have abortifacient effects and interfere with the development of the ovum and endometrium (42). In females, the hypothalamus, anterior pituitary, ovary, oviduct, uterus, and vagina are the sites of action of antifertility medications. Antifertility effects primarily occur in the mammalian uterus (40). In immature rats, typical estrogenic compounds can cause cornification and vaginal opening, as well as increase the uterine wet weight, all of which have anti-implantation effects (43). When given to male rats, plant extracts have also demonstrated encouraging antifertility effects. Plants have a variety of effects on the male reproductive system that can cause antifertility, such as antispermatic, post-testicular, spermicidal, sperm immobilizing, and antiandrogenic effects.

f) Medicinal plants with significant antifertility activity

Although some herbal contraceptives have been developed, their potential for human use is limited. People are now searching for herbal remedies to combat a variety of illnesses and regulate fertility as a result of these issues (44). There are a number of preventive and corrective contraceptive methods available thanks to modern medicine, but none of them are particularly safe or free of major side effects. Drugs that are synthetic or chemically based have the potential to disrupt the endocrine system and have effects on the body's metabolism, development, neurological function, and reproduction. Natural hormone synthesis, secretion, transport, and activity may all be adversely affected by these substances. By preventing the synthesis and metabolism of hormones or by obstructing their action, they disrupt the normal level of hormones. Among them are Alkylphenols, bisphenol A, dioxins, heavy metals, fungicides, and insecticides prevent the synthesis of estrogen and progesterone, which impacts female sexual development by causing toxicity to the gonads, testicular germ cell cancer, breast/prostate cancer, and endometriosis. Pesticides, phthalates, and plasticizers also prevent the production of androgens, which impacts male sexual development. Other negative effects of these chemicals on the reproductive system have been demonstrated, including temporary or permanent infertility (45). These factors make it essential to create a highly effective, entirely herbal medication that doesn't negatively impact the reproductive system. Worldwide, over 35,000 plant species are utilized for medicinal purposes in a variety of human cultures. For primary healthcare, almost 80% of people worldwide rely on traditional medicines, the majority of which use plant extracts (46). People have been using plants to treat illnesses and ease physical pain since ancient times. Many traditional medicines are now recognized for their effectiveness, reduced side effects, and improved cultural acceptability and compatibility with the human body. The need for the development of safe and effective herbal contraceptives Even the savages of

ancient societies used herbal contraceptives to manage their fertility and avoid getting pregnant. Although some significant anti-fertility drugs (contraceptives) for women have been discovered by conventional medicine, their use and popularity among women are limited because of certain undesirable and problematic side effects. Obesity, cholelithiasis, stomach issues, breast and cervical cancer, asthma, and venous thromboembolism are among the frequent adverse effects (47).

Medical professionals are therefore looking for herbal contraceptives that are both safe and effective. Numerous plants have anti-fertility properties that have been scientifically proven. Both men and women may find these plants to be a useful source of herbal contraceptives. Due to their minimal or nonexistent adverse effects, plant products have caught the interest of numerous scientists as a major source of naturally occurring fertility-regulating agents. There have been reports of several plant extracts acting as antifertility agents (48). Given India's long-standing concerns about population growth, medicinal plants have been examined for their potential as contraceptives and anti-fertility effects. There are fewer options for effective, reversible, non-irritating, and highly expectable contraceptives available to men who are willing to share family planning responsibilities, and female contraceptive methods have always been given priority. Additionally, some herbs have been shown to disrupt the regular movement or production of sperm. Since every herb has a unique use, it's critical to have a basic understanding of how they are or might be used. Let's clarify the potential courses of action in more detail. Traditional herbal medicine-based sterilization techniques, such as abortion during the first few weeks, preventing conception, or rendering either partner sterile, are employed to regulate population growth rates. A review of the literature showed that, with the exception of gynecological disorders, herbal remedies that induce abortion, and plants that induce abortion, sufficient research has been done on the various medicinal uses of plants in this region (49). Numerous plant products have the potential to be developed into contraceptives by inhibiting both male and female fertility. Only a small number of native plants have been studied for their anti-fertility properties thus far, despite the fact that many of them have been demonstrated to prevent conception. The anti-fertility effects of a variety of medicinal plant extracts have been investigated in both males and females. Hormone levels were changed and spermicidal in some of these plants (50). Currently, there is a global effort to investigate the effectiveness of herbal products as a form of birth control (51). Synthetic drugs are losing ground to plant-based products. Their low toxicity and extensive exposure to these medications in traditional medical systems such as Ayurveda are the main reasons for this in recent years. Therefore, it is necessary to look for appropriate products made from

local medicinal plants that can be used in place of pills. In an effort to reduce adverse effects and increase efficacy, the types and quantities of these ingredients have evolved over time (52). There are various ways that medicinal plants can cause infertility in females. In addition to interfering with implantation and sperm penetration, they may have an impact on the ovary, uterus, hormone production, and inhibition of hormonal action. Some of them create a protective layer around an egg to stop fertilization. Since antifertility plants are medications that prevent gametes from forming and disrupt the fertilization process, the plants can be categorized based on these actions. Ovulation is suppressed by antioestrogenic plants. These medications are administered by injection or by mouth. Anti-implantation plants stop fertilized ovum from attaching or penetrating the uterus. Abortifacients The fetus is expelled early by plants (53). In females, the hypothalamus, anterior pituitary, ovary, oviduct, uterus, and vagina are the sites of action of antifertility medications. By releasing follicle-stimulating hormone (FSH) and luteinizing hormone (LH), the hypothalamus regulates the uterus's activity. Therefore, antifertility drugs may work at this level by interfering with the pituitary and/or hypothalamus's hormonal function or by blocking the neural pathway to the hypothalamus that regulates the release of hormones that release gonadotropin.

Male contraceptive options and progress are still limited and slow, despite significant advancements in the development of highly effective, acceptable, and reversible methods for females (13). New methods of male contraception must be developed in light of recent advancements in our understanding of male reproductive physiology. Numerous possible methods for causing infertility have been studied for a long time, including immunological, chemical, and hormonal methods. A variety of chemical groups, including steroid and non-steroidal ones, have an impact on testicular function. These include melatonin, α -chlorhydrin, serotonin, levonorgestrel, depot medroxyprogesterone acetate (DMPA), cyproterone acetate (CPA), Danazol, and metapiron. However, their use has failed due to a number of risks, as they have been shown to be toxic or idiosyncratic in both short- and long-term use in the reproductive organs (54). Even though there are many different forms of contraception, finding newer, more effective ones is one of the most difficult tasks in the field of pharmaceutical and medical sciences. Exploration of the hidden wealth of medicinal plants for use as contraceptives has recently begun. A large portion of the global population still has access to herbal medicine as a common form of therapy for both illness treatment and health maintenance. Information about the screening of plants with antifertility efficacy has been steadily accumulating (55). The antifertility program can benefit from the knowledge found in

folklore and ancient literature about plants and herbs. Many plants have been identified recently, and researchers have evaluated extracts and active ingredients from various plant parts, such as seeds, roots, leaves, flowers, stems, or stem barks (56).

III. RESULTS

To investigate the traditional and folkloric uses of plants with antifertility properties, a thorough analysis of a large number of scientific peer-reviewed publications was carried out. Several plants that have been asserted and proven to have antifertility properties were included in the study. A list of plants that have been shown to have antifertility properties is provided below, along with information on the precise parts used and how they work.

IV. DISCUSSION

Medicinal plants have been utilized for their therapeutic properties throughout history across various regions of the globe. In India and other countries, numerous medicinal plants are documented to exhibit antifertility effects (57).

This review aims to provide a comprehensive analysis of ethnopharmacological data concerning plant species utilized for the regulation of fertilization and conception by various tribes worldwide over recent decades. *Table 3* includes the names of these plants, along with their respective families, the parts used, the animal models employed, and their mechanisms of action. As indicated in *Table 3*, the plants are categorized based on their effects as antifertility agents, with some exhibiting multiple properties that vary according to dosage. Furthermore, this review presents a compilation of plants that play a significant role in fertility control for both males and females. The literature survey revealed that among the different parts of plants, leaves are predominantly used for the purpose of controlling fertilization, while other parts such as fruits, stems, bark, roots, seeds, and flowers are utilized in lesser amounts (58).

V. CONCLUSION

To sum up, this review has brought together data that has been verified by science about the phytochemical components and antifertility properties of medicinal plants that have been used for centuries. The results show that these medicinal plants' extracts have strong antifertility effects. Additionally, the findings show that the previously mentioned plants have dose-dependent antifertility effects.

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Table 1: List of Antifertility Plants with Chemical Constituents (29)

S.No.	Plant name	Common name	Type of extract	Plant part used	Activities	Chemical Constituents
1.	<i>Abrus precatorius</i>	Chirmi	Methanolic	Seed	Antifertility	Precatorine, trigonelline, choline, abrine abricin, abridin
2.	<i>Acacia catechu</i>	Katha	—	Exudate	Anti-implantation	—
3.	<i>A. leucophloea</i>	Reonja	Alcoholic	Root	Antifertility	Tannins, flavonoids, terpenes, alkaloids
4.	<i>Acacia nilotica</i>	Babul	Aqueous	Pod	Antispermatogenic	Phytosterols, phenolic compounds, saponins
5.	<i>Azadirachta indica</i>	Khokli	Petroleum ether and ethanolic	Whole plant	Post-coital activity	β -Sitosterol, acalyphine, triacetonamine, kaempferol, tannin, stigmastrol
6.	<i>Achyranthus aspera</i>	Chirchira	Ethnolic	Root	Anti-implantation	Ecdysterone, oleanolic acid, n-hexacos-14-enoic acid
7.	<i>Adathoda vasica</i>	Arusa	—	Leaves	Anti-iplantation	Vasicine
8.	<i>Aegle marmelos</i>	Bael	Ethnolic	Leaves	Antifertility	Alkaloids, caumarins, steroids
9.	<i>Aerva lanata</i>	Bui	Ethnolic	Root	Anti-implantation	Alkaloids, kaempferol, quercetin, β -sitosteryl acetate, tannic acid
10.	<i>Albizzia lebbek</i>	Siris	Methanolic	Pod	Spermicidal activity	Lebbekanin-E
11.	<i>Ammanaa baccifera</i>	Aginbuti	Ethnolic	Whole plant	Antisteroidogenic	Steroids, triterpenoids, Flavonoids, and tannins
12.	<i>Amaranthus spinosus</i>	Kanta chaulai	Acetone	Root	Anti-spermatogenic and anti- androgenic	Alkaloids, flavonoids, saponins, β -sitosterol, stigmasterol, Kaempferol, glycosides
13.	<i>Amaramthu viridis</i>	Jangli cholai	Aqueous	Root	Abortifacient	Alkaloids, anthraquinon, saponins
14.	<i>Anagallis arvensis</i>	Dhartidhak	—	Whole plant	Spermicidal activity	Oleanolic acid
15.	<i>Andrographis paniculata</i>	Kiryat	Dry leaf powder	Leaves	Antispermatogenic	Flavonoids, andrographilode, diterpenoids, phenylpropanoids, oleanolic acid, and β -sitosterol
16.	<i>Aristolochia indica</i>	Indian Birthwort	Ethnolic	Root	Antispermatogenic/ anti-androgenic	Aristolic acid, p-coumaric acid, methyl aristolate
17.	<i>Argemone maxicana</i>	Satyanashi	-	Seed	Anti-spermatogenic	Isoquinoline alkaloids, dihydro palmatine hydroxide, berberine, protopine
18.	<i>Azadirachta indica</i>	Neem	Alcoholic	Flower	Antifertility	Steroids, triterpenoids, alkaloids, phenolic compound, flavonoids
19.	<i>Balanites aegyptiaca</i>	Desert date	Methanolic	Bark	Antiimplantation	β -sitosterol, bergaptem, marmesin, β -sitosterol glucoside
20.	<i>Balanites roxburghii</i>	Desert date	Ethnolic	Fruit	Abortifacient	Alkaloids, saponins, tannins, flavonoids, phenolic compound
21.	<i>Bbiophytum sensitivum</i>	Lakshmana	Ethnolic	Whole plant	Antifertility activity	Phenolic and polyphenolic compound, saponins
22.	<i>Boerhavia diffusa</i>	Khapra-ara	Methanolic	Root	Antiimplantation, antiestrogenic	β -sitosterol, alkaloids, ursolic acid
23.	<i>Butea monosperma</i>	Dhak	Petroleum ether and Chloroform	Root	Anti-steroidogenic	Glycine, glycoside, aromatic hydroxyl compound
24.	<i>Cajanus cajan (L)</i>	Arhar	Methanolic	Seed	Antifertility	Sitosterol
25.	<i>Calotropis gigantea</i>	Madar	Ethnolic	Root	Anti-implantation	Akundarin, calotropin
26.	<i>Calotropis</i>	Aak	Ethnolic	Root	Anti-implantation	Alkaloids, flavonoids, tannins,

	<i>procera</i>					saponins, and cardiac glycosides
27.	<i>Capparis decidua (aphylla)</i>	Kair	Ethanolic	Whole plant	Antispermatogenic	Capparin, capparilin, capparinin, sitosterol, n-triacontanol
28.	<i>Cassia fistula</i>	Amaltash	Aqueous	Seed	Antiestrogenic	Anthraquinone, glycosides, flavonoids, phenolic compound
29.	<i>Cassia occidentalis</i>	Kajondi	Ethanolic	Root	Anti-implantation and abortifacient	β -sitosterol, campesterol, emodin, 1,8-dihydroxyanthraquinone, quercetin
30.	<i>Celsia cromandeliana</i>	Kokhima	Methanolic	Arial part	Antiovulatory	–
31.	<i>Convolvulus arvensis</i>	Field bindweed	Alcoholic	Arial part	Antispermatogenic	α -amyrin, campesterol, stigmasterol, β -sitosterol, quercetin, kaemferol, p-caumaric acid
32.	<i>Corchorus olitorius</i>	Nalta jute	Methanolic	Seed	Antisteroidogenic	Hydrocyanin, cardiac glycosides, tannins, flavonoids, anthraquinones, saponins, Corchoroside A, helveticoside, coroloside, digitoxigenin, periplogenin
33.	<i>Cordia dichotoma</i>	Lasora	Methanolic	Bark	Antiimplantation	α -amyrins, lupeol-3-rhamnoside, β -sitosterol, β -sitosterol-3-glucoside, toxifolin-3,5-dirhmnoside
34.	<i>Crotalaria juncea</i>	Sunnhemp	Petroleum ether, Benzene and ethanol	Seed	Antispermatogenic	Flavonoids, alkaloids, saponins, volatile oil
35.	<i>Cuscuta reflexa</i>	Amarbel	Methamolic	Stem	Anti steroidogenic	Kaemferol-3-o-glucoside quercetin, quercetin-3-0-glucoside
36.	<i>dactylon</i>	Durva	Aqueous	Whole plant	Anti-implantation	Flavonoids, tannins, phenolic compound
37.	<i>Cyperus rotundus</i>	Nut grass	–	Tuber	Antifertility	Tannins, flavonoids, coumarins, sterols
38.	<i>Dactyloctenium aegypticum</i>	Crowfoot grass	Ethanolic	Whole plant	Antifertility activity	Saponins, flavonoids, tannins, terpenoids, alkaloids
39.	<i>Dalbergia sisso</i>	Seesam	Ethanolic	Stem bark	Anti-spermatogenic	Isoflavones, flavone, β -amyrin, β -sitosterol, stigmasterol
40.	<i>Datura metal</i>	Datura	Acetone	Seed	antifertility	Saponins, flavonoids, tannins, glycosides, alkaloids, terpenoids
41.	<i>Dendrophthoe falcata</i>	Banda	Methanolic	Stem	Depression of spermatogenesis	β -amyrin-6-acetate, oleonolic acid, β -sitosterol, stigmasterol
42.	<i>Dolichos biflorus</i>	Kulattha	Acetone	Seed	Anti spermatogenic antiandrogenic	Isoflavone diglycoside, aglycone
43.	<i>Emblica officinalis</i>	Amala	–	Fruit	Abortifacient	
44.	<i>Feronia limonia</i>	Wood apple	Ethanolic	Fruit pulp	Antispermatogenic	Polyphenols, phytosterols, saponins, tannin, coumarins, Triterpenoids
45.	<i>Ficus benghalensis</i>	Bargad	Ethanolic	Leaves	Suppression of the spermatogenesis	Tannins, flavonoids, steroids
46.	<i>Ficus religiosa</i>	Peepal	–	Fruit	Anti-implantation	n-hexadecanoic acid, 9,12-octadecadienoic acid, 9,12,15-octadecatrienoic acid, butyl 9,12,15-octadecatrienoate
47.	<i>Gnaphalium indicum</i>	Cudweed	Ethanolic	Whole plant	Anti-implantation	Luteolin, quercetin, quercetin-3-methyl ether
48.	<i>Grangea maderaspatana</i>	Mukhatari	Flavonoid extract	Whole plant	Anti-implantation	Sesquiterpenoids, γ -gurjunene, terpinyll acetate, hinesol
49.	<i>Ipomoea fistulosa</i>	Pink morning glory	Alcoholic	Plant without root	Postcoital antifertility	Alkaloids, glycosides, phenolics, tannins, phytosterols, flavonoids, saponins
50.	<i>Mangifera indica</i>	Mango	Methanolic	Leaves	Antispermatogenic	Saponin, anthraquinone, steroids, tannin, flavonoids
51.	<i>Maytenus emarginata</i>	Kankero	Methanolic	Leaves	Inhibition of spermatogenesis	Tannins, flavonoids, alkaloids, steroids
52.	<i>Melia azedarach</i>	Chinaberry	–	Seed	Abortifacient	Alkaloids, tannins, saponins, phenols, glycosides, steroids, terpenoids, flavonoids
53.	<i>Mimosa pudica</i>	Touch me not	–	Root	Contraception and abortion	Alkaloids, glycosides, steroids, flavonoids, phenols
54.	<i>Nelumbo nucifera</i>	Lotus	Ethanolic	Seed	Antiestrogenic	Alkaloids, flavonoids, ursane triterpenoid ester
55.	<i>Nyctanthes arbortristis</i>	Har singar	Methanolic	Stem bark	Antispermatogenic	Alkaloid, phytosterols, phenolics, tannins, flavonoids, saponins
56.	<i>Ocimum</i>	Shyam Tulsi	Hydroalcoholic	Leaves	Antifertility	Saponins, glucosides, alkaloids,

	<i>basilicum</i>					tannins, and phenolic compounds
57.	<i>Opuntia dillenii</i>	Naagfani	Methanolic	Phylloclade	Antispermatogenic	Vitexin, isorhamnetin
58.	<i>Purgularia deamia</i>	Sagovani	Ethnolic	Stem, leaves	Antifertility	Flavonoids, terpenoids, steroids, alkaloids
59.	<i>Polygonum glabrum</i>	Neli	—	Root	Contraceptive	Sterol
60.	<i>Portulaca oleracea</i>	Purslane	Petroleum ether, chloroform, and ethanol crude	Arial part	Abortifacient	Alkaloids, tannins, flavonoids, saponins, and triterpenoids
61.	<i>Rivea hypocrateriform</i>	Night glory	Ethnolic	Arial part	Antiovulatory	Alkaloids, glycosides, saponins, tannins, phenolic compound
62.	<i>Salvadora persic</i>	Meswak	Aqueous	Leaf and stem	Antifertility	Octacosanol, 1-triacantanol, β -sitosterol, β -sitosterol-3-o- β -D-glycopyranoside
63.	<i>Sida acuta</i>	common wireweed	Ethnolic	Leaf	Antiimplantation	Alkaloids, steroids, glycosides, saponins, flavones, phenolic compound
64.	<i>Syzygium cumini</i>	Jamun	Alcoholic	Seed	Antispermatogenic	β -pinene, terpinolene, eugenol, rutin, quercetin, β -sitosterol
65.	<i>Terminalia bellirica</i>	Harad	Ethnolic	Bark	Anti-implantation	Phytosterols, flavonoids, phenolic comp., tannins
66.	<i>Terminalia chebula</i>	Harad	Acetone, Methanol, Ethanol, Aqueous	Bark	Antispermatogenic	Tannins, flavonoids, sterolstriterpenoids
67.	<i>Tectona grandis</i>	Teak	Petroleum ether	Stem	Antifertility	Lapachol
68.	<i>Tamarindus indica</i>	Imli	—	Fruit	abortifacient	—
69.	<i>Tephrosia purpurea</i>	Unhali	—	Seed	Purpurin, rutin	—
70.	<i>Terminalia arjuna</i>	Arjun tree	—	Bark	Antiimplantation, Abortifacient	Lupeol, oleanolic acid, arjunic acid, arjunetin, arjunolitin
71.	<i>Tinospora cordifolia</i>	Giloya	Methanolic	Stem	Antifertility	Alkaloids, sesquiterpenoid, β -sitosterol, cordifolia, columbin
72.	<i>Tribulus terrestris</i>	Gokhru	—	Seed	Abortifacient	Alkaloids, flavonoids, saponins, tannins
73.	<i>Vicoa indica</i>	Banjhauri	—	Plant	Antiimplantation	Vicolid B, Vicolid D
74.	<i>Wrightia tinctorial</i>	Duhi	Ethnolic	Stem bark	Post-coital interceptive activity	Lupeol, stigmasterol, campesterol
75.	<i>Zizyphus mauritiana</i>	Ber	Aqueous, methanolic	Bark	Spermicidal	Mauritine A, B, oleonic acid, betulonic acid

Table 2: List of Antifertility Medicinal Plants (31)

Plant	Type	Dose/Body weight (mg/kg)	Activity
<i>Cichorium intybus</i>	50% ethanolic extract	50	Anti-implantation
<i>Cuscuta reflexa</i>	Ethanolic extract	800	Anti-implantation
<i>Rubia cordifolia</i>	Ethanolic extract	250	Anti-implantation
<i>Urtica dioica</i>	Ethanolic extract	250	Anti-implantation
<i>Abroma augusta</i>	Petroleum ether	50	Anti-implantation
<i>Curcuma longa</i>	Petroleum ether	200	Anti-implantation
<i>Plumbago rosea</i>	Acetone extract	200	Anti-implantation
<i>Aloe barbadensis</i>	Aqueous extract	100	Anti-implantation
<i>Abutilon indicum</i>	50% aqueous methanolic extract	500	Anti-implantation
<i>Artemisia vulgaris</i>	Methanolic extract	300 and 600	Anti-implantation

Table 3: List of Medicinal Plants Reported to Possess Antifertility Effects (58)

S. no.	Name of the plant	Family	Part used	Animal model	Mechanism of action
1.	<i>Abroma angusta</i> Linn.	Sterculiaceae	Roots	Rat	Antiimplantation & Abortifacient
2.	<i>Abrus precatorius</i> Linn.	Fabaceae	Seeds	Rat	Reduced sperm motility, Post-testicular antifertility effect
3.	<i>Acacia auriculaeformis</i> A. Cunn.	Fabaceae	-	-	Sperm immobilizing effect
4.	<i>Acacia caesia</i> Wight & Arn	Leguminosae	Fruit	-	Immobilization of spermatozoa
5.	<i>Acacia concinna</i> DC	Fabaceae	Stem bark	Rat	Spermicidal and semen coagulating activities
6.	<i>Acalypha indica</i> Linn.	Euphorbiaceae	Whole plant	-	Anti-estrogenic activity
7.	<i>Achillea millefolium</i> Linn.	Asteraceae	Flowers	Mice	Antispermatogenic effect
8.	<i>Achyranthus aspera</i> Linn.	Amaranthaceae	Root	Rat	Spermicidal action
9.	<i>Actiniopteris dichotoma</i> Kuhn	Pteridaceae	Whole plant	Rat	Antifertility effect
10.	<i>Adhatoda vasica</i> Nees Syn. <i>Justice adhatoda</i> L.	Acanthaceae	Leaves	Rat	Antiimplantation & Abortifacient
11.	<i>Aegle marmelos</i> Corr. Ex Roxb.	Rutaceae	Leaf	Rat	Resist process of spermatogenesis and decrease sperm motility
12.	<i>Aerva lanata</i> (L.) Juss. Ex. Shult	Amaranthaceae	Aerial parts	Rat	Antiimplantation effect
13.	<i>Afromosia laxiflora</i> (Baker) Harms	Fabaceae	Stem bark	Rat	Antigonadotropic activity and blocks oestrous cycle
14.	<i>Ailanthus excelsa</i> Roxb.	Simaroubaceae	Leaf, Stem, Bark	Rat	Antiimplantation effect and Early Abortifacient
15.	<i>Alangium Salvifolium</i> (L.f.)	Alangiaceae	Stem, Bark	Rat	Antiimplantation & Abortifacient
16.	<i>Albizia procera</i> (Roxb.) Benth.	Leguminosae	Seed and Root	Rat	Spermicidal and semen coagulating activities
17.	<i>Albizia lebbek</i> (Linn.) Benth.	Mimosaceae	Pod, Bark	Rat	Antifertility activity
18.	<i>Allium cepa</i> Linn.	Liliaceae	Bulb	Rat	Antiimplantation activity
19.	<i>Allium sativum</i> Linn.	Amaryllidaceae	Pod	Rat	Antispermatogenic activity
20.	<i>Aloe barbadensis</i> Mill. Syn. <i>Acalypha indica</i> , <i>A. litoralis</i> , <i>A. vera</i>	Liliaceae	Leaves	Dog	Antiandrogenic activity
21.	<i>Alstonia scholaris</i> R.Br.	Apocynaceae	Stem bark	Rat	Antifertility activity
22.	<i>Amaranthus spinous</i> Linn.	Amaranthaceae	Root	Rat	Inhibit fusion of Sperm and Ovum
23.	<i>Amaranthus viridis</i> L.	Amaranthaceae	Root	Rat	Contraception Activity
24.	<i>Anacardium occidentale</i> Linn.	Anacardiaceae	Nut Shell	Rat	Spermicidal
25.	<i>Anagallis arvensis</i> Linn.	Primulaceae	Whole Plant	Rat	Spermicidal and semen coagulating activities
26.	<i>Ananas comosus</i> Merr.	Bromeliaceae	Unripe fruit	Rat	Antispermatogenic activity
27.	<i>Andrographis paniculata</i> Wall. Ex Nees	Acanthaceae	Leaves	Rat	Antispermatogenic and antiandrogenic
28.	<i>Arctium lappa</i> Linn.	Asteraceae	Leaves and roots	Rat	Abortifacient
29.	<i>Ardisia solanacea</i> Roxb.	Myrsinaceae	Plants excluding roots	Rat	Spermicidal Activity
30.	<i>Aristolochia indica</i> Linn.	Aristolochiaceae	Root	Presbytes langur	Antispermatogenic and antiandrogenic
31.	<i>Artemisia afra</i> Jacq. Ex Wild.	Asteraceae	Leaf	Rats	Abortion
32.	<i>Artemisia vulgaris</i> Linn.	Asteraceae	Leaves	Rats	Antiimplantation and Estrogenic activity
33.	<i>Aspilia Africana</i> (pers.) C.D. Adams	Asteraceae	Leaves	Rats	Antiovulatory Activity
34.	<i>Austropolenckia populnea</i> (Reiss.) Lundell.	Celastraceae	Pods	Rats	Affects the sexual behavior and epididymal sperm concentration
35.	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Seed Oil	Rats	Antispermatogenic and antiandrogenic
36.	<i>Bacopa monnieri</i> (L.) Pennell	Scrophulariaceae	Whole plant	Rats	Contraception Activity
37.	<i>Balanites roxburghii</i> Linn.	Zygophyllaceae	Fruits	Dog	Antispermatogenic activity and testicular necrosis and atrophy

38.	<i>Ballota undulata</i> (Sieber ex. Fresen.) Benth.	Labiatae	Leaves, Flowers	Rats	Antiimplantation activity
39.	<i>Bambusa arundinacea</i> Willd.	Gramineae	Shoots, Stem	Rats	Impaired the structural and functional activity of epididymis, Reduced sperm motility
40.	<i>Barleria prionitis</i> Linn.	Acanthaceae	Roots	Rat	Antifertility effect
41.	<i>Berberis chitria</i> Buch.-Ham.ex Lindl.	Berberidaceae	Root	Dog	Antispermatogenic activity
42.	<i>Biophytum sensitivum</i> (L.) DC.	Oxalidaceae	Leaves	Rats	Antiimplantation Activity
43.	<i>Bougainvillea</i> Comm. Ex Juss.	Nyctaginaceae	Leaves	Rats	Antifertility effect
44.	<i>Butea monosperma</i> (Lam.) Kuntze	Fabaceae	Seed	Rat, Dog	Effects on testicular function
45.	<i>Calotropis procera</i> (Ait.) R. Br.	Asclepiadaceae	Roots	Rabbit, Mice	Antispermatogenic effect anf leydig cell atrophy Functional alteration in the genital organs and inhibition of fertility
46.	<i>Cananga odorata</i> (Lam.) Hook. F. & Thomson	Annonaceae	Root, Bark	Rat	Spermicidal Activity
47.	<i>Cannabis sativa</i> Linn.	Cannabaceae	Leaves	Presbytis Monkey	Testicular lesions and atrophy of Leydig cells
48.	<i>Cardiospermum Helicacabum</i> L.	Spindaceae	Whole plant	Rat	Antiimplantation activity
49.	<i>Carica papaya</i> Linn.	Caricaceae	Fruit	Rat	Antispermatogenic activity
50.	<i>Carum carvi</i> Linn.	Apiaceae	Rhizome	Rat	Antioestrogenic activity
51.	<i>Cassis fistula</i> Linn.	Caesalpiniaceae	Pods, Seeds	Rat	Antioestrogenic activity
52.	<i>Catharanthus roseus</i> G. Don syn. <i>Vinca rosea</i> Linn.	Apocynaceae	Leaves	Mice	Antioestrogenic activity
53.	<i>Celastrus paniculatus</i> Willd.	Celastraceae	Seeds	Rat	Antispermatogenic action
54.	<i>Cicer arietinum</i> Linn.	Fabaceae	Seeds	Rat	Abortifacient and estrogenic activity
55.	<i>Cichorium intybus</i> Linn.	Asteraceae	Whole plant	Rat	Antispermatogenic activity
56.	<i>Cinnamomum</i>	Lauraceae	Seed	Sparrow	Arrest and inhibition of spermatogenesis
57.	<i>Camphora</i> Nees & Eberm.				
58.	<i>Cissampelos pareira</i> Linn.	Menispermaceae	Leaves	Mice	Antioestrogenic activity
59.	<i>Citrullus colocynthis</i> Schrad.	Cucurbitaceae	Fruit, Root	Rat	Induced reversible antifertility effects and Antispermatogenic effect
60.	<i>Clerodendrum serratum</i> L.	Lamiaceae/Verb enaceae	Whole plant (Excluding Roots)	Rats	Spermicidal activity
61.	<i>Cnidoscolus aconitifolius</i> (Mill.) J.M.Johnst.	Euphorbiaceae	Leaves	Rats	Contraception
62.	<i>Cola nitida</i> Schott & Endl.	Sterculiaceae	Stem Bark	Rats	Antigonadotropic activity and
63.	<i>Colebrookia oppositifolia</i> Sm.	Lamiaceae	Leaf	Rats	Antifertility Effect
64.	<i>Combretodendron macrocarpum</i> (P. Beauv.) Keay	Barringtoniaceae	Stem bark	Rats	Antigonadotropic activity and
65.	<i>Convolvulus micropus</i> Sieb. ex Spreng	Convolvulaceae	Whole Plant	Rat	Antispermatogenic effect
66.	<i>Crataeva nurvala</i> Buch.Ham.	Capparidaceae	Stem Bark	Rat	Antiimplantation and Antioestrogenic activity
67.	<i>Crotalaria juncea</i> Linn.	Papilionaceae	Seeds	Mice	Antifertility Activity, Arrest of spermatogenesis and antiandrogenic Effect
68.	<i>Croton roxburghii</i> Balak.	Euphorbiaceae	Bark	Mouse	Anti-steroidogenic activity
69.	<i>Cumftiga racemosa</i> L.	Apocynaceae	Root	Rats	Spermatogenesis
70.	<i>Cuminum cyminum</i> Linn.	Apiaceae	Seed	Rat	Antispermatogenic effect
71.	<i>Curcuma aromatica</i> Salisb.	Zingiberaceae	Rhizome	Rats	Antifertility Activity
72.	<i>Curcuma longa</i> Linn.	Zingiberaceae	Root	Rats	Interference with Spermatogenesis
73.	<i>Cyclamen persicum</i> Mill.	Primulaceae	Whole Plant	-	Spermicidal activity
74.	<i>Cyclea burmanni</i> Miers	Menispermaceae	Roots	Rat	Decrease Sperm Count
75.	<i>Cynomorium coccineum</i> Linn.	Cynomoraceae	Inner pulp of stem and root	Rats	Effect on epididymal sperm pattern
76.	<i>Daucus Carota</i> Linn.	Apiaceae	Seeds	Rat	Blastocystotoxic and Antiimplantation effects; Postcoital contraceptive effects
77.	<i>Dendrophthoe falcata</i> (Linn. f.)	Loranthaceae	Aerial parts	Rats	Antifertility effect

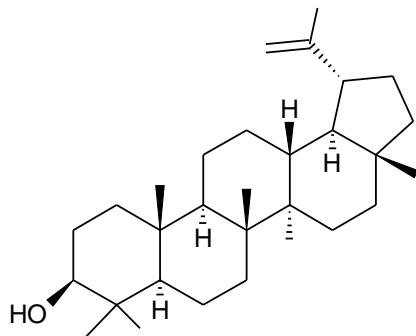
78.	<i>Derris brevipes</i> Baker.	Fabaceae	Root Powder	Rats	Abortifacient
79.	<i>Desmodium gangeticum</i> DC.	Fabaceae	Whole plant	Rat	Antifertility effect
80.	<i>Dioscorea bulbifera</i> L.	Dioscoreaceae	Tuber	-	Contraceptive
81.	<i>Diploclisia echinatus</i> Linn.	Asteraceae	Stem	-	Spermicidal
82.	<i>Dipsacus mitis</i> D. Don	Spindaceae	Root	Hamster	Contraceptive
83.	<i>Ecballium elaterium</i> A. Rich.	Cucurbitaceae	-	Rabbit	Decreases sperm motility
84.	<i>Echeveria gibbiflora</i> DC	Crassulaceae	Whole plant	Guinea Pig	Decreased sperm motility
85.	<i>Echinops echinatus</i> Roxb.	Asteraceae	Root	Rat	Sperm antimotility
86.	<i>Embelia Ribes</i> Burm.f.	Myrsinaceae	Berry	Rat	Antifertility activity
87.	<i>Epilobium angustifolium</i> Linn.	Onagraceae	-	Rat	Reduction in weight of accessory sex organs
88.	<i>Eupatorium odoratum</i> Linn.	Asteraceae	-	-	Spermicidal activity
89.	<i>Euphorbia nerifolia</i> Linn.	Euphorbiaceae	Root	Rat	Antispermatogenic effects
90.	<i>Eugenia jambolana</i> L.	Myrtaceae	Flowers	Rat	Antifertility effect
91.	<i>Ehretia cymosa</i> Thonn.	Boraginaceae	Leaf, Bark	-	Contraceptive
92.	<i>Eleutherine bulbosa</i> Urb.	Iridaceae	Bulb	Rat	Abortifacient
93.	<i>Fevillea passiflora</i> Vell.	Cucurbitaceae	Seed	-	Abortifacient
94.	<i>Ferula assa-foetida</i> Linn.	Apiaceae	Resin	-	Emmenagogue
95.	<i>Ficus religiosa</i> Linn.	Moraceae	Fruit	Goat	Anti-implantation
96.	<i>Ficus wassa</i> Roxb.	Moraceae	Root	-	Contraceptive
97.	<i>Flagellaria indica</i> Linn.	Flagellariaceae	Leaf	-	Contraceptive
98.	<i>Flemingia strobilifera</i> (L.) St. Hil syn. <i>Moghania strobilifera</i> (L.) J. St.-Hil.	Fabaceae	Seed	-	Contraceptive
99.	<i>Fleura aestuans</i> Linn.	Utricaceae	Root	-	Abortifacient
100.	<i>Foeniculum vulgare</i> Mill.	Apiaceae	Seed	Rat	Sperm toxic
101.	<i>Fragaria vesca</i> Linn.	Rosaceae	Leaf	-	-
102.	<i>Franseria artemisioides</i> Willd.	Asteraceae	Whole plant	-	Contraceptive
103.	<i>Galium mexicanum</i> Var.	Rubiaceae	Leaves	Cat	Abortifacient
104.	<i>Garcinia cambogia</i> Desr.	Clusiaceae	Fruit	Rat	Testicular atrophy
105.	<i>Gardenia jasminoides</i> Ellis.	Rubiaceae	Fruits	-	Abortifacient
106.	<i>Gloriosa superb</i> Linn.	Liliaceae	Roots	Rat, mice	Oxytocic activity, Abortifacient
107.	<i>Glossocardia bosvallia</i> DC.	Asteraceae	Whole plant	-	Emmenagogue
108.	<i>Glycyrrhiza glabra</i> Linn.	Fabaceae	Root	-	Emmenagogue
109.	<i>Gossypium barbadense</i> Linn.	Malvaceae	Cotton Seed	rat	Testicular
110.	<i>Grewia columnaris</i> Sm.	Triliaceae	Root	-	Sterilizer
111.	<i>Hagenia abyssinica</i> .syn. <i>Brayera anthalmintica</i>	Rosaceae	-	-	Abortifacient
112.	<i>Haematoxylon campechianum</i> L.	Fabaceae	Whole plant	-	Abortifacient
113.	<i>Hamelia erecta</i> Jacq	Rubiaceae	Leaf	-	Abortifacient
114.	<i>Hedeoma pulegioides</i> Linn.	Labiateae	Plant without root	-	Contraceptive and Abortifacient
115.	<i>Hedera helix</i> Linn.	Araliaceae	Fruit	-	Contraceptive
116.	<i>Hibiscus rosa-sinensis</i> Linn.	Malvaceae	Root	Rats & Mice	Anti-implantation & Uterotropic activity
117.	<i>Hyptis suaveolens</i> Poit.	Labiatae	Whole plant	Mice	Antifertility
118.	<i>Hypochoeris brasiliensis</i> (Less.) Benth	Asteraceae	Leaf & Root	-	Contraceptive
119.	<i>Hypericum chinensis</i> Linn.	Clusiaceae	Leaf	-	Emmenagogue
120.	<i>Hymenaea stigonocarpa</i> Mart. Ex Hayne	Fabaceae	Bark	-	Contraceptive
121.	<i>Indigofera linnaei</i> Ali	Fabaceae	Herb	rats	Anti-fertility activity
122.	<i>Jacaranda copaia</i> (Aublet.) D. Don	Bignoniaceae	Tuber	-	Contraceptive
123.	<i>Jasminum multiflorum</i> (Burm.f.) Andrews	Oleaceae	-	-	Emmenagogue
124.	<i>Jodinia rhombifolia</i> (Hook. & Arn.) Reissek.	Santalaceae	Leaf	-	Abortifacient
125.	<i>Juglans regia</i> Linn.	Juglandaceae	Leaf	-	Contraceptive
126.	<i>Juniperus communis</i> Linn.	Cupressaceae	Stem & Fruit	-	Anti-implantation activity
127.	<i>Juniperus oxycedrus</i> Linn.	Cupressaceae	Berry	-	Abortifacient
128.	<i>Justicia simplex</i> D. Don	Acanthaceae	Root	-	Contraceptive
129.	<i>Kopsia</i> SP	Apocynaceae	Leaf	-	Contraceptive
130.	<i>Laurus nobilis</i> Linn.	Lauraceae	Leaf	Rats	Testicular dysfunction



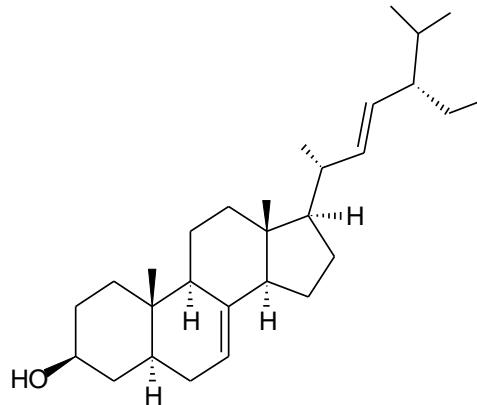
131.	<i>Lawsonia inermis</i> Linn. syn. <i>L. alba</i>	Lythraceae	Leaves	rats	Abortifacient
132.	<i>Leonotis nepetaefolia</i> R.Br.	Labiatae	Leaf	Rats	Anti-implantation
133.	<i>Lepidium meyenii</i> Walp.	Brassicaceae	Root	Rats	invigorates spermatogenesis in male rats
134.	<i>Lepidium sativum</i> Linn.	Brassicaceae	Herb	-	Abortifacient & Anti-Ovulatory
135.	<i>Licuala</i> SP.	Arecaceae	Root bark	-	Contraceptive
136.	<i>Ligusticum porter</i> Coul. And Rose	Apiaceae	Root	-	Emmenagogue
137.	<i>Lithospermum officinale</i> Linn.	Broaginaceae	Leaves	Rat	Inhibition of hypophyseal hormone secretion
138.	<i>Lobelia nicotianifolia</i> Heyne	Campanulaceae	Whole plant	-	Contraceptive
139.	<i>Lonicera ciliosa</i>	Caprifoliaceae	Leaf	-	Contraceptive
140.	<i>Malvaviscus conzattii</i> Greenm	Malvaceae	Flower	Albino Mice	Antifertility activity
141.	<i>Martynia annua</i> Linn.	Martyniaccae	Root	Rats	Antifertility Effect
142.	<i>Melodinus fusiformis</i> Champ. Ex Benth.	Apocynaceae	-	-	Spermicidal Effect
143.	<i>Mentha arvensis</i> Linn.	Labiatae	Leaves	Rabbits	Anti-Ovulatory
144.	<i>Millettia auriculata</i> Baker. ex, Brand.	Fabaceae	Leaves	Rat	Anti-Implantation effect
145.	<i>Momordica charantia</i> Linn.	Cucurbitaceae	Seeds	Rats	Antispermatogenic
146.	<i>Mondia whiteii</i> Skeels	Apocynaceae	Root bark	Rat	Antispermatogenic & Anti fertility activities
147.	<i>Mucuna urens</i> Medik.	Fabaceae	Seed	Rat	Antispermatogenic
148.	<i>Myristica fragrans</i> Houtt	Myristiacaceae	Seed	-	Abortifacient
149.	<i>Mesua ferrea</i> Linn.	Clusiaceae	Flowers	Rat	Anti-implantation
150.	<i>Nardostachys jatamansi</i> DC.	Valerianaceae	Root	-	Emmenagogue
151.	<i>Nasturtium officinale</i> R.Br.	Brassicaceae	Whole Plant	-	Abortifacient
152.	<i>Nerium indicum</i> Mill.	Aocynaceae	Whole Plant	-	Emmenagogue
153.	<i>Nicotiana tabacum</i> Linn.	Solanaceae	Leaves	Rat	Antiandrogenic effects
154.	<i>Nigella sativa</i> Linn.	Ranunculaceae	Seeds	Rat	Post-Coital Antifertility effect
155.	<i>Nothocnide repanda</i> (Bl.) Bl.	Utricaceae	Leaf	-	Abortifacient
156.	<i>Ochna jaboatapita</i> Linn.	Ochnaceae	Plant (Without	-	Semen coagulating activity
157.	<i>Ocimum sanctum</i> Linn.	Labiatae	Leaves	Rats	Antiandrogenic Property
158.	<i>Olea europea</i> Linn.	Oleaceae	Fruit	Rats	Contraceptive
159.	<i>Ophiopogon intermedius</i> (D.Don) Maxim	Asparagaceaea	Rhizomes	-	Spermicidal
160.	<i>Opuntia dilleni</i> Haw.	Cactaceae	Phylloclade	Rats	Spermatotoxic
161.	<i>Origanum vulgare</i> Linn.	Labiatae	-	-	Abortifacient
162.	<i>Oxalis physocalyx</i> Zucc.ex Progel	Oxalidaceae	Whole Plant	-	Abortifacient
163.	<i>Oxytenanthera abyssinica</i> Munero	Poaceae	Leaf	-	Abortifacient
164.	<i>Papaver somniferum</i> Linn.	Papaveraceae	Fruit	-	Induces Abortion
165.	<i>Peganum harmala</i> Linn.	Zygophyllaceae	Epigeal Plants	Rats	Abortifacient
166.	<i>Petrocarpus santalinus</i> Linn.f.	Fabaceae	Stem Bark	Rats	Anti-implantation activity
167.	<i>Piper longum</i> Linn.	Piperaceae	Fruit	Rats	Antifertility Activity
168.	<i>Pittosporum neelgherrense</i> Wight & Arn.	Pittosporaceae	Plant (Without Root)	Rats	Spermicidal and Semen Coagulation
169.	<i>Plumbago zeylanica</i> Linn.	Plumbaginaceae	Leaves & Root	Rats	oestrogenic activity
170.	<i>Plumeria rubra</i> Linn.	Apocynaceae	Pod Extract	Rats	Anti-implantation activity
171.	<i>Polemonium caeruleum</i> Linn.	Polemoniaceae	-	-	Antispermatogenic effect
172.	<i>Primula vulgaris</i> Huds.	Primulaceae	-	-	Spermicidal effect
173.	<i>Pueraria tuberosa</i> DC.	Fabaceae	Tubers	Rats	Antifertility activity
174.	<i>Portulaca oleracea</i> Linn.	Portulacaceae	Seed	Mice	Impairement of Spermatogenesis
175.	<i>Pyrus cuspidata</i> Bertol	Rosaceae	Whole Plant	-	Spermicidal effect
176.	<i>Quassia amara</i> Linn.	Simaroubaceae	Stem wood	Rats	Antifertility activity
177.	<i>Randia dumetorum</i> Lamk.	Rubiaceae	-	-	Anti-implantation effect
178.	<i>Randia spinosa</i> (Thumb.) Bl.	Rubiaceae	Fruit	-	Antifertility activity
179.	<i>Ranunculus sceleratus</i> Linn.	Ranunculaceae	Whole Plant	-	Antifertility activity
180.	<i>Rauwolfia serpentine</i> Benth.	Apocynaceae	Root	-	Antifertility activity
181.	<i>Rhamnus catharticus</i> Linn.	Rhamnaceae	-	-	Emmenagogue
182.	<i>Ricinus communis</i> Linn.	Euphorbiaceae	Seed	Guinea Pigs	Anti-implantation and Abortifacient
183.	<i>Rubia cordifolia</i> Linn.	Rubiaceae	Root	-	Antifertility activity
184.	<i>Rubus ellipticus</i> Sm.	Rosaceae	Leaves	Rats	Anti-implantation Effect

185.	<i>Ruta angustifolia</i> Linn.	Rutaceae	Leaf	-	Antifertility activity
186.	<i>Ruta graveolens</i> Linn.	Rutaceae	Aerial parts and Roots	Rats and hamsters	Anticonceptive activity
187.	<i>Salvia fruticosa</i> Mill.	Labiateae	Leaves	Rats	Anti-implantation Effect
188.	<i>Samida rosea</i> Sims.	Flacourtiaceae	Leaf	Rats	Abortifacient and Emmenagogue
189.	<i>Santalum album</i> Linn.	Santalaceae	Whole Plant	-	Abortifacient
190.	<i>Sapindus mukorossi</i> Gacrtm	Sapindaceae	Fruit Pericarp	Rats	Alteration in Sperm membrane physiology
191.	<i>Sarcostemma acidum</i> (Roxb) Voigt	Apocynaceae	Stem	Rats	Arrests Spermatogenesis
192.	<i>Scilla indica</i> (Baker)	Liliaceae	Bulb	-	Emmenagogue
193.	<i>Semecarpus anacardium</i> Linn.	Anacardiaceae	Fruits	Rats	Spermatogenic arrest
194.	<i>Solanum surattense</i> Burm.f.	Solanaceae	Seed	Rats	Deplete the oxidative stress of cauda epididymal spermatozoa
195.	<i>Stephania hernandifolia</i> Willd.	Menispermaceae	Leaf	Rats	Inhibition of spermatogenesis
196.	<i>Stevia rebaudiana</i> Bertoni	Asteraceae	Whole plant	Rats	Decrease in Testosterone Level
197.	<i>Striga orobanchoides</i> Benth	Scrophulariaceae	Whole Plant	Rats	Antispermatogenic effect
198.	<i>Syzygium cuminii</i> Linn. Syn. <i>Eugenia jambolana</i> Lam.	Myrtaceae	Oleanolic acid isolated from the flowers of <i>Eugenia jambolana</i>	Rats	Arrest of spermatogenesis
199.	<i>Tagetes erecta</i> L.	Asteraceae	leaves	-	Emmenagogue
200.	<i>Tanacetum parthenium</i> L.Sch.	Asteraceae	Plant without Root	-	Abortifacient
201.	<i>Taxus baccata</i> Linn.	Taxaceae	Leaves	Rats	Antifertility
202.	<i>Terminalia arjuna</i> Wight & Arn.	Combretaceae	Bark	-	Antispermatogenic effect
203.	<i>Tinospora cordifolia</i> (Willd.) Miers ex Hook.f. Thoms	Menispermaceae	Stem	Rats	Reduction in testosterone levels
204.	<i>Trichosanthes cucumerina</i> Linn.	Curcurbitaceae	Whole plant	Rats	Antiovulatory activity
205.	<i>Trigonella foenumgraecum</i> Linn.	Fabaceae	Seeds	Rabbits	Antifertility activity
206.	<i>Tripterygium hypoglaucum</i> (Level) Hutch	Celastraceae	Root Xylem	Humans	Reduced Sperm concentration and motility
207.	<i>Tripterygium wilfordii</i> Hook f.	Celastraceae	Root and Isolated plant fractions	Rats and Humans	Reversible infertility
208.	<i>Tylophora asthmatica</i> Wight & Arn	Apocynaceae	Leaf and Stem	Rat	Antispermatogenic effect
209.	<i>Uraria lagopodioides</i> Desv.	Fabaceae	Whole plant	-	Abortifacient effect
210.	<i>Urena lobata</i> Linn.	Malvaceae	Root	Rat	Inhibition of Spermatogenesis and
211.	<i>Urginea indica</i> Kunth.	Liliaceae	Bulb	-	Abortifacient effect
212.	<i>Urtica dioica</i> Linn.	Urticaceae	-	-	Abortifacient effect
213.	<i>Urospatha antisylleptica</i> R.E. Schult.	Araceae	-	-	Contraceptive
214.	<i>Valeriana Montana</i> Linn.	Valerianaceae	Root	-	Sterilizer
215.	<i>Ventilago neo-caledonica</i> Schlecht.	Rhamnaceae	Leaf	-	Contraceptive
216.	<i>Vernonia amygdalina</i> Delile	Asteraceae	Root	-	Antifertility effect
217.	<i>Viburnum foetidum</i> wall	Caprifoliaceae	Leaf	-	Emmenagogue
218.	<i>Vigna unguiculata</i> (Linn.)Walp (Cowpeas)	Fabaceae	-	Rat	Antifertility effect
219.	<i>Vitex negundo</i> L	Lamiaceae	Seeds	Dog	Anti-Androgenic Effect
220.	<i>Waltheria Americana</i> Linn	Sterculaceae	-	-	Abortifacient Effect
221.	<i>Wedelia gracilis</i> Rich	Asteraceae	Whole plant	-	Abortifacient Effect
222.	<i>Wedelia trilobata</i> (L.) Hitch.	Asteraceae	-	-	Antifertility effect
223.	<i>Withania coagulans</i> (Stocks.) Dunal	Solanaceae	Fruit	-	Emmenagogue
224.	<i>Withania somnifera</i> Dunal	Solanaceae	Fruit	Rats	Decreased Sperm motility
225.	<i>Xanthium spinosum</i> Linn.	Asteraceae	Leaf	-	Contraceptive
226.	<i>Xylopia aethiopica</i> (Dunal) A.Rich	Annonaceae	Fruit	Rats	Antifertility effect
227.	<i>Zaluzania triloba</i> (Ort.) Pers.	Asteraceae	Plant without root	-	Abortifacient

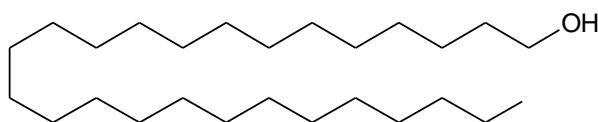
228.	<i>Zingiber roseum</i> (Roxb.) Roscoe	Zinziberaceae	Stem	-	Antifertility
229.	<i>Zinziber officinale</i> Rosc.	Zinziberaceae	Rhizome	Rats	Abortifacient
230.	<i>Ziziphora tenuior</i> Linn	Labiatae	Seed	-	Emmenagogue
231.	<i>Ziziphus nummularia</i> (Burm.f.)	Rhamnaceae	Root bark	-	Abortifacient
232.	<i>Zizyphus jujuba</i> Mill.	Rhamnaceae	Bark	-	Antifertility
233.	<i>Zizyphus xylopyrus</i> (Retz.) Willd.	Rhamnaceae	Fruit	-	Induces Sterility



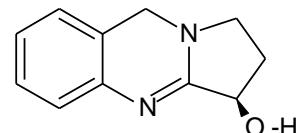
Lupeol



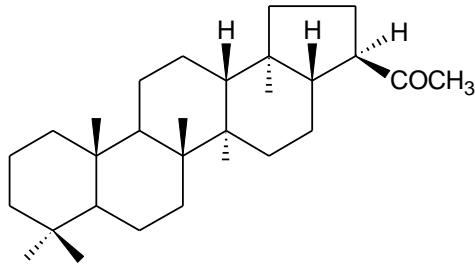
Alpha - spinasterol



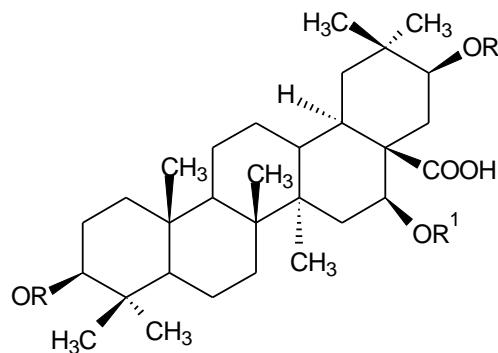
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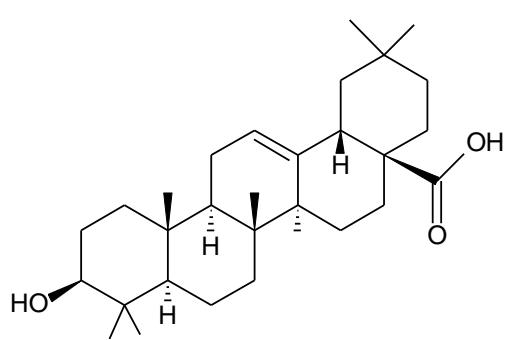
Vasicine



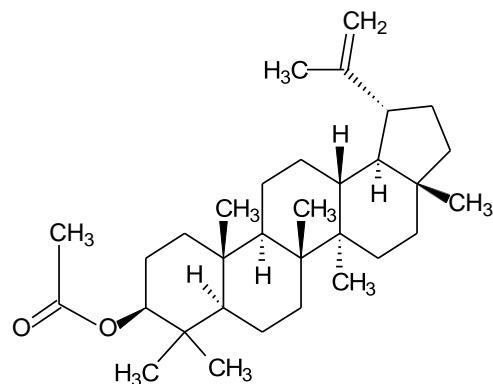
Isoadiantone



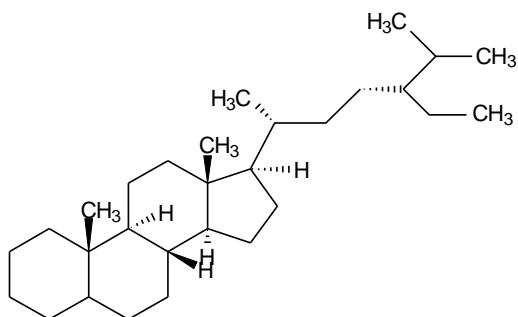
Lebbekanin -E



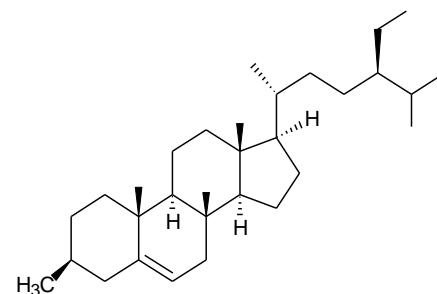
Oleanolic acid



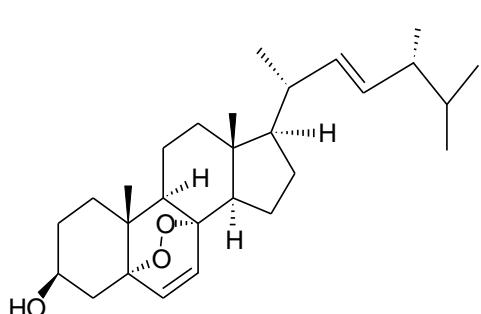
Leupelol acetate



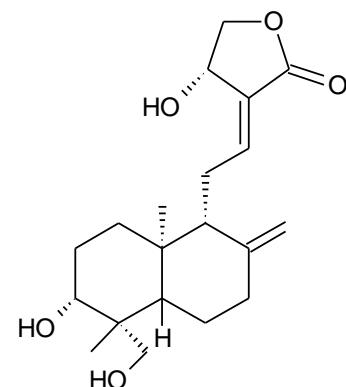
Stigmastane



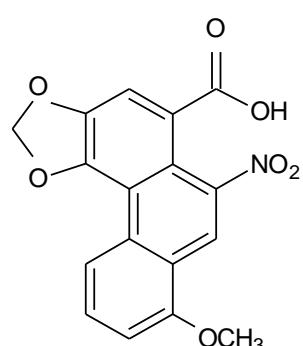
Beta - Sitosterol



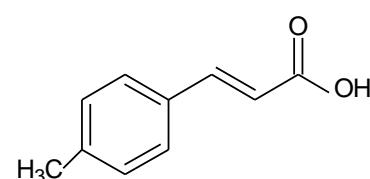
Ergosterol peroxide



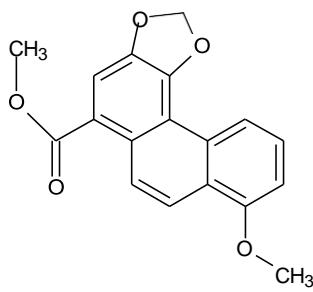
Andrographolide



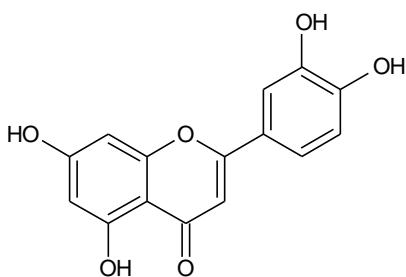
Aristolic acid



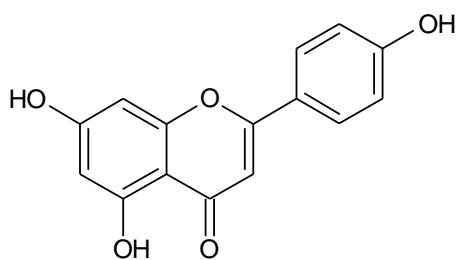
p -coumaric acid



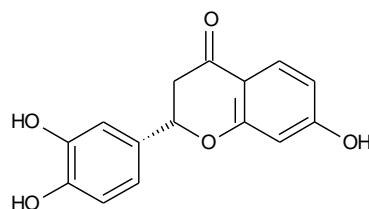
Methyl aristolactone



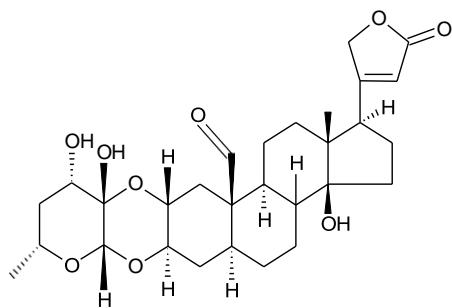
Luteolin



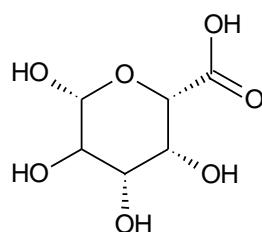
Apigenin



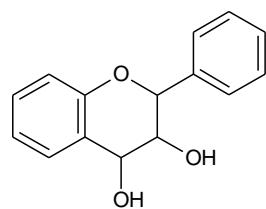
Butin



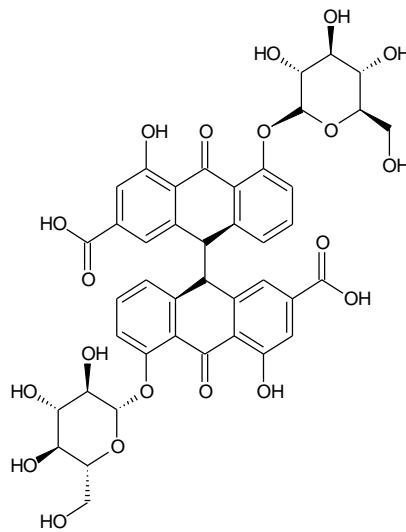
Calotropin



Pectin

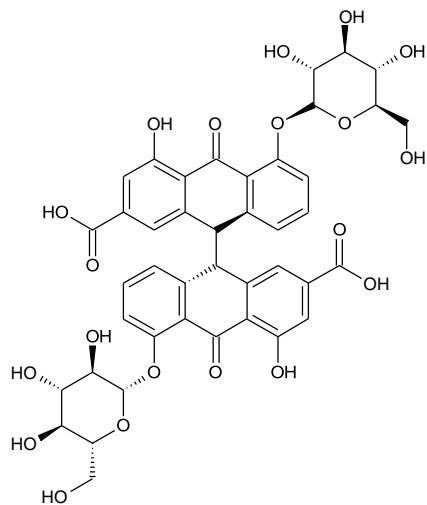


Leucoanthocyanidin

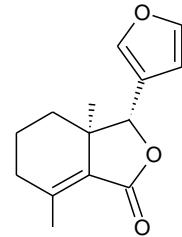


Sennoside A

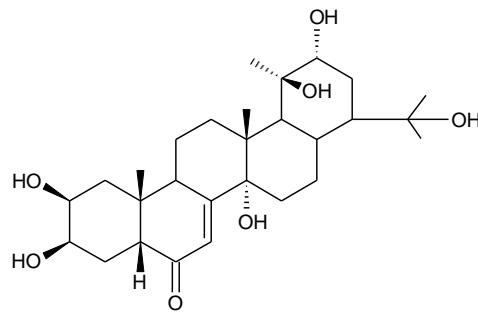




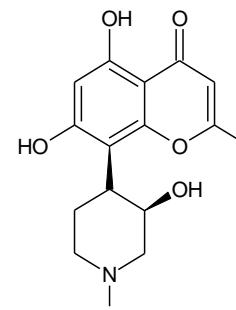
Sennoside B



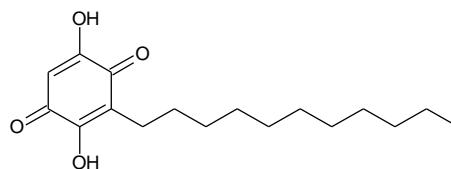
Fraxinellone



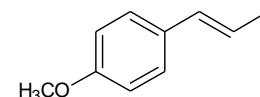
Ecdysterone



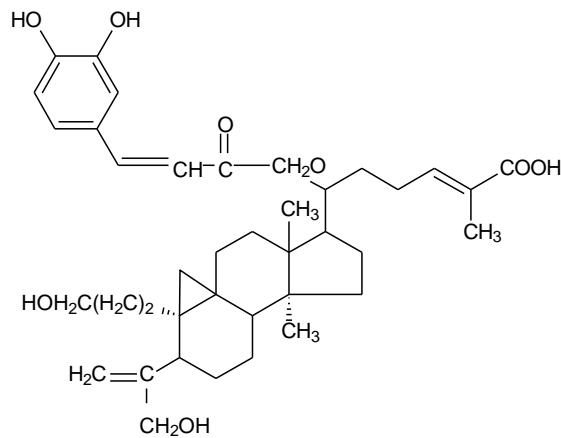
Rohitukene



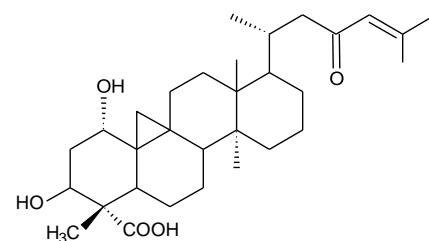
Embelin



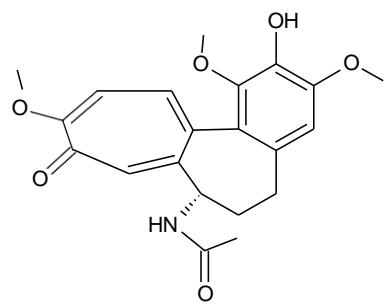
Anethole



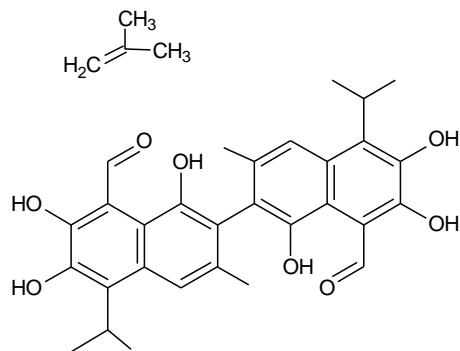
Gardenic acid



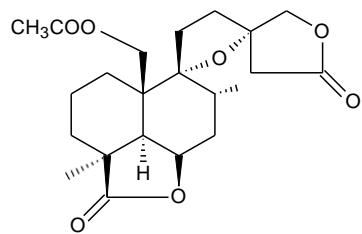
Gardenolic acid B



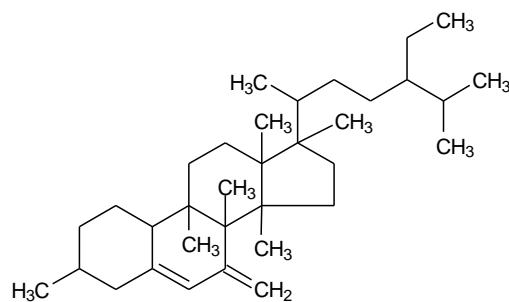
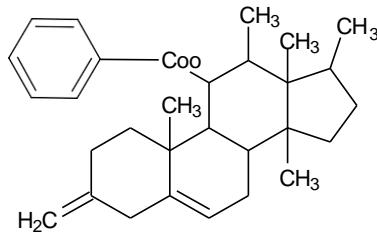
Colchicine



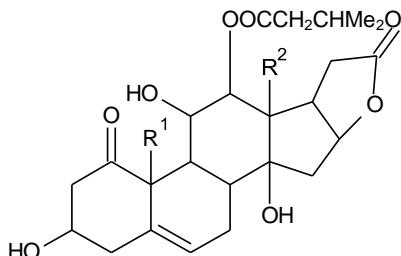
Gossypol acetic acid



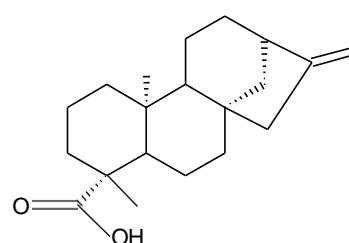
Leonitin

7 -Oxo - β -sitosterol

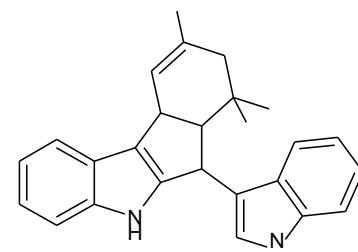
Tinctoramine



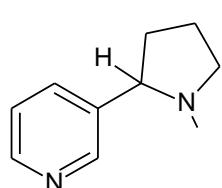
Tinctoralactone



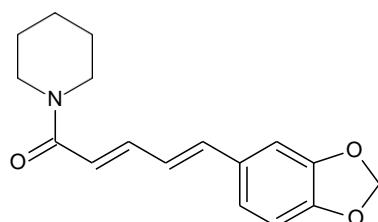
kaurenoic acid



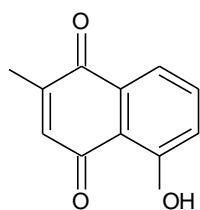
Yuehchukene



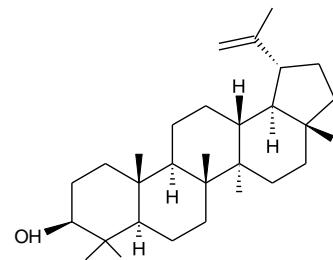
Nicotine



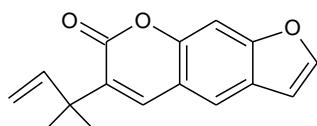
Piperine



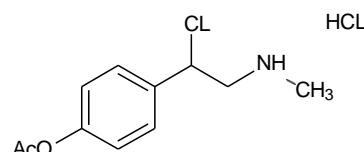
Plumbagin



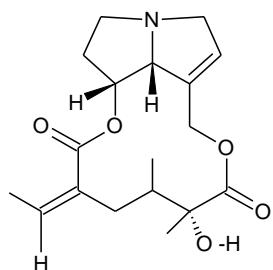
Lupeol



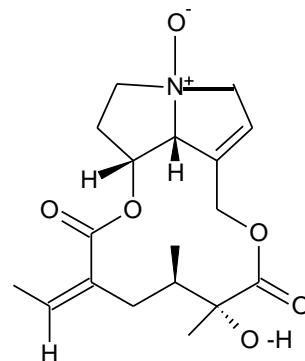
Chalepensin



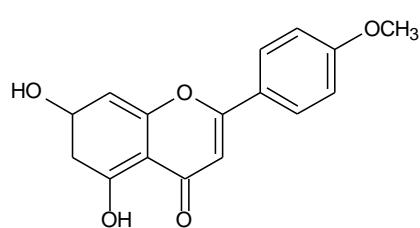
2 -(4 -acetoxyphenyl) -2 -chloro -N -methyl -ethyl ammonium chloride



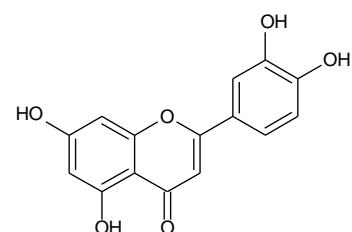
Senecionine



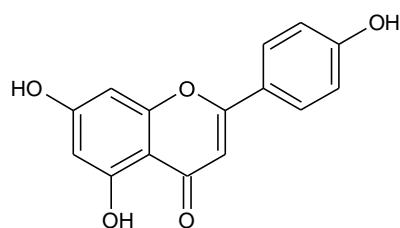
Senecionine N-oxide



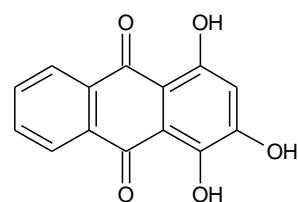
Acacetin



Luteolin

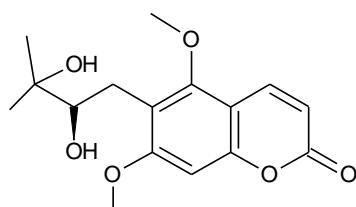
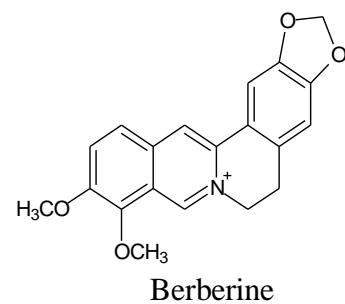
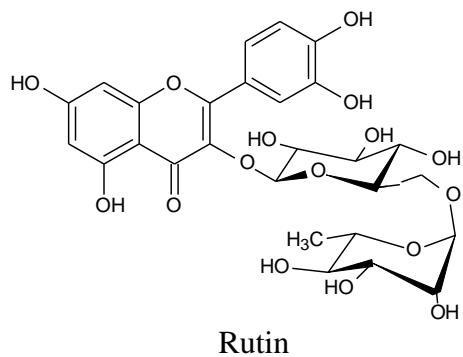


Apigenin

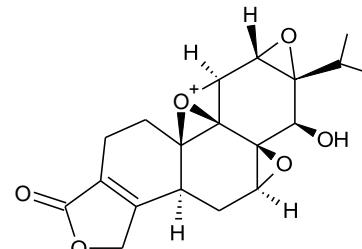


Purpurin

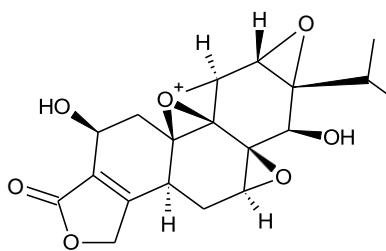




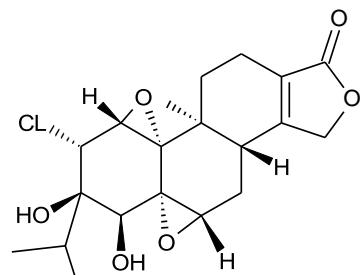
Toddaline



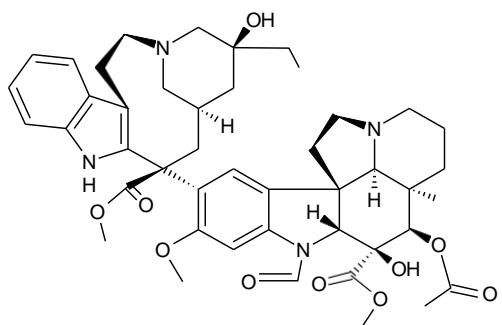
Triptolide



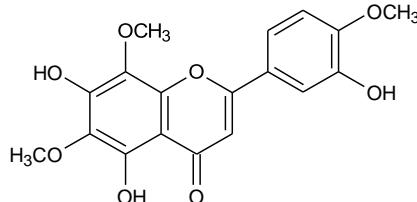
Tripdiolide



Tripchlorolide



Vincristine



5,7,3'-trihydroxy-6,8,4'-trimethoxy (Acerosin)

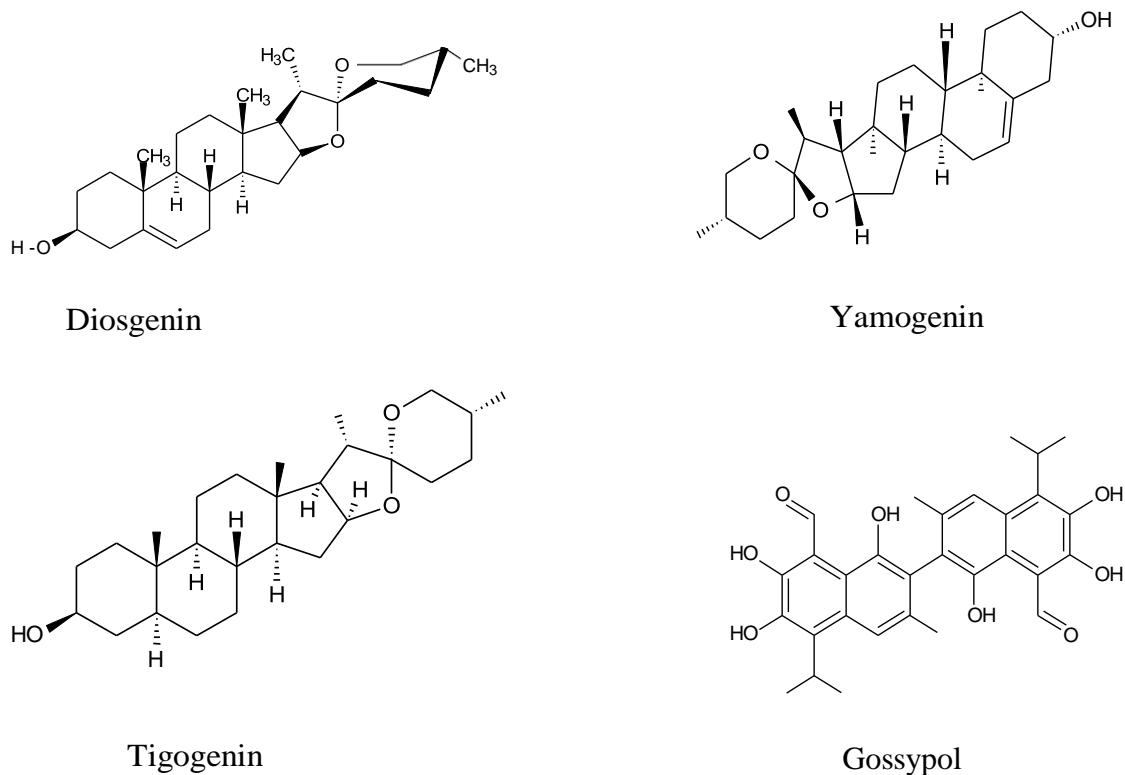


Figure 1: Structure of a Few Chemical Components that Were Isolated from the Plants on the List

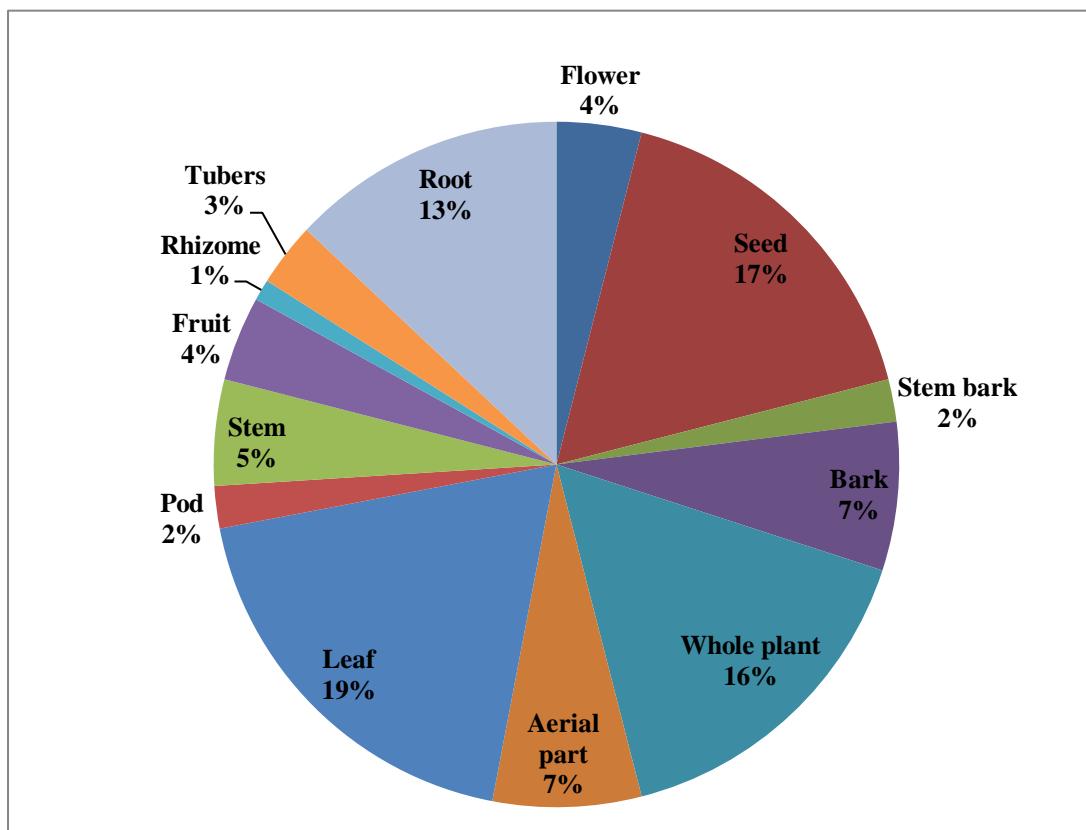


Figure 2: Percentage of Different Plant Parts Responsible for Antifertility Activity