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Treatment of Necrosis after Hair

Highlights

Impact of Medicinal Plants

Antifertility Activities A Review

Discovering Thoughts, Inventing Future

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Impact of Medicinal Plants on Antifertility Activities: A Review

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Abstract- *Aims and Objectives:* The effectiveness of medicinal plants in treating a wide range of illnesses is well known, frequently outperforming that of allopathic medicine. The purpose of this review is to clarify these plants' and their chemical components' anti-fertility characteristics. It gathers current research on medicinal plants with anti-fertility properties that have been verified by science.

Methodology: An extensive bibliographic analysis was conducted, encompassing classical textbooks, peer-reviewed articles, and reputable global scientific databases. Searches were performed in Central, Embase, Niscair, Scopus, Google Scholar, and PubMed using keywords related to the antifertility activity of plants.

Results: Medicinal plant species from various families that have historically been used as antifertility agents in both males and females are included in the review. It describes the different plant partsleaves, fruits, roots, bark, and stems that are used to control fertility.

Keywords: *antifertility, medicinal plant, reproductive systems, antifertility agents.*

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Impact of Medicinal Plants on Antifertility Activities: A Review

Venkataramanaiah Poli [α] & Srinivasulu Reddy Motireddy [σ]

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Results: **Medicinal plant species from various families that have historically been used as antifertility agents in both males and females are included in the review. It describes the different plant partsleaves, fruits, roots, bark, and stems that are used to control fertility. The study also offers details on the chemical components, parts used, solvents used, botanical names, and families of these therapeutic plants.**

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.**

Keywords: antifertility, medicinal plant, reproductive systems, antifertility agents.

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).

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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 steroidal 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 conceptive 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 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 abortifacient 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. *Antispermatogenic 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, beta-sitosterol, 4-hydroxybenzaldehyde, and plumbagic 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 antispermatogenic, 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 steroidal and non-steroidal ones, have an impact on testicular function. These include melatonin, α-chlorohydrin, 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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References Références Referencias

1. Dabhadkar DK, Thakare VG, Zade VS, Charjan AP, Dhore MM and Deosthale SM. Review on some ethnomedicinal plants having antifertility activity in female albino rats. International Research Journal of Science and Engineering. 2015; 3 (2): 41-46.
2. Kumar D, Kumar A, Prakash O. Potential antifertility agents from plants: a comprehensive review. Journal of Ethnopharmacolog. 2012; 140: 1-32.
3. Pei X, Nai W. Can ethnopharmacology contribute to the development of antifertility drugs?. Journal of Ethnopharmacology. 1991; 32: 167-77.
4. Shibeshi W, Makonne E, Zerihum L, Debella A. Effect of Achyranthes aspera L. on fetal abortion, uterine and pituitary weights, serum lipids and hormones. African Health Sciences. 2006; 6(2): 108-112.
5. Khushalani H, Tatke P, Singh KK. Antifertility activity of dried flowers of Woodfordia fruticosa kurz. Indian Journal of Pharmaceutical Sciences. 2006; 68(4): 528-529.
6. Bent S, Ko R. Commonly used herbal medicines in the United states: A review. American Journal of Medicine. 2004; 116(7): 478-485.
7. Zha S, Zha J, Huang Y. Male antifertility drugs and cell apoptosis. National Journal of Andrology. 2008; 14: 75-8.
8. John JS. The continuing need for contraceptive research. Fertility and Sterility. 1981; 36(6): 697-698.
9. Lin CC. Crude drugs used for the treatment of diabetes mellitus in Taiwan. American Journal of Medicine. 1992; 20: 269-279.

10. Marles R.J. and Farnsworth NR. Plants as sources of antidiabetic agents. Economic and medicinal plant research. 1994; 6: 149-187.
11. Stalin C, Vivekanandan K & Bhavya E. Medicinal Plants with Antifertility Activity-An Overview. Global Journal of Medical research. 2013; 13(2): 23-25.
12. Murugan V, Shareef GS, Sarma R, Ramanathan M, Suresh B. Antifertility activity of the stem bark of Alangium salvifolium (Linn.) Wang in wistar female rats. Indian Journal of Pharmacology. 2000; 32: 388-389.
13. Allag IS and Rangari K. Extragenomic action of steroids on spermatozoa: Prospects for regulation of fertility. Health and PopulationPerspectives and Issues. 2002; 25:38-44.
14. Gupta RS and Sharma R. A review on medicinal plants exhibiting antifertility activity in males. Natural product radiance. 2006; 5:389-410.
15. Bhowmik D, Umadevi M, and Kumar PKS and Duraivel S. Medicinal Plants with Potential Antifertility Activity. Journal of Medicinal Plants Studies. 2013; 1:26-33.
16. Agrawal SS, Kumar A, Gullaiya S, Dubey V, Nagar A, Tiwari P, Dhar P and Singh V. Antifertility activity of methanolic bark extracts of Aegle marmelos (l.) in male wistar rats. DARU Journal of Pharmaceutical Sciences. 2012; 20:94.
17. Saravanan K, Priya G and Renuka C. Medicinal plants with potential antifertility activity- A review of sixteen years of herbal medicine research (1994-2010). International Journal of PharmTech Research. 2012; 4:481-494.
18. Priya G, Saravanan K and Renuka C. Medicinal plants with potential antifertility activity- A review of sixteen years of herbal medicine research. International Journal of Pharm Tech Research. 2012; 4: 481-494.
19. Goswami P, Laskar MA, Basak M. A Review on Medicinal Plants of North Eastern Region with Potential Antifertility Activity. Asian Journal of Pharmaceutical Research and Development. 2020; 8(3): 162-165.
20. Bala K, Arya M, Katare DP. Herbal contraceptive: an overview. World Journal of Pharmacy and Pharmaceutical Sciences. 2014; 3(8):1305-1326.
21. Peri X, Nai W. Can ethnopharmacology contribute to the development of antifertility drugs?. Journal of Ethnopharmacology 1991;32:167-77.
22. Yegnanarayan R, Joglekar G. Antifertility effect of non-steroidal anti-inflammatory drugs. Japanese Journal of Pharmacology 1978; 28:909-17.
23. United Nations, Department of economic and social affairs, population division (2019). World population prospects 2019. Highlights. (ST/ESA/SER.A/423).
24. Umadevi M, Sampath Kumar PK, Debjit Bhowmik, Duraivel S. Medicinal Plants with Antifertility Activity. Journal of Medicinal Plants Studies. 2013; 1(1):26-33.
25. Choudhury A, Marbaniang B, Sutnga I, Hazarika G, Goswami P, Dey BK. Pharmacognostic and preliminary phytochemical screening of Trachyspermum khasianum H. Wolff. Indian Journal of Natural Products and Resources 2020; 11(2):101-109.
26. Mahadevan, Harold Ellis, Vishy. Clinical anatomy applied anatomy for students and junior doctors, Chichester, West Sussex, Wiley-Blackwell, UK, ISBN 9781118373767, 13th Edition, 2013.
27. Shaik RSK, Cuddapah R, Nelson KS, Vara PR, Sibyala S. Antifertility activity of Artemisia vulgaris leaves on female wistar rats. Chinese Journal of Natural Medicines. 12(3); 2014: 180-185.
28. Lemke TL, Williams DA, Roche VF, Zito SW. Foye's principles of medicinal chemistry, Wolters Kluwer/Lippincott Williams and Wilkins, New Delhi, 6th Edition, 2008; 1377.
29. Sandeep Dewal, Rachna Sharma, RS Gupta. A Review on Antifertility Activity of Plants of Chambal Riverine. Asian Journal of Pharmaceutical and Clinical Research. 2018; 11(8): 8-14.
30. Kapoor M, Garg SK, Mathur V. Anthiovulatory activity of five indigenous plants in rabbits. Indian Journal of Medical Research. 1974; 62: 1225-7.
31. Tejashri S.S, Dattaprasad N.V, Ravindra S.J. Antifertility Activities of Medicinal Plants. World Journal of Pharmaceutical and Life Sciences. 2021; 7(12): 167-169.
32. Said Ataa, Hawas Usama W, El-Shenawy Siham, Nofal Salwa M, Rashed Khaled. Flavonoids and some biological activities of Ailanthus excelsa leaves.IUFS Journal of Biology. 2010; 69(1): 41-55.
33. Olagbende-Dada Stella O, Ukpo Grace E, Herbert AB, Coker and Samuel A. Adesina Oxytocic and anti-implantation activities of the leaf extracts of Graptophyllum pictum (Linn.) Griff. (Acanthaceae). African Journal of Biotechnology. 2009; 8(21): 5979-5984.
34. Parohit A, Surendra K, Keshav B. Contraceptive efficacy of Plumbago zeylanica root extract (50% ETOH) in male albino rats with special emphasis on testicular cell population dynamics. Ancient science of life. 2008; 27: 31-5.
35. Wiart C. Medicinal plants of Southeast Asia. Kuala Lumpur (Pearson Malaysia Sdn. Bhd), 2002; 524.
36. Zaheer Z, Konale AG, Patel KA, Khan S & Ahmed RZ. Comparative phytochemical screening of flowers of Plumeria alba and Plumeria rubra. Asian Journal of Pharmaceutical and Clinical Research. 2010; 3: 88.
37. Khanna U, Garg SK, Vohra SB, Walia HB, Choudhary RR. Antifertility screening of plants. II. Effect of six indigenous plants on early pregnancy in

albino rats. Indian Journal of Medical Research. 1969: 57: 237- 244.
38. Abdulazeez MA, Mansurah DA, Ameh AD, Ahmadu D, Ibrahim S, Sani A, Ayo JO, Joseph O, Ambali SF & Suleiman F. Effect of fermented seed extract of Carica papaya on litters of female wistar rats. African Journal of Biotechnology,. 2009; 8: 854.
39. Dusmanta Kumar Pradhan, Manas Ranjan Mishra, Ashutosh Mishra, Ashok Kumar Panda, Rajani Kanta Behera, Shivesh Jha and Sanjaya Choudhury. A comprehensive review of plants used as contraceptives. International Journal of Pharmaceutical Sciences and Research. 2012; 4(1): 148-155.
40. Williamson EM, Okpako DT, Evans FJ. Pharmacological methods in phytotherapy research: Selection preparation and pharmacological evaluation of plant material. John Wiley and Sons Ltd., London. 1996; 1:191-212.
41. Brinker F. Inhibition of endocrine function by botanical agents, antigonadotropic activity. British journal of phytotherapy. 1997; 4:123-145.
42. Prakash AO, Saxena V, Shukla S, Mathur R. Contraceptive potency of Pueraria tuberosa D.C. and its hormonal status. Acta Europaea fertilitatis. 1985; 16(1):59-65.
43. Turner DC. General endocrinology 4th ed. Tokyo, WB Saunders Company, Topan Company Ltd. 1971.
44. Patil SJ & Patil SB. Antiovulatory activity of petroleum ether extract of chromatographic fractions of Citrus medica seeds in albino rats. International Journal of Medical Sciences. 2013; 13(6): 410-417.
45. Schug TT, Janesick A, Blumber B & Heindela JJ. Endocrine disrupting chemicals and disease susceptibility. Journal of Steroid Biochemistry & Molecular Biology. 2011; 127: 204–15.
46. Kaur R, Sharma A, Kumar R & Kharb R. Rising Trends towards Herbal Contraceptives. ournal of Natural Product and Plant Resources. 2011; 1(4): 5-12.
47. Kumud Bala, Mahima Arya & Deepshikha Pandey Katare. Herbal Contraceptive: An Overview. World Journal of Pharmacy and Pharmaceutical Sciences. 2014; 3(8): 1305-26.
48. Shah GM, Khan MA, Ahmad M, Zafar M & Khan AA. Observations on antifertility and abortifacient herbal drugs. African Journal of Biotechnology. 2009; 8(9): 1959-64.
49. Dehghan MH, Martin T & Dehghanan R. Antifertility effect of Iranian neem seed alcoholic extract on epididymal sperm of mice. Iranian Journal of Reproductive Medicine. 2005; 3(2): 83-89.
50. Mishra N, Joshi S, Tondon VL & Munjal A. Evaluation of Antifertility potential of aqueous extract of Bougainvillea spectabilis leaves in swiss albino mice. International Journal of Pharmaceutical Sciences and Drug Research. 2009; 1(1): 19-23.
51. Ahmad S, Jamal Y & Mannan A. Review of Some Medicinal Plants with Anti-fertility Activities. Unani Research. 2011; 1(2): 24-28.
52. Qureshi AA, Sanghai DB & Padgilwar SS. Herbal options for contraception: A review. Pharmacognosy Magazine. 2006; 2(8): 204-15.
53. Kabra M, Bhandari S, Gupta R & Sharma A. A review on herbal contraception. World Journal of Pharmacy and Pharmaceutical Sciences. 2013; 2(5): 2569-77.
54. Prasad MRN. Control of fertility in the male, In: Pharmacology and the future of man, Proceendings 5th International Congress of Pharmacology, San Francisco, Karger S, Basel, 1973; 1: 208-20.
55. Farnsworth NR, Bingel AS, Cordell GA, Crane FA & Fong HHS. Potential value of plants as source of new antifertility agents I. Journal of Pharmaceutical Sciences. 1975; 64: 535-49.
56. Zhu D. Plant constituents with biological activity reported in recent years. Zhongcaoyao. 1982; 13: 377-82.
57. Hiremanth SP, Rudresh K, Badami S, Patil SB, Patil SR. Post-coital antifertility activity of Acalypha indica L. Journal of Ethnopharmacology. 1999; 67(3):253-258.
58. Afsar Shaik, Prasanna Raju Yalavarthi and Chandrasekhar Kothapalli Bannoth. Role of Anti-fertility Medicinal Plants on Male & Female Reproduction. Journal of Complementary and Alternative Medical Research. 3(2): 1-22, 2017.

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.	*Abrus precatorius*	Chirmi	Methanolic	Seed	Antifertility	Precatorine, trigonelline, choline, abrine abricin, abridin
2.	*Acacia catechu*	Katha	_	Exudate	Anti-implantation	_
3.	*A. leucophloea*	Reonja	Alcoholic	Root	Antifertility	Tannins, flavonoids, terpenes, alkaloids
4.	*Acacia nilotica*	Babul	Aqueous	Pod	Antispermatogenic	Phytosterols, phenolic compounds, saponins
5.	*Azadirachta indica*	Khokli	Petroleum ether and ethanolic	Whole plant	Post-coital activity	β-Sitosterol, acalyphine, triacetonamine, kaempferol, tannin, stigmastrol
6.	*Achyranthus aspera*	Chirchira	Ethanolic	Root	Anti-implantation	Ecdysterone, oleanolic acid, n-hexacos-14-enoic acid
7.	*Adathoda vasica*	Arusa	_	Leaves	Anti-iplantation	Vasicine
8.	*Aegle marmelos*	Bael	Ethanolic	Leaves	Antifertility	Alkaloids, caumarins, steroids
9.	*Aerva lanata*	Bui	Ethanolic	Root	Anti-implantation	Alkaloids, kaempferol, quercetin, β-sitosteryl acetate, tannic acid
10.	*Albizzia lebbek*	Siris	Methanolic	Pod	Spermicidal activity	Lebbekanin-E
11.	*Ammanaia baccifera*	Aginbuti	Ethanolic	Whole plant	Antisteroidogenic	Steroids, triterpenoids, Flavonoids, and tannins
12.	*Amaranthus spinosus*	Kanta chaulai	Acetone	Root	Anti-spermatogenic and anti- androgenic	Alkaloids, flavonoids, saponins, β-sitosterol, stigmasterol, Kaempferol, glycosides
13.	*Amaramthu viridis*	Jangli cholai	Aqueous	Root	Abortifacient	Alkaloids, anthraquinon, saponins
14.	*Anagallis arvensis*	Dhartidhak	_	Whole plant	Spermicidal activity	Oleanolic acid
15.	*Andrographis paniculate*	Kiryat	Dry leaf powder	Leaves	Antispermatogenic	Flavonoids, andrographilode, diterpenoids, phenylpropanoids, oleanolic acid, and β-sitosterol
16.	*Aristolochia indica*	Indian Birthwort	Ethanolic	Root	Antispermatogenic/ anti-androgenic	Aristolic acid, p-coumric acid, methyl aristolate
17.	*Argemone maxicana*	Satyanashi	-	Seed	Anti-spermatogenic	Isoquinoline alkaloids, dihydro palmatine hydroxide, berberine, protopine
18.	*Azardirachta indica*	Neem	Alcoholic	Flower	Antifertility	Steroids, triterpenoids, alkaloids, phenolic compound, flavonoids
19.	*Balanites aegyptiaca*	Desert date	Methanolic	Bark	Antiimlantation	β-sitosterol, bergaptem, marmesin, β-sitosterol glucoside
20.	*Balanites roxburghii*	Desert date	Ethanolic	Fruit	Abortifacient	Alkaloids, saponins, tannins, flavonoids, phenolic compound
21.	*Bbiophytum sensitivum*	Lakshmana	Ethanolic	Whole plant	Antifertility activity	Phenolic and polyphenolic compound, saponins
22.	*Boerhavia diffusa*	Khapra-ara	Methanolic	Root	Antiimplantation, antiestrogenic	β-sitosterol, alkaloids, ursolic acid
23.	*Butea monosperma*	Dhak	Petroleum ether and Chloroform	Root	Anti-steroidogenic	Glycine, glycoside, aromatic hydroxyl compound
24.	*Cajanus cajan (L)*	Arhar	Methanolic	Seed	Antifertility	Sitosterol
25.	*Calotropis gigantea*	Madar	Ethanolic	Root	Anti-implantation	Akundarin, calotropin
26.	*Calotropis*	Aak	Ethanolic	Root	Anti-implantation	Alkaloids, flavonoids, tannins,

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

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

Table 2: List of Antifertility Medicinal Plants (31)

lant	Type	Dose/Body weight (mg/kg)	Activity
Cichorium intybus	50% ethanolic extract	50	Anti-implantation
Cuscuta reflexa	Ethanolic extract	800	Anti-implantation
Rubia cordifolia	Ethanolic extract	250	Anti-implantation
Urtica diocia	Ethanolic extract	250	Anti-implantation
Abroma augusta	Petroleum ether	50	Anti-implantation
Curcuma longa	Petroleum ether	200	Anti-implantation
Plumbago rosea	Acetone extract	200	Anti-implantation
Aloe barbadensis	Aqueous extract	100	Anti-implantation
Abutilon indicum	50% aqueous methanolic extract	500	Anti-implantation
Artemisia vulgaris	Methanlic 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.	*Abroma angusta* Linn.	Sterculiaceae	Roots	Rat	Antiimplantation & Abortifacient
2.	*Abrus precatorius* Linn.	Fabaceae	Seeds	Rat	Reduced sperm motility, Post-testicular antifertility effect
3.	*Acacia auriculaeformis* A. Cunn.	Fabaceae	-	-	Sperm immobilizing effect
4.	*Acacia caesia* Wight & Arn	Leguminosae	Fruit	-	Immobilization of spermatozoa
5.	*Acacia concinna* DC	Fabaceae	Stem bark	Rat	Spermicidal and semen coagulating activities
6.	*Acalypha indica* Linn.	Euphorbiaceae	Whole plant	-	Anti-estrogenic activity
7.	*Achillea millefolium* Linn.	Asteraceae	Flowers	Mice	Antispermatogenic effect
8.	*Achyranthus aspera* Linn.	Amranthaceae	Root	Rat	Spermicidal action
9.	*Actiniopteris dichotoma* Kuhn	Pteridaceae	Whole plant	Rat	Antifertility effect
10.	*Adhatoda vasica Nees Syn. Justice adhatoda L.*	Acanthaceae	Leaves	Rat	Antiimplantation & Abortifacient
11.	*Aegle marmelos* Corr. Ex Roxb.	Rutaceae	Leaf	Rat	Resist process of spermatogenesis and decrease sperm motility
12.	*Aerva lanata* (L.) Juss. Ex. Shult	Amaranthaceae	Aerial parts	Rat	Antiimplantation effect
13.	*Afromosia laxiflora* (Baker) Harms	Fabaceae	Stem bark	Rat	Antigonadotropic activity and blocks oestrous cycle
14.	*Ailanthus excelsa* Roxb.	Simaroubaceae	Leaf, Stem, Bark	Rat	Antiimplantation effect and Early Abortifacient
15.	*Alangium Salvifolium* (L.f.)	Alangiaceae	Stem, Bark	Rat	Antiimplantation & Abortifacient
16.	*Albizia procera* (Roxb.) Benth.	Leguminosae	Seed and Root	Rat	Spermicidal and semen coagulating activities
17.	*Albizia lebbek* (Linn.) Benth.	Mimosacaeae	Pod, Bark	Rat	Antifertility activity
18.	*Allium cepa* Linn.	Liliaceae	Bulb	Rat	Antiimplantation activity
19.	*Allium sativum* Linn.	Amaryllidaceae	Pod	Rat	Antispermatogenic activity
20.	*Aloe barbadensis Mill. Syn. Acalypha indica, A. litoralis, A. vera*	Liliaceae	Leaves	Dog	Antiandrogenic activity
21.	*Alstonia scholaris* R.Br.	Apocynaceae	Stem bark	Rat	Antifertility activity
22.	*Amaranthus spinous* Linn.	Amaranthaceae	Root	Rat	Inhibit fusion of Sperm and Ovum
23.	*Amaranthus viridis* L.	Amaranthaceae	Root	Rat	Contraception Activity
24.	*Anacardium occidentale* Linn.	Anacardiaceae	Nut Shell	Rat	Spermicidal
25.	*Anagalis arvensis* Linn.	Primulaceae	Whole Plant	Rat	Spermicidal and semen coagulating activities
26.	*Ananas comosus* Merr.	Bromeliaceae	Unripe fruit	Rat	Antispermatogenic activity
27.	*Andrographis paniculata* Wall. Ex Nees	Acanthaceae	Leaves	Rat	Antispermatogenic and antiandrogenic
28.	*Arctium lappa* Linn.	Asteraceae	Leaves and roots	Rat	Abortifacient
29.	*Ardisia solanacea* Roxb.	Myrsinacea	Plants excluding roots	Rat	Spermicidal Activity
30.	*Aristolochia indica* Linn.	Aristolochiaceae	Root	Presbytes langur	Antispermatogenic and antiandrogenic
31.	*Artemisia afra* Jacq. Ex Wild.	Asteraceae	Leaf	Rats	Abortion
32.	*Artemisia vulgaris* Linn.	Asteraceae	Leaves	Rats	Antiimplantation and Estrogenic activity
33.	*Aspilia Africana* (pers.) C.D. Adams	Asteraceae	Leaves	Rats	Antiovulatory Activity
34.	*Austroplenckia populnea* (Reiss.) Lundell.	Celastraceae	Pods	Rats	Affects the sexual behavior and epididymal sperm concentration
35.	*Azardirachta indica* A. Juss.	Maliaceae	Seed Oil	Rats	Antispermatogenic and antiandrogenic
36.	*Bacopa monnieri* (L.) Pennell	Scrophulariaceae	Whole plant	Rats	Contraception Activity
37.	*Balanites roxburghii* Linn.	Zygophyllaceae	Fruits	Dog	Antispermatogenic activity and testicular necrosis and atrophy

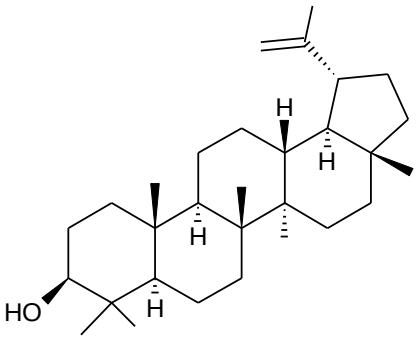
38.	*Ballota undulate* (Sieber ex. Fresen.) Benth.	Labiatae	Leaves, Flowers	Rats	Antiimplantation activity
39.	*Bambusa arundinacea* Willd.	Graminae	Shoots, Stem	Rats	Impaired the structural and functional activity of epididymis, Reduced sperm motility
40.	*Barleria prionitis* Linn.	Acanthaceae	Roots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

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

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

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

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



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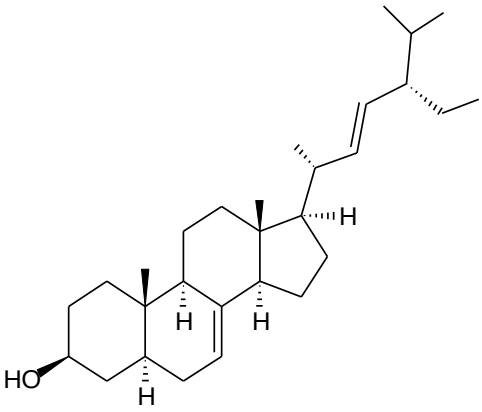

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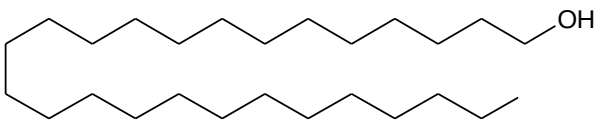

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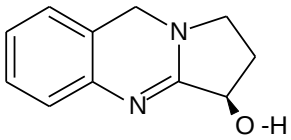

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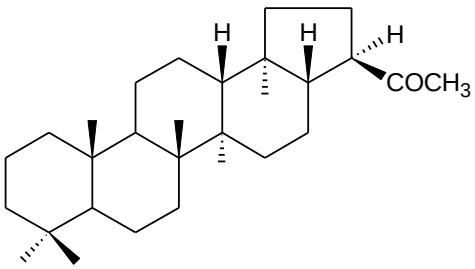

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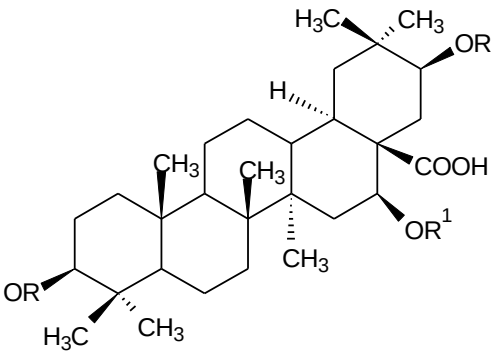

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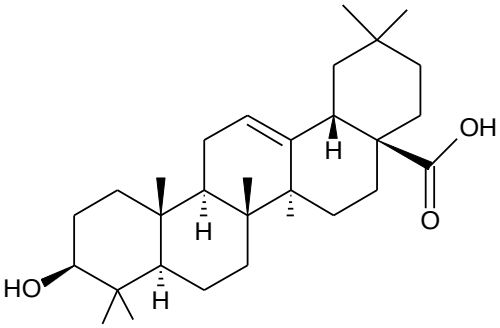

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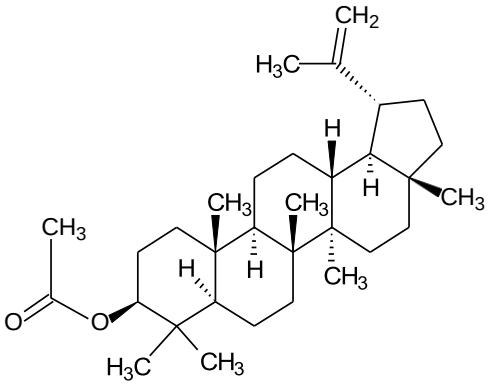

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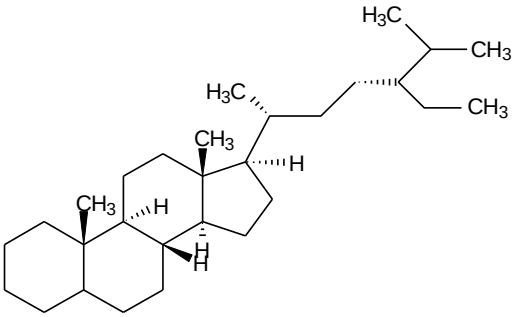

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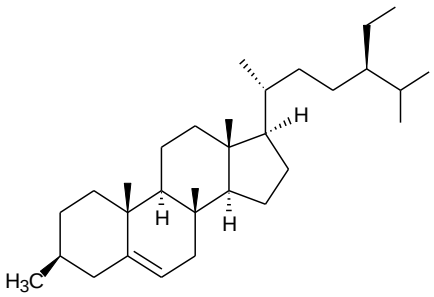

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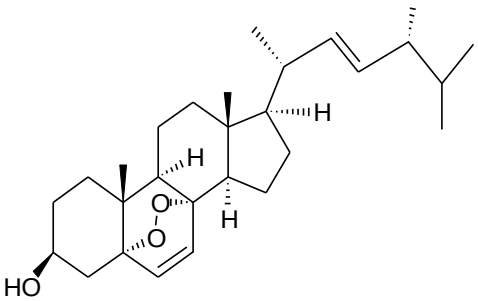

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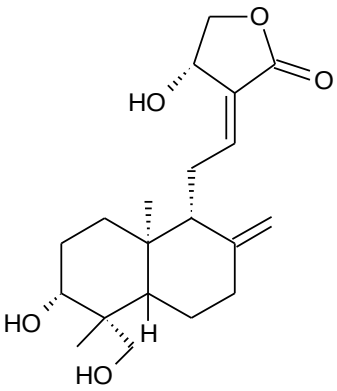

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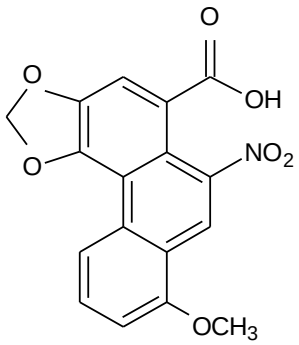

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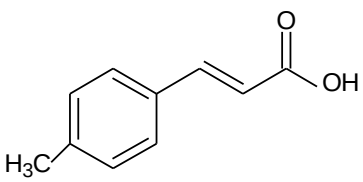

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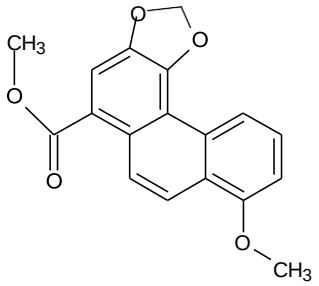

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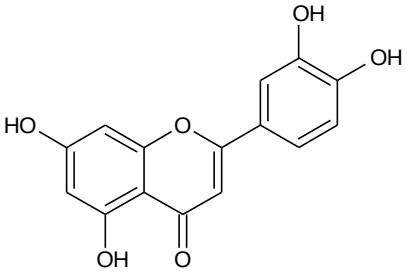

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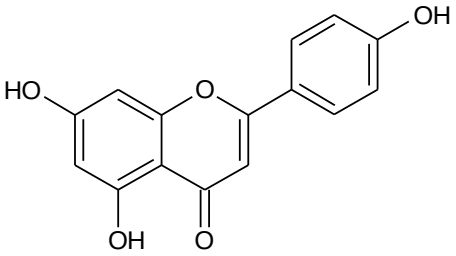

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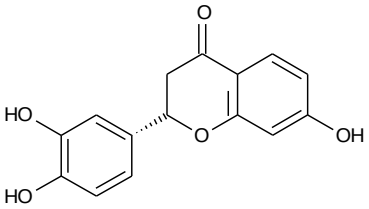

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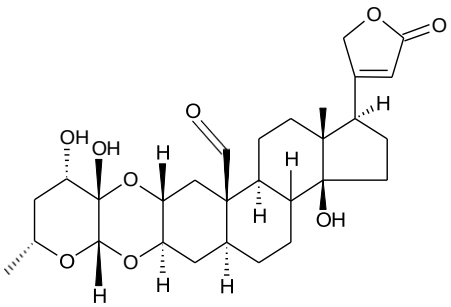

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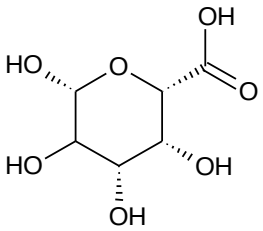

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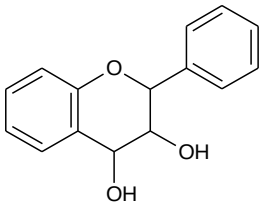

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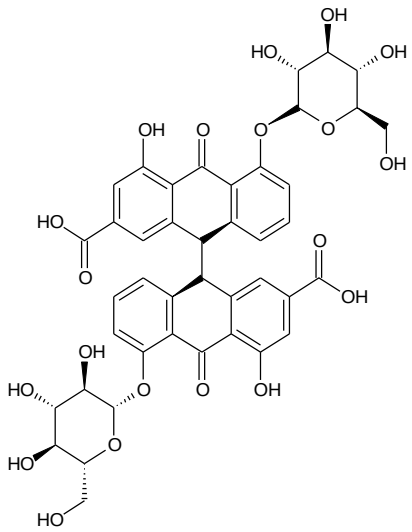

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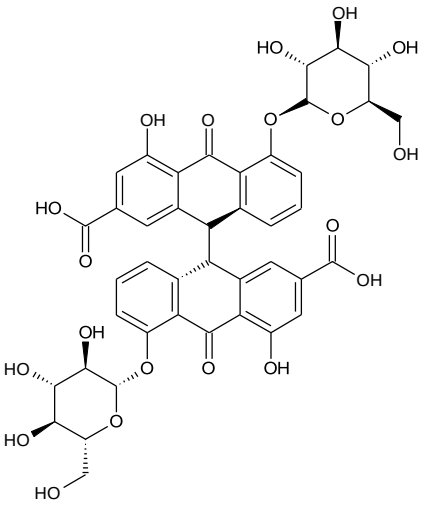

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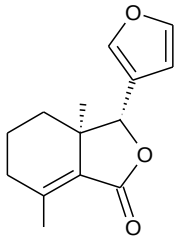

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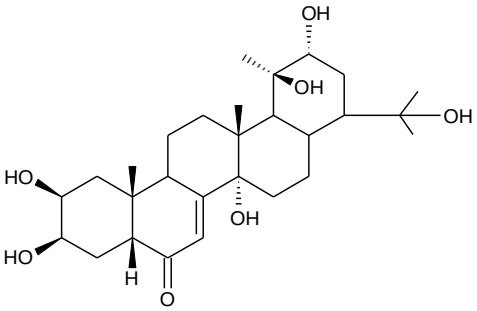

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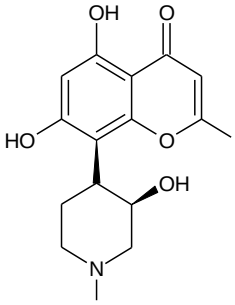

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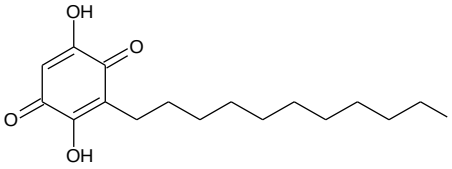

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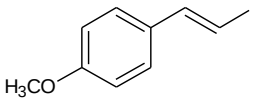

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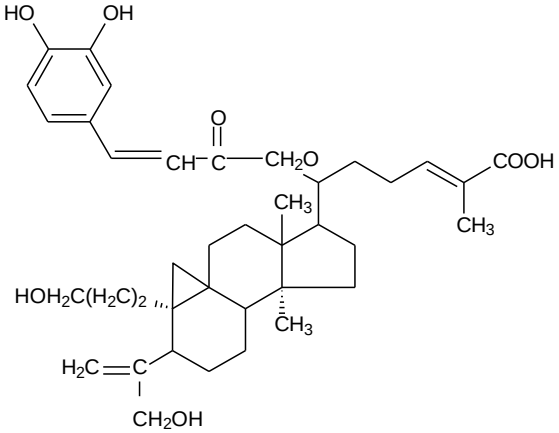
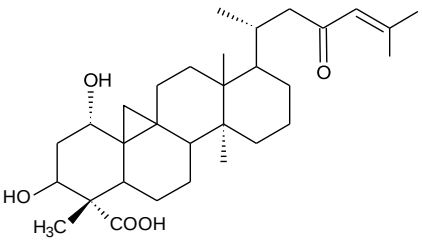


Gardenic acid



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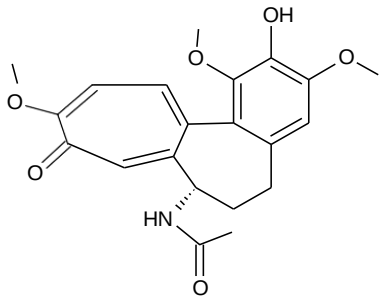

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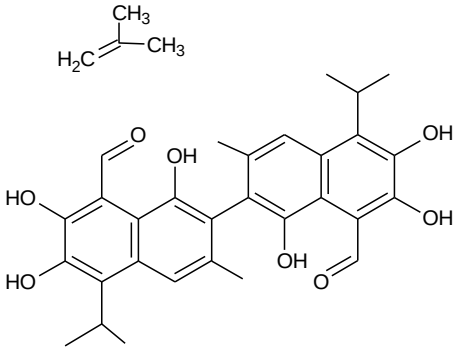

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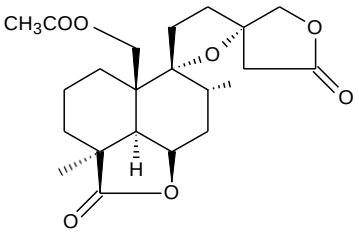

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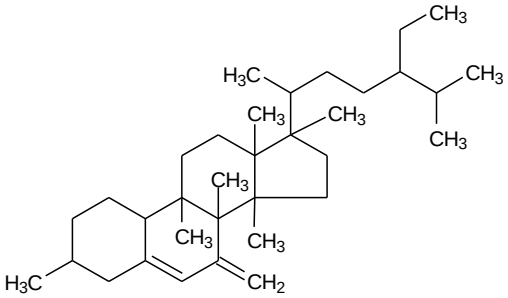
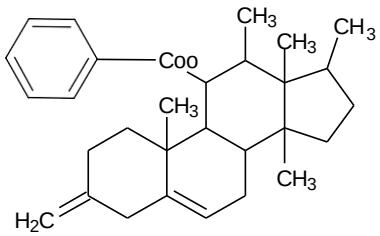


7 -Oxo -beta -sitosterol



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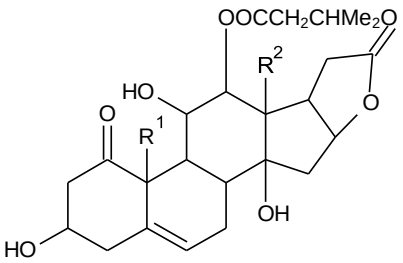

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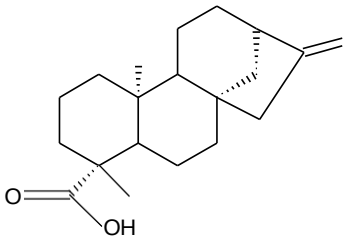

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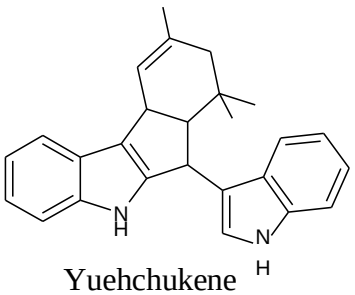

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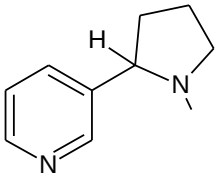

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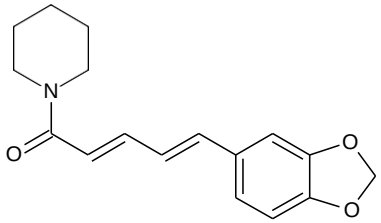

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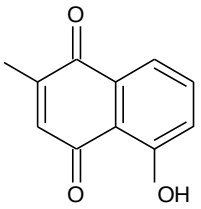

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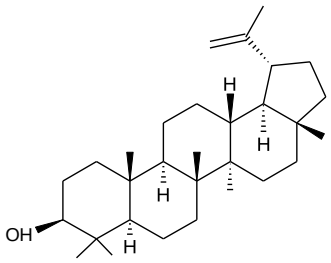

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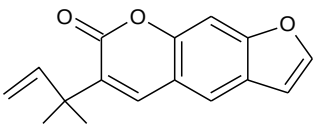

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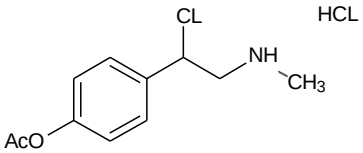

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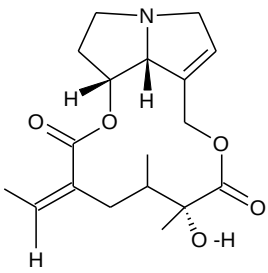

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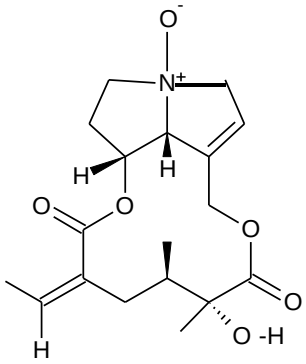

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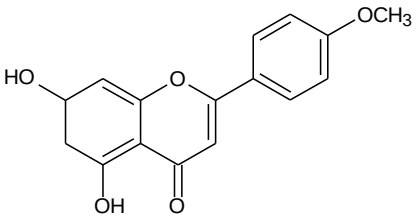

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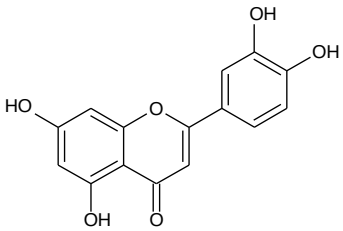

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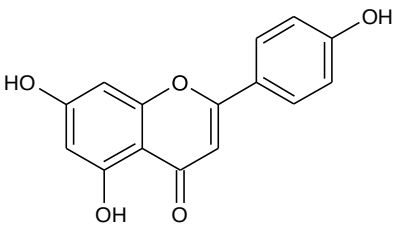

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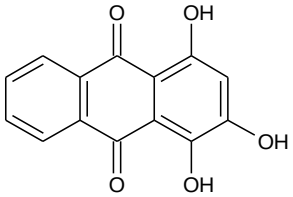

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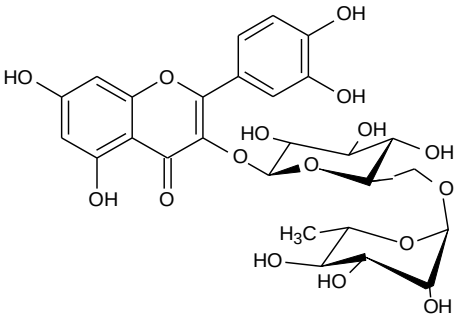

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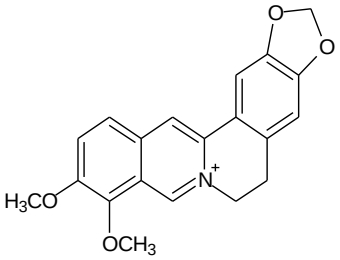
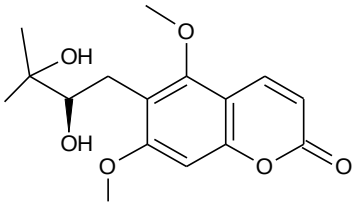


Berberine



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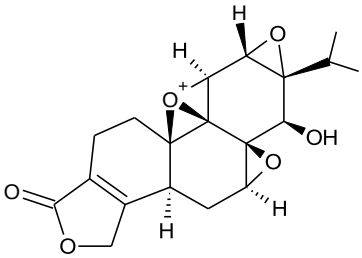

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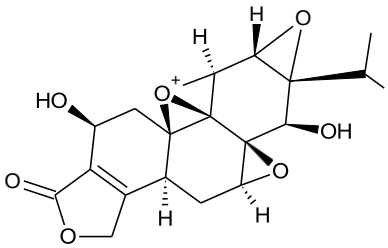

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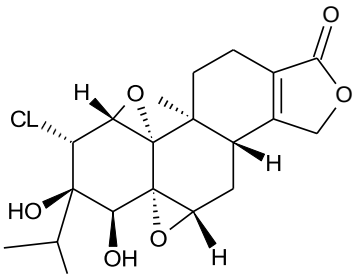
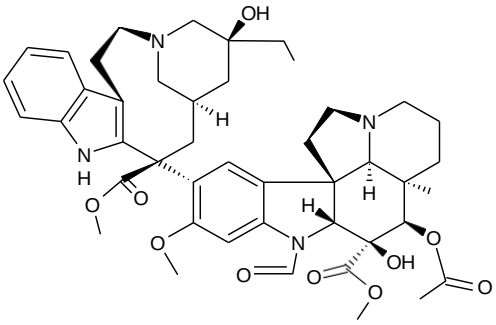
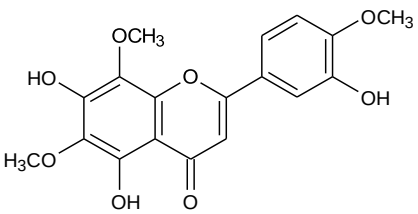


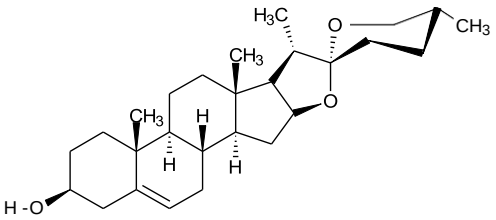
Tripchlorolide



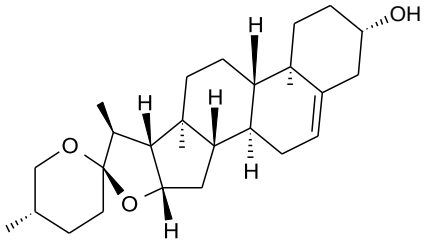
Vincristine



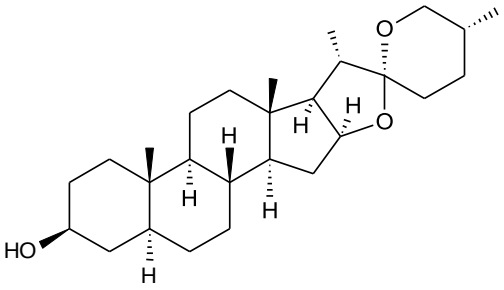
5,7,3' -trihydroxy -6,8,4' -trimethoxy (Acerosin)



Diosgenin



Yamogenin



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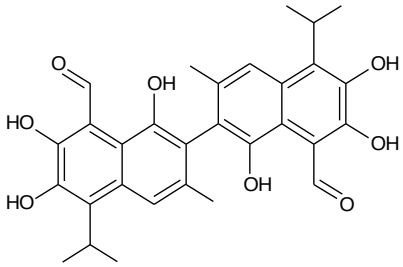

Gossypol

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

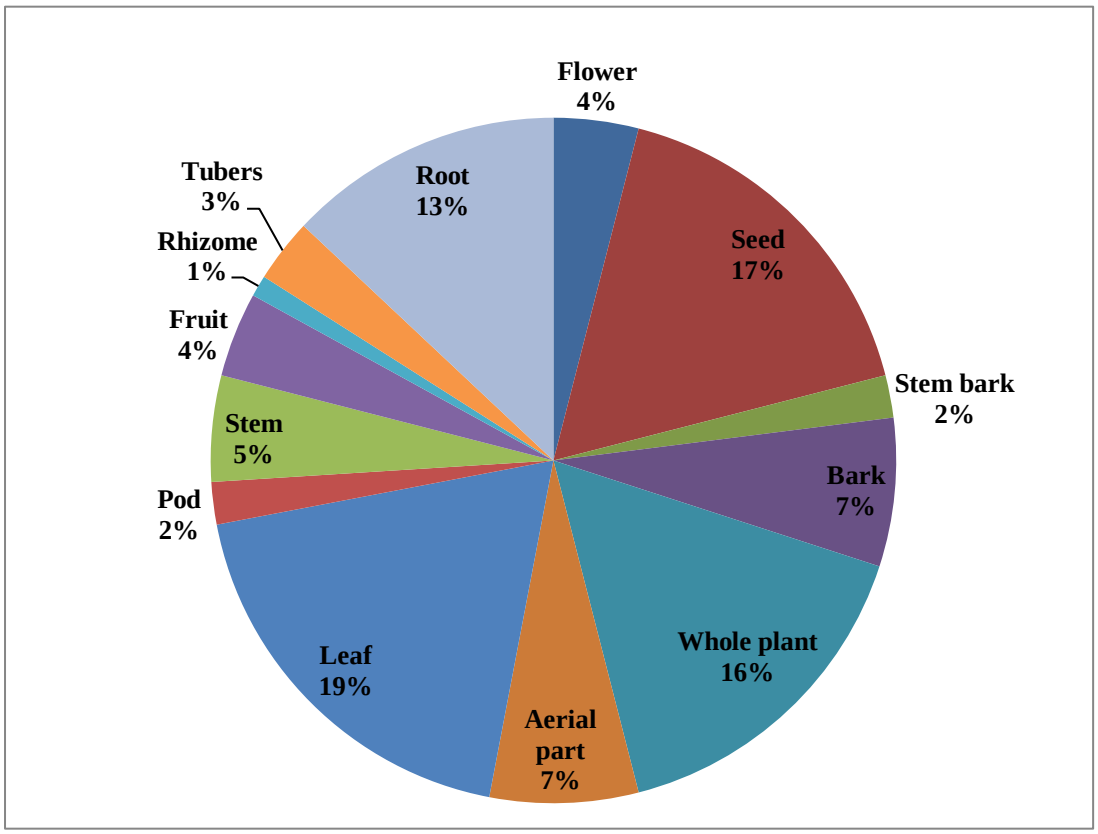

Figure 2: Percentage of Different Plant Parts Responsible for Antifertility Activity

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Health Benefits of Ajwain (Tracyspermum Ammi L.)

By Dr. Yasmeen Ansari

Abstract- Ajwain is highly valued in Unani as a gastrointestinal remedy and as an antiseptic. It is mixed with salt and hot water and brought after meals to alleviate bowel ache or colic and to enhance digestion. Ajwain is also a conventional treatment for cholera and fainting spells. Westerners typically use it for coughs and throat problems. It is also a component in mouthwashes and toothpastes because of its antiseptic homes. The volatile oil present within the seeds of ajwain is one of the predominant components accountable for imparting a normal taste, attributable to the presence of thymol. It also incorporates a cumene and terpene. The methanolic extracts of ajwain seeds possess herbal antioxidant properties. However, the acetone extract showed higher antioxidative hobby for linseed oil compared to synthetic antioxidants consisting of butylated hydroxy toluene and butylated hydroxy anisole. Ajwain oil exhibited a vast spectrum of fungitoxic behavior towards all tested fungi. Immediate research should focus on validating the antioxidant capability of herbs and spices after harvesting, in addition to testing their consequences on markers of oxidation.

Keywords: *ajwain, unani, traditional.*

GJMR-B Classification: *NLMC Code: QV766*

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I. Introduction

Known as Ajwain, Trachyspermum ammi (L.) Sprague is an annual herbaceous plant belonging to the distinctly valued medicinally vital own family, Apiaceae [1]. It is stated that the herb is extensively grown in arid and semi-arid regions in which the soil involve excessive quantity of salts [2]. Ajwain has an erect and striate stem regarding glabrous or minutely pubescent properties which may also grow as much as 90 cm tall [3]. Ajwain is widely disbursed and cultivated in various regions such as Iran, Pakistan, Afghanistan, and India in addition to Europe at the same time as it is indigenous to Egypt [4]. The herb is commonly grown in October–November and must be harvested in May–June [5, 6]. Usually grayish brown seeds or fruits of Ajwain are taken into consideration for clinical and nutritional purposes [5].

Oral application of seed changed into pronounced to be beneficial for paralysis, tremor and palsy as well as different neural issues within the discipline of neurology [6]. Persian practitioners additionally applied the eye and ear drop formulated from seeds of Ajwain with a purpose to control the infected conditions and accurate the auditory weak point [7]. In the field of respiration, Ajwain become stated to be powerful on cough, pleurisy and dysphonia [8]. Fruits were widely administered for liver spleen in addition to gastrointestinal problems such as nausea, vomiting, reflux, belly cramps and lack of appetite [6]. They have been additionally stated to be useful in belly problems and own stimulant and carminative properties [7]. Ajwain changed into stated as an anthelmintic medicinal drug and also antidote for diverse natural poisonous agents [7]. It became also believed to be beneficial for dissolving the calculi and stones if focused on wine. Persian practitioners also taken into consideration the seeds as an aphrodisiac, galactagogue and diuretic agent [6].

II. Discussion

Ajwain (Trachyspermum ammi) is a plant that produces small, seed-like fruits much like caraway and cumin. It comes from the Apiaceae circle of relatives, which is a collection of plant life that consists of celery, caraway, coriander, fennel, parsley, and parsnips. It goes by way of many different names, including carom seed, bishop's weed, and ajowan caraway.

Ajwain extensively utilized every now and then as an element in barbered, a spice combination desired in Eritrea and Ethiopia [9, 10]. Ajwain is an annual herbaceous plant having 30-70 cm (1-2 ft) height, with feathery leaves and crimson plant life. Ripe seeds are dried and threshed [11,12] manually and/ or routinely. Ajwain seed (fruit) is said to have antifungal/ antibacterial, antiseptic and antithelminitic effects [13]. The essential phenolic compound thymol determined in ajwain has been pronounced to be an antispasmodic, germicide and antifungal agent [14]. The principle energetic elements of ajwain oil are phenols, particularly thymol (35-60%) and some carvacrol [15]. Both the phenols thymol and carvacrol are having antiseptic, expectorant and antitussive residences [16]. Thymol also has antiseptic pastime and carvacrol possesses antifungal homes.

Ajwain is not unusual in Indian food. It has a strong, sour flavor with an aroma just like thyme. The "seeds," which can be truely culmination, are usually dry-roasted or floor and used in spice mixtures. They also are utilized in Unani and Ayurvedic remedy to help treat severa problems. These are recuperation structures that involve the notion that your ordinary fitness and wellbeing rely upon a balance among your body, thoughts, and spirit.

a) Health Benefits [9-10]

Ajwain seeds have a small amount of oil in them known as ajwain oil. The oil includes thymol, a phenol that offers the fruit its thyme-like scent. Thymol is usually

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used to treat digestive problems. It also has antifungal and antibacterial residences.

Here are some of the fitness benefits that ajwain has to offer:

Digestive Health

Active enzymes in ajwain enhance the drift of belly acids, that can help to relieve flatulence indigestion and gasoline. The plant also can assist to treatgastric ulcers as well as sores in the esophagus, belly, and intestines.

Figure 1: Health Benefits of Ajwain

Infection Prevention

Many of the important oils in ajwain, most substantially thymol and carvacrol, can assist to combat the increase of micro organism and fungi. They may help to combat micro organism like salmonella and E. Coli, which could lead to food poisoning and other belly problems.

Lower Blood stress

Research in rats indicates that thymol in ajwain may act to preserve calcium from entering the blood vessels on your heart, supporting to decrease blood pressure.

Cough and Congestion Relief

Ajwain can offer comfort from coughing as well as clean mucus out of your nostril, both of which make respiration less difficult. It may additionally assist to widen the bronchial tubes, that can help people with asthma.

Toothache Relief

Due to the anti inflammatory residences of thymol and different important oils, ajwain can help to lessen ache associated with toothaches. Thymol may also assist to enhance your oral fitness via preventing micro organism and fungi in the mouth.

Arthritis Pain Relief

Ajwain also can assist to assuage pain and swelling. Crushed fruit may be made into a paste and applied to the skin at the joints to treat arthritis ache. Alternatively, you can fill your tub with warm water and upload a handful of seeds for a soothing tub.

Medicinal and Pharmacological Properties

Antimicrobial activity: Bacteria like gram-fine and gram-poor may be suppressed by means of nigella essential oil. It exhibited strong antimicrobial activity in opposition to Salmonella typhi, Pseudomonas aeruginosa and others. Comparatively higher sensitivity against gram-

tremendous micro organism Staphylococcus aureus and Vibrio cholera become located to be stronger than gram bad micro organism. Staphylococcusaureus, Staphylococcuspyogenes and Staphylococcusviridans are greater liable to Nigella sativa.[17]

Antifungal hobby: Methanolic extracts of Nigella have the most powerful antifungal effect accompanied by the chloroform extracts towards one of a kind traces of Candida albicans. An intravenous inoculum of Candida albicans produced colonies of the organism in the liver, spleen and kidneys. Treatment of mice with the plant extract 24h after the inoculation prompted a vast inhibitory impact on the growth of the organism in all organs studied. Khan et al. In 2003 pronounced that the aqueous extract of Nigella seeds well-known shows inhibitory impact against candidiasis in mice. A five-fold lower in Candida in kidneys, eight-fold in liver and 11-fold in spleen was determined in the businesses of animals publish-dealt with the plant extract. These findings had been also showed by using Histopathological examination of the respective organs. [18]

Antioxidant activity: Treating broiler chicks with black seeds for 6 weeks avoided the liver from oxidative strain with the aid of growing the activities of enzymes which includes myeloperoxidase, glutathione-S-transferase, catalase, adenosine deaminase, myeloperoxidase and by way of lowering hepatic lipid peroxidation. [19]

Antidiabetic activity: Significant hypoglycaemic interest turned into pronounced. Antihyperglycemic outcomes of Nigella seed extract are attributed to a combination of the rapeutically applicable insulinotropic and insulin-like houses. [20]

Anti-inflammatory and analgesic activity: The chronic inflammatory disorders, allergies and arthritis involve a ramification of inflammatory mediators and pathways. Nigella fixed oil and thymoquinone have been discovered to inhibit membrane lipid peroxidation and eicosanoid generation in leucocytes, substantially decreased rat paw oedema and granulomapouch weight. Nigellonein low awareness is powerful in inhibiting the histamine release from the mast cells, which supports an antiasth maticrole for theplant. [21]

Immunomodulatory activity: The capacity immunomodulatory results of Nigella have been investigated in mild of splenocyte proliferation, macrophage function, and NK anti-tumor pastime the use of BLAB/c and C57/BL6 primary cells. Finally, experimental proof suggests that the aqueous extract of N. Sativa appreciably complements NK cytotoxic activity in opposition to YAC-1 tumor cells, suggesting that the documented anti-tumor results of N. Sativa may be, at least in component, attributed to its potential to function a stimulant of NK anti-tumor interest. It become expected that N. Sativa substances can be employed as powerful healing dealers inside the regulation of various immune reactions implicated in numerous conditions and illnesses together with most cancers [22].

III. Conclusion

Conclusion Ajwain seed possesses stimulant, antispasmodic and carminative residences and is used traditionally as an essential remedial agent for flatulence, atonic dyspepsia, diarrhea, abdominal tumors, abdominal pains, piles, and bronchial issues, lack of urge for food, galactogogue, bronchial asthma and amenorrhea. Medicinally, it's been validated to possess numerous pharmacological sports like antifungal, antioxidant, antimicrobial, antinociceptive, cytotoxic, hypolipidemic, antihypertensive, antispasmodic, bronchodilating movements, antilithiasis, diuretic, abortifacient, antitussive, nematicidal, anthelmintic and antifilarial. Further, research monitor the presence of numerous phytochemical materials specifically carbohydrates, glycosides, saponins, phenolic compounds, unstable oil (thymol, γ-terpinene, para-cymene and α and β-pinene), protein, fats, fiber and mineral remember containing calcium, phosphorous, iron and nicotinic acid. These research display that Trachyspermum ammi is a source of medicinally energetic compounds and feature various pharmacological consequences; consequently, it's far encouraging to locate its new therapeutic uses.

References Références Referencias

1. Gersbach PV, Reddy N. Non-invasive localization of thymol accumulation in Carum copticum (Apiaceae) end result through chemical shift selective magnetic resonance imaging. Ann Bot. 2002; 90(2): 253–57.
2. Joshi S. Medicinal plant life. 1st ed. Delhi: Oxford and IBH Publisher; 2000.
3. Information Directorate CSIR; 1995. Shojaaddini M, Moharramipour S, Sahaf B. Fumigant toxicity of essential oil from Carum copticum towards Indian meal moth, Plodia interpunctella. J Plant Prot Res. 2008; forty eight (four): 411–19.
4. Chauhan B, Kumar G, Ali M. A Review on phytochemical materials and activities of Trachyspermum ammi (L.) sprague fruits. AJPTR. 2012; 2(4): 329–40.
5. Ranjan B, Manmohan S, Singh SR, Singh RB. Medicinal makes use of Trachyspermum ammi: a evaluate. Pharmacogn Rev. 2012; 6(11): 56–60.
6. Aghili-Shirazi S. Makhzan ol Advieh. 1st ed. Tehran: Intisharat va Amoozesh enghelab Islami Press; 1992.
7. Tonekaboni H. Tohfat ol momenin. 1st ed. Tehran: Nashre shahr Press; 2007.
8. Avicenna. Al Qanun Fil Tibb [Hameed HA trans]. 1st ed. New Delhi: Jamia Hamdard Printing Press; (1998).

9. Srinivasan K (2005) Plant meals inside the control of diabetes mellitus: spices as useful antidiabetic food adjuncts. Int J Food Sci Nutr fifty six(6): 399-414.
10. Kelly GS (2000) Insulin resistance: lifestyle and nutritional interventions. Altern Med Rev 5(2): 109-132.
11. Maton A (1993) Human Biology and Health. Pearson Prentice Hall, New Jersey, USA pp. 256.
12. Dusenbery DB (1996) Life at Small Scale: The Behavior of Microbes. Scientific American Library, New York, pp: 113-one hundred fifteen.
13. Morsi NM (2000) Antimicrobial effect of crude extracts of Nigella sativa on multiple antibiotics-resistant bacteria. Acta Biochimica Polonica forty nine(1): 63-seventy four.
14. Nagalakshmi S, Shankaracharya NB, Naik JP, Rao LJM (2000) Studies on chemical and technological elements of ajowan (Trachyspermum ammi (L.) syn. Carum copticum Hiern) seeds. J Food Sci Technol 37(3): 277-281.
15. Tsimidou M, Boskou D (1994) Antioxidant Activity of Essential Oils from the Plants of the Lamiaceae Family. In: Spices, Herbs and Edible Fungi, Charalambous, G (Eds.), the Netherlands pp: 273-284.
16. William Evans (2002) Trease, Evans Pharmacognosy (16th Edn.), In William Evans Saunders, New York 258.
17. Hanafy M S and HatemM E (1991) Studies at the antimicrobial pastime of Nigella sativaseed (black cumin). Journal of Ethnopharmacology 34(2-three): 275 - 280.
18. Bita A, Rosu AF, Calina D, Rosu L, Zlatian O, Dindere C (2012) An opportunity remedy for Candida infections with Nigella sativa extracts. Eur J Hosp Pharm 19(2): 162.
19. MariodAA, IbrahimRM, Ismail M, IsmailN (2009) Antioxidant pastime and phenolic content material of phenolic rich fractions acquired from black cumin (Nigella sativa) seed cake. Foodhemistry 116(1): 306 - 312.
20. Benhaddou-Andaloussi A, Martineau L, Danielle S, Vuong T, Leduc C, et al. (2008) Antidiabetic activity of Nigella sativa. Seed extract in cultured pancreatic β-cells, skeletal muscle cells, and adipocytes. Pharmaceutical biology forty six (1-2): 1-29.
21. Mutabagani A, El-Mahdy SAM (1997) A examine of the anti- inflammatory interest of Nigella sativa L. And thymoquinone in rats. Saudi Pharm J five (2): 110-113.
22. Majdalawieh AF, Hmaidan R, Carr RI (2010) Nigella sativa modulates splenocyte proliferation, Th1/Th2 cytokine profile, macrophage feature and NK anti-tumor pastime. J Ethnopharmacol 131(2): 268- 275.

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Effect of Ozoniotherapy in the Treatment of Necrosis after Hair Transplantation: Case Report

By Luisa Melo Lucas, Anayene Craveiro Mendes & Jorge Temer Merhi

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Abstract- *Introduction:* Nowadays, ozone plays an important role in wound healing and tissue repair as a therapy and as antimicrobial, bactericidal and fungicidal agent. It attains recognition in hair transplantation as a treatment for necrosis due to hypoxic-ischemic local syndrome. *Objective:* to demonstrate the therapeutic evolution of ischemia in a hair transplant after ozone therapy sessions. *Methods:* The patient was evaluation and gave consent to photographic records. He went through 30 topic applications of ozonated oil, with a 10 drop dosage daily; 12 bag ozone sessions for 10 minutes; besides subcutaneous applications, with 30% ozone concentration and a very small gas volume (1-2 ml) with 30G needle. *Results:* Evolution of the case was registered with images and tissue coloring and changes evidenced. *Conclusion:* It is clear that ozone therapy made wound healing and tissue repair faster, since there was an increase of epithelial cells and neoangiogenesis due to therapy, resulting in almost complete repair of the patient's hair transplant at the end of the sessions.

Keywords: *ozone therapy, hair transplant, hair treatment.*

GJMR-B Classification: *LCC: RL87.3*

Strictly as per the compliance and regulations of:

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Luisa Melo Lucas [α], Anayene Craveiro Mendes [σ] & Jorge Temer Merhi [ρ]

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I. Introduction

Hair transplant has been changing many individuals' reality that face alopecia, a disease consisting of head or body hair loss. Unlike several other transplants, hair transplant is in the spotlight because of its peculiarity in using follicles of the same donor who is supposed to receive them in a less invasive way. In spite of the many techniques available, all of them require patient evaluation including: patient history, age, previous medical evaluations. Diagnosing the type of alopecia is mandatory. Whenever the patient has the conditions for the procedure, it is unusual the occurrence of resulting complications. However, as highlighted by Zito and Raggio in Statpearls, "Potential complications include: edema (5%), bleeding (0.5%), folliculitis, infection (less than 1% of patients)". Being the necrosis of the receiving area due to excess density in the area or another possible cause present.

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Hypoxic-ischemic local syndrome, which can evolve to tissue necrosis, develops from low blood perfusion in tissues and decrease in oxygen because of several etiologies, such as abuse of anesthetics and vasoconstrictors and excess of FUs in an area. The appropriate level of oxygen in tissues is fundamental so that cells keep their aerobic metabolism and vital functions. When the perfusion pressure is not enough to keep the minimal oxygen level, aerobic metabolism shifts to anaerobic with resulting organic dysfunctions. Therefore, treatment is an issue of diagnosing the primary cause and should be initiated at the ischemic lesion spot so as to start revacularization.

Necrosis takes place whenever a cell is exposed to extreme environmental conditions, adverse and excessive stimuli, or in face of deleterious mutations codified in its genetic material. Cell necrotic death occurs as a response to severe physiological conditions, including hypoxia, ischemia, toxin exposition, anesthetics, reactive metabolites of oxygen and nutrient deprivation. In cases of ischemic necrosis, nuclear alterations of cytoplasms portray a clotted blood appearance: acidophilus, granular and hardened. There is loss of tissue structure and the area becomes whitish, bulged and hyperemic. Among microscopic aspects there is increase in acidophilus, a granular appearance and formation of amorphous masses as a result of membrane rupture and mixture of autolyzed material.

Ozone therapy, considered an alternative therapy, with excellent results and ease of application, is in evidence in many countries. It was first acknowledged in 1839, by german chemist Christina Friedrich, and in 1896, by Nikola Tesla, who patented the first ozone generator, in the US, used during the First World War to treat gas gangrene, which treatment is still in use.

Ozone therapy is a bio-oxidative therapy based on a gasified mixture of oxygen and medical ozone, whose therapeutic effects include mainly the improvement of metabolism and the oxygenation of peripheral tissues, as a consequence of increased erythrocyte flexibility, allowing for a better flow inside capillaries and assuring a larger supply of oxygen in the tissues. This process facilitates epithelial repair and growth and inhibits bacterial and fungicidal development.

In hair transplantation, despite technological advancements, ozone therapy application to treat ischemic necrosis is unknown or barely known, as

shown by the reduced number of research papers and therapeutic approaches which might be a guidance for professionals in the field. Thus, the current study aimed at making the causes and effects of ozone therapy more clear whenever it is aptly applied to treat and prevent ischemia and necrosis in hair transplantation procedures.

II. Materials and Methods

This is a longitudinal descriptive and interventionist study with convenience, consecutive, non-probabilistic sampling. The patient underwent a hair transplant procedure in May, 2022, in an unknown doctor's office and was referred to Dr. Anayene Craveiro, at Belcorp Institute, after first signs of ischemic necrosis.

The recommendations of the Madrid Declaration on Ozone Therapy were considered to evaluate the appropriate doses for the corresponding mechanism of action. First, there are three basic principles: (1) not to do harm; (2) stagger the dose; (3) apply the necessary concentration.

Treatment was started with initial evaluation and recognition of the ischemic necrotic area, with mediated intervention. Lesion characteristics were evaluated on the grounds of photographic records facilitating the patient's therapeutic evolution follow-up.

The Oxy device, manufactured by Tonederm®, licensed by the Brazilian Health Regulatory Agency (ANVISA), was employed in the treatment. This device turns medical oxygen into ozone gas through corona discharge. Topical treatment with gas, and a plastic transparent bag manufactured with ozone resistant material, consists of applying an elastic band with sealed edges to the skin.

III. Case Outline

A 40-year-old white male patient, with no pre-existing diseases, underwent the hair transplantation procedure in May, 3rd 2022, with 4,600 follicle units.

The patient - himself a doctor - was referred to Dr. Craveiro Mendes in the same week following his noticing of an ischemic area. His exams showed no other symptoms, nor were there any complaints of allergic reactions. On inspection, the lesion showed well defined edges adherent to wound bed with small fibrin clots, wound bed with granular tissue, adjacent skin edema, peeling skin around the tissue lesion and absence of exudate and odor.

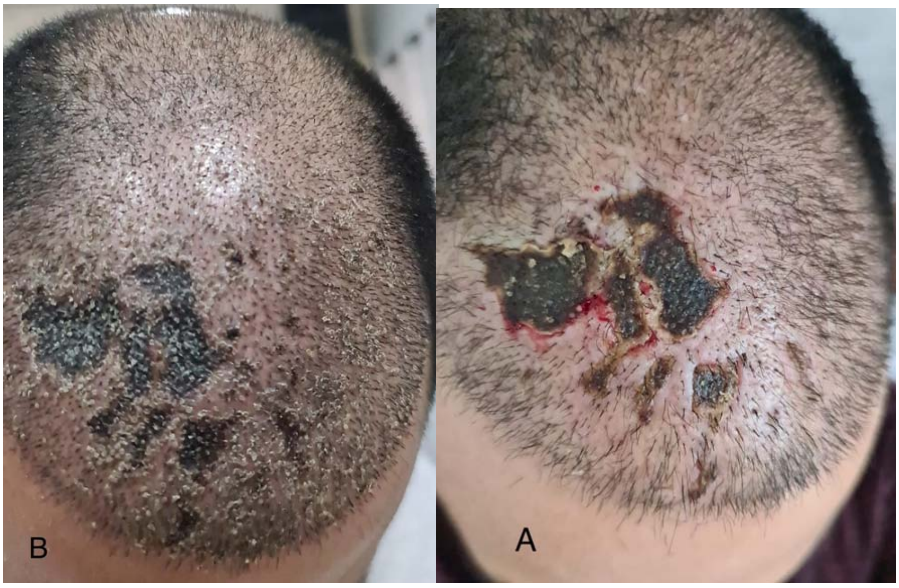
The patient was submitted to 30 ozonized oil topical applications, 10 drops a day, and twelve 30 % ozone sessions with a bag, once a week, for 10 minutes, besides subcutaneous 30% concentration ozone applications with a small gas volume (1-2 ml) through 30G needle. Ozone therapy was conducted after local hygienization with no dressing following the application.

The patient, who unexpectedly faced complications after pursuing hair transplant for high self-esteem, was also provided with psychological care for better acceptance of ozone therapy results.

IV. Results and Discussion

Photographic images demonstrate the progress between the first and last ozone therapy applications. There was local neovascularization and wound healing with progressive reduction of the necrotic area. It is possible to observe at first hand the increased blood supply, vessel permeability and vasodilation, which showed a better coloring appearance since the first session. Granular tissue was found in the first session with endothelial and fibroblast proliferation, which are mesenchymal differentiated cells spreading on the lesion surface. On the first days, angiogenesis first stages were observed with a bulged and whitish region surrounded by a red halo. On the last day it was possible to see a better wound bed and epithelial tissue growth, that is, new skin growing out of the lesion edges in face of a concentration process of the marginal wound walls, under the action of activated fibroblasts, making epithelization possible. It exhibits a shiny rose coloring related to mature collagen.

According to the photographic records before and after the three sessions (Picture 1), there was improvement of tissue healing, decreasing bulging, better local blood supply, and recovery of the whitish appearance. In addition, there was growth of granular tissue due to collagen activity, elastin and reticular fibers in an attempt to tissue repair. This phase produces the increase of inflammatory cells, growth factors, vasodilation and presence of permeability.



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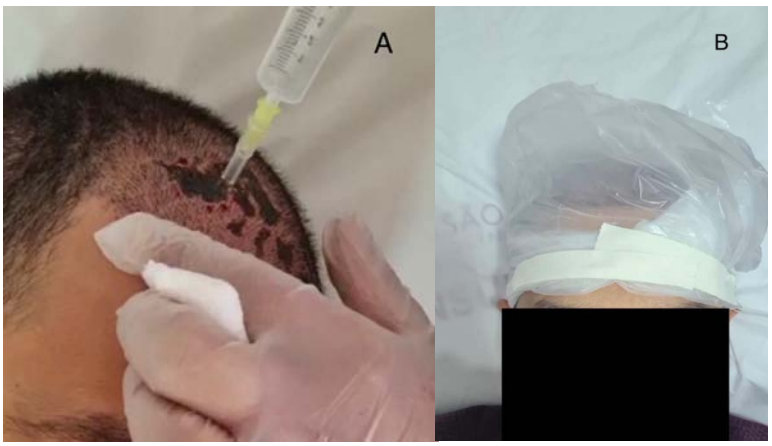
Picture 1: Before (B) and after (A) of Ozone Therapy Application

Along the application sessions, there was significant improvement (Picture 2). Necrotic tissue started debriding and granular tissue formation took place, with faster neovascularization and local epithelialization. Studies have demonstrated that ozone oil can promote wound healing through PI3K/Akt/mTOR signaling. Mechanically, it is possible to verify that ozone oil can activate fibroblasts and promote their migration. Besides that it can extend the mesenchymal epithelial transition (MET) process.



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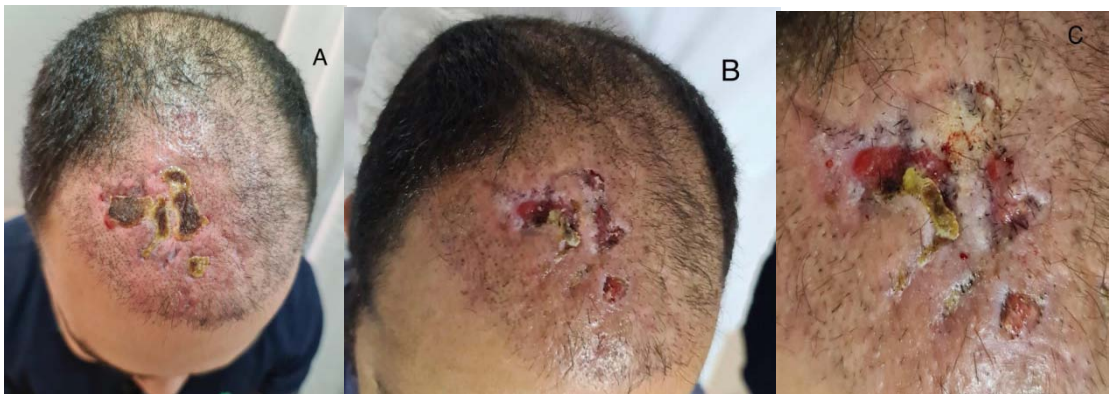
Picture 2: Application of Subcutaneous Ozone (A) and Bag Therapy (B)

The analysis of therapeutic evolution after 5 sessions of ozone therapy (Picture 3) makes clear the expansion of mesenchymal cells, fibroblasts, on the wound surface, which is related to internal vessel growth and formation of conjunctive tissue. From this moment, concentration of lesion edges takes place, facilitating epithelization.



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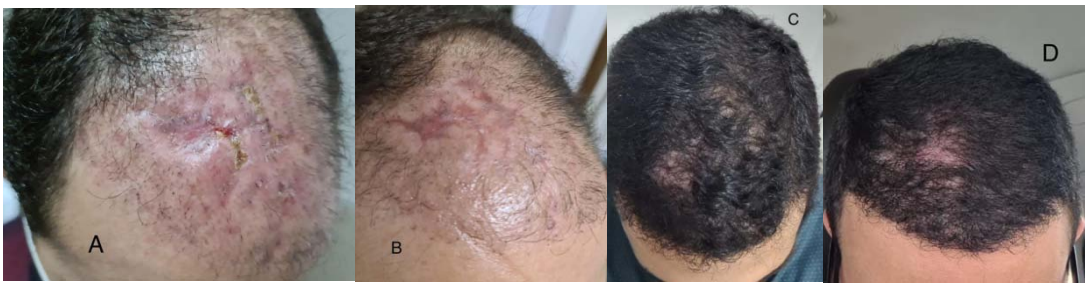
Picture 3: Evidence of mesenchymal cell growth surrounding de lesion (A); Concetration of edges for epithelization in (B) and (C)

Gradually after concluding ozone therapy sessions, remodeling phase starts (Picture 4) leading to reduction of cell activity and blood vessels, Then, maturation and increased local resistance ensues.



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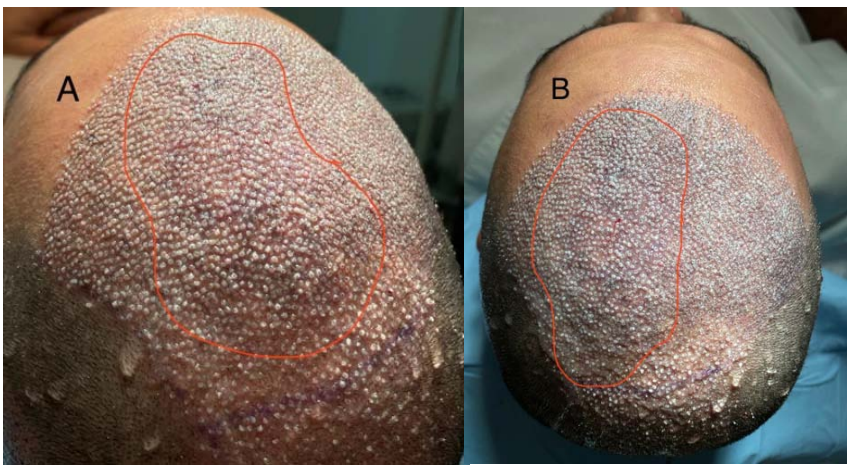
Picture 4: Tissue with reddish coloring indicating blood flow and mature collagen (A) and (B). There was hair growth of some follicles implanted in the area, which demonstrates recovery from the hair transplant through ozone therapy (C) and (D)

For data collection, pictures after hair transplantation procedure (Picture 5). High density and dark coloring areas due to possible ischemia are visible.



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Picture 5: Hair transplant with high approximation of FUs in (A) and (B) showing spots with immediate reduction of blood flow

There is limited evidence on the direct use of ozone therapy in hair transplantation, but it is successful in several other treatments and it presents a therapeutic challenge. There are several therapies for dermal treatment but their adverse effects hamper their application. However, as previously observed, ozone therapy, despite being a simple molecule, holds an

efficient approach to fight microorganisms and promote healing capacity.

V. Conclusion

The current study demonstrated the use of ozone for ischemic tissue treatment. Eventual therapeutic outcomes were positive as healing evolution was attested as a result of improved blood flow and re-epithelialization of damaged tissue.

Despite being an innovative procedure, hair transplantation does not exclude the possibility of necrosis, which highlights the importance of the availability of tools to cope with unexpected situations. Healing is a complex process and demands immediate intervention in face of its occurrence.

This case report is free of any conflict of interest and aims at supporting study and learning initiatives by professionals addressing similar cases in their professional settings.

References Références Referencias

1. CINTRA, G.S. et al. Hair transplant techniques and their main complications: an integrative review. ARCHIVES OF HEALTH INVESTIGATION, v. 11, no. 5, p. 827–831, 9 Dec. 2022.
2. CRISTINA, A.; BARREIRA, C. Ozone therapy in the treatment of wounds. [s.l: s.n.]. Available at: <https://drajynanipichara.com/wp-content/uploads/2020/08/Ozonioterapia-no-tratamento-de-feridas.pdf>.
3. LEMES, M. In vitro evaluation of the effects of ozone on cells affected by induced ischemia. Available at: <https://philozon.com.br/avaliacao-in-vitro-dos-efeitos-do-ozonio-em-celulas-afetadas-por-isquemia-inçada/>. Accessed on: 28 Feb. 2023.
4. MADRID DECLARATION ON OZONE THERAPY. [s.l: s.n.]. Available at: <http://www.spozonoterapia.com/pdf/portuguese_declaration.pdf>. Accessed on: 26 Feb. 2023.
5. MARCHESINI, B. F.; RIBEIRO, S. B. Effect of ozone therapy on wound healing. Physioter. Bras, p. 281–288, 2020.
6. PEREIRA, M. M. S. et al. Effect of different gases on bacterial growth: experimental study "in vitro". Magazine of the Brazilian College of Surgeons, v. 32, no. 1, p. 12–14, Feb. 2005.
7. PIRES, J. R. et al. Effect of systemic ozone therapy as a biomodulator of tissue regeneration and inflammatory response in rats. UNESP Journal of Dentistry, v. 50, 2021.
8. REVIEW ARTICLE S63 Jornal de Pediatria. [s.l: s.n.]. Available at: <https://www.jped.com.br/index.php?p=revista&tipo=pdf-simple&pii=X2255553601029340>. Accessed on: 28 Feb. 2023.
9. SYNTICHAKI, P. Death by necrosis: Uncontrollable catastrophe, or is there order behind the chaos? EMBO Reports, v. 3, no. 7, p. 604–609, 15 Jul. 2002.
10. WANG, X. Emerging roles of ozone in skin diseases. Zhong Nan Da Xue Xue Bao. Yi Xue Ban = Journal of Central South University. Medical Sciences, v. 43, no. 2, p. 114–123, 28 Feb. 2018.
11. ZENG, Jinrong. LU, Jianyun. Mechanism of action involved in ozone therapy in skin diseases. International Immunopharmacology. p.235-241, 2018.

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Tips for writing a good quality Medical Research Paper

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of medical research then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

Criterion for Grading a Research Paper (Compilation) by Global Journals

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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