

AN ANALYSIS OF MEDICINAL HERBS WITH ANTIFERTILITY PROPERTIES

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ABSTRACT

Synthetic steroidal contraceptives may cause gonad toxicity, temporary or permanent infertility, testicular germ cell cancer, breast/prostate cancer, brain developmental issues, endometriosis, and early puberty. These hazards have spurred molecular development. Hence, herbal antifertility remedies are essential. Many modern medications are isolated from nature, which has given medicinal chemicals for millennia. Hindu doctors recognized plants were contraceptive, abortifacient, and anti-implantation. Male and female animal models have tested medicinal plant extracts and active compounds for antifertility. This review updates anti-fertility herbs for men and women. Plant anti-fertility research is reviewed here. Herbal contraceptives suppress fertility and are better for women who can't use modern contraception due to negative effects. Researchers may find anti-fertility herbs here.

KEYWORD: Herbal contraceptives, population explosion, birth control, antifertility, medicinal herbs.

INTRODUCTION

The world population is alive. Global population is 6,790,062,216. Population was 6.8 billion in 2009. 7 billion by late 2015, 10 billion by 2050. Global population has risen since the Black Plague in 1400[2]. India is second-largest. India will outnumber China by 2030. China will reach 1.46 billion and India 1.53 billion. Employment, education, housing, health care, sanitation, and environment are all affected by population

expansion. 2005 saw 74.2 million Ethiopians and 2.9 percent increase. 6.14 births/woman and 8.1% contraception [3]. Birth control devices or medications prevent pregnancy. Pregnancy prevention include contraception, contragestion, and chemical or surgical abortion. Contraception and constipation are often interchangeable. Family planning typically involves birth control. Overpopulation plagues India.

History

Coitus and pregnancy led to birth control. Coitus interruptus, lactational, barrier, and herbal contraception are the oldest methods besides vaginal contact (emmenagogues and abortifacients). Birth control may have started with coitus interruptus (penis removal before ejaculation). Pre-ejaculate fluid lacks viable sperm [4]. Egyptian women destroyed sperm using honey or oil-lubricated acidic pessaries. European women may have used beeswax and Asian ladies oiled paper cervical caps. Abortifacients have been used to terminate undesired pregnancies. The most effective ones are harmful. Silphium, a low-side-effect abortifacient, was wiped out in the 1st century.

Birth control methods

Physical methods- may restrict sperm

from entering the female reproductive canal, hormonally limit ovulation, make the woman's reproductive system inhospitable to sperm, or physically alter the male or female reproductive tract to cause sterility. Multi-mechanism approaches exist. Physical methods are easy and effective.

Barrier methods- Sperm can't get in. Most people use male condoms. Female polyurethane condoms exist. The female condom's flexible rings attach behind the pubic bone outside the vagina. Fully vaginal cervical barriers. Contraceptive sponges rest on cervix depressions. Cervical cap is smallest barrier. Depending on kind, the cap adheres to the cervix or vaginal walls. The diaphragm's rigid, flexible ring pushes on the vaginal walls behind the pubic bone. Vaginal spermicide protects pre-intercourse. Spermicide and physical barriers work.

Hormonal methods- Carl Djerassi, Mexican Luis E. Miramontes, and Hungarian George Rosenkranz devised oral hormonal contraception in 1951. The first successful oral contraceptive, the combo pill, employed progestin-analogue norethindrone (COCP).

Progestins- Progestin hormone contraception. Estranes, gonanes, and pregnanes are progestins. Estranes include norethindrone. Desogestrel, norgestimate, and gestodene are gonanes. Estranes and gonanes have varied half-lives and estrogenic/anti-estrogenic effects. Anti-androgenic and anti-mineralocorticoid drospirenone. Injected pregnancies. The 6-capsule Norplant was superseded in 1999 by the single-rod contraceptive implant Implanon.

Progestin only contraceptives-

Minipills—progestin-only tablets—are used as combined OCs. Progestin-only minipills are almost contraceptive. These pills must be taken everyday for 28 days. Nursing and estrogen-intolerant women use this contraception most.

Side Effects: Progestin-only pills disrupt menstruation. Spotting, amenorrhea, and shortened periods are common abnormalities. A WHO randomized, double-blind experiment found that 53% of users had frequent bleeding, 22% had prolonged bleeding, 13% had irregular bleeding, and 6% had amenorrhea after three months. Acute myocardial infarction, stroke, and venous thromboembolism risk did not increase in a recent WHO case-control study of cardiovascular disease with progestin-only tablets. Progestin-only pills do not influence lipid, glucose, hypertension, or coagulation variables.

Progestin only injectables- DMPA (Depo-Provera®) is 150 mg MPA injected deep intramuscularly every 12 weeks. 24 hours after injection, MPA is pharmacologically active ($>0.5\text{mg/ml}$). Serum values $>1.0\text{ng/ml}$ three months after dose. Month five: 0.2mg/ml . DMPA prevents ovulation.

Side Effects: Menstrual, weight, and mood problems are the most prevalent DMPA adverse effects. Almost half of DMPA users have amenorrhea after three months, with the rest experiencing irregular bleeding.

Progestin only vaginal rings- Currently being developed are progestin-only rings that contain 100 mg of medroxyprogesterone acetate (MPA) that inhibit ovulation¹⁰. To produce a withdrawal bleed, these rings are inserted on day 5 of the cycle and are taken off

after 21 days of usage. Norethindrone-impregnated rings were another kind of progestin-only ring that have been linked to irregular bleeding and ovulation.

Estrogens- Just two estrogenic substances—Ethinyl estradiol (EE) and mestranol—are utilized in hormonal contraceptives, in contrast to a vast array of progestin formulations. Mestranol must be transformed into EE in order to become active, while EE is pharmacologically active. Nowadays available contraceptives include no more than 35 mcg of estrogen. Rapid absorption and substantial hepatic first pass metabolism characterize ethinyl estradiol. Its half-life in plasma has been estimated to be between 10 and 27 hours. In tissue like the endometrium, it seems to have a longer half-life.

Intrauterine methods

These are internal contraceptive methods that are inserted into the uterus. They often have a "T" form, with the arms holding the device in place. There are two primary categories of intrauterine contraceptives: those that produce a progestogen and those that include copper, which has a spermicidal effect (in the US the term progestin is used).

Process of action: IUDs, whether they are medicated or not, have the potential to change the uterine lining and make it less conducive to implantation. Moreover, the uterine cavity's fluid is changed by the release of copper ions in a way that reduces sperm viability and prevents conception. The remarkable effectiveness of copper IUDs as emergency contraception may be due to this mechanism. Moreover, IUDs may affect sperm motility and integrity: IUDs that include medications or hormones may slow down sperm movement by thickening

cervical mucus. There have been reports of sperm head-tail disruption when a copper IUD is present.

Sterilization

For women, a tubal ligation is an option for surgical sterilization, and for males, a vasectomy. The procedure is often known as "tying the tubes" in women, however the fallopian tubes may also be cut, clamped, or obstructed. By doing this, sperm are kept from contacting the unfertilized egg. One technique that clogs the tubes is Essure, a non-surgical method of sterilization. Sterilization has to be regarded as permanent. While tubal ligation is known to be permanent, it is possible to reverse the process in order to start a family again. Nevertheless, this relies on the kind of tubal ligation that was previously performed, the woman's age, and the extent of the damage to the tubes.

Behavioral methods

In order to avoid the entry of sperm into the female reproductive canal, either completely or while an egg may be present, behavioral approaches entail controlling the time or manner of sexual activity.

Mechanism of birth control: Hormonal contraception mainly suppresses ovulation as part of its mode of action.

Effects of pregnancy include:

Inhibition of ovulation by suppressing luteinizing hormone (LH);

1. cervical mucous thickening, which hinders sperm movement;
2. Potential sperm capacitation inhibition;
3. The development of decidualized endometrium with worn-out and atrophic glands made implantation difficult.
4. Depending on dosage, partial reduction of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) might partially limit ovulation;

5. Modification of the endometrium's cellular composition and secretions within the uterus.

The World Health Organization (WHO) has launched a program that incorporates research on conventional medical procedures in an effort to manage the population. Many hormonal contraceptives have been created and used up to this point, but because to their chemical foundation, high cost, sophistication, and side effects, they could not satisfy the need of developing countries[9].

Medicinal plants with significant anti fertility activity

There have also been other natural contraceptives created, however they have little promise for human use. People are increasingly seeking for the usage of herbal remedies against different ailments and for managing fertility as a result of these issues[10]. There are various preventative and curative methods of contraception available today, but none of them are particularly safe or free from negative side effects. The impact of synthetic or chemically based medications on the body's reproductive, neurological, developmental, and metabolic processes may interfere with the endocrine system. These substances could impair natural hormone production, secretion, transport, and action. By preventing hormone synthesis, metabolism, or action, they interfere with the body's regular hormone levels. Examples include Pesticides, Phthalates, and Plasticizers prevent the synthesis of androgen, which in turn affects male sexual development. Alkyphenols, Bisphenol A, Dioxins, Heavy Metals, Fungicides, and Insecticides, on the other hand, prevent the synthesis of estrogen and progesterone,

which affects female sexual development. These chemicals have also been linked to endometriosis, breast/prostate cancer, testicular germ cell cancer, and other. These factors make it important to create all-herbal medications with excellent effectiveness and no harmful effects on the reproductive system. More than 35,000 plant species are utilized as medicines by different human societies across the globe. The majority of traditional medicines, which are used to treat basic health issues in about 80% of the world's population[12,13], depend on plant extracts. Humanity has always utilized plants to treat illnesses and soothe bodily pain. Several traditional medicines are now widely used due to their increased efficacy, more cultural acceptance, and greater human body compatibility. The necessity for the development of natural contraceptives that are reliable and safe. Even the savage inhabitants of ancient civilizations employed herbal contraceptives to regulate fertility and avoid conception. While traditional medicine has identified certain crucial contraceptives (anti-fertility drugs) for females, their acceptance and usefulness among women is constrained by a number of unfavorable side effects. Obesity, cholelithiasis, gastrointestinal issues, cancer of the breast and cervix, asthma, and venous thromboembolism are among of the typical adverse effects[14]. Thus, medical professionals are looking for effective and secure herbal-based contraceptives. Many plants have been shown to have anti-fertility properties by science. These plants might be an important source of natural contraceptives for both sexes. Due to their few or nonexistent adverse effects, plant products have caught the attention of several

scientists as a key source of naturally occurring fertility regulating agents. There are reports of some plant extracts acting as antifertility agents[12]. As India has long been worried about population growth, medicinal herbs have been examined for their potential as contraceptives and for their ability to reduce fertility. Men who are prepared to partake in the duties of family planning have fewer alternatives for effective, reversible, non-irritating, and highly expectable forms of contraception than women have. Moreover, several herbs have been shown to impair normal sperm production or movement. Every plant has a unique application, thus it's crucial to understand how they are or may be utilized. Let's outline the potential courses of action in more detail. To slow down population growth, traditional sterilization methods based on herbal remedies are utilized. These methods include termination during the first few weeks of pregnancy, contraception, or rendering one or both partners sterile. Except for gynecological problems, herbal contraceptives, and plants used to induce abortion, adequate research has been done on the various therapeutic properties of plants in this region, according to a review of the literature [15,16,17]. A number of plant substances may be made into contraceptives and decrease both male and female reproduction. Just a small number of native plants have been studied for their ability to suppress fertility, despite the fact that several have been found to prevent birth.

Both male and female test subjects for the anti-fertility efficacy of several medicinal plant extracts. Several of these plants showed changed hormone levels and spermicidal properties[18,19]. A worldwide effort is now being made to

determine the effectiveness of herbal products as contraceptives[20]. The popularity of plant-based products is rising faster than that of synthetic medications. It has recently been primarily ascribed to their low toxicity and lengthy history of exposure to these medications in traditional systems of ethnic medicine like Ayurveda. So, it is necessary to look for acceptable native medicinal plant products that might be utilized in lieu of tablets. The kinds and dosages of these ingredients have evolved throughout time in an effort to reduce negative effects and boost effectiveness[21]. In many methods, medicinal herbs may cause infertility in females. They may have an impact on the ovary, the uterus, hormone synthesis, hormonal action inhibition, implantation, and sperm penetration. Some of them stop fertilization by enclosing an egg in a protective covering. These behaviors allow the plants to be classified into a variety of groups, including Drugs that prevent the development of gametes and impede fertilization are known as antifertility herbs. Ovulation is suppressed by antiovaratory plants. These medications are administered intravenously or orally. Anti-implantation plants that stop a fertilized ovum from attaching to or penetrating into the uterus. Abortifacients Plants induce early foetal expulsion[22]. The hypothalamus, the anterior pituitary, the ovary, the oviduct, the uterus, and the vagina are the sites where antifertility medications work in females. Via the release of follicle-stimulating hormone (FSH) and luteinizing hormone (LH), the hypothalamus regulates the uterus's function. Hence, antifertility drugs may work at this level by interfering with pituitary and/or hypothalamic hormonal activity, or by affecting the neurological

route leading to the hypothalamus, which regulates the release of gonadotropin-releasing hormones.

While there has been significant progress in the creation of highly effective, palatable, and reversible contraceptive techniques for females, progress and options for males are still gradual and limited[23]. New male contraceptive methods must be developed in light of recent advancements in our knowledge of the physiology of male reproduction. Throughout a lengthy period of time, several possible methods for inducing infertility have been researched, including hormonal, pharmacological, and immunological methods. Levenogestral, Depot medroxy progesterone acetate (DMPA), Cyproterone acetate (CPA), Depot medroxy progesterone acetate (DMPA), Melatonin, -Chlorohydrin, Metapiron, and Serotonin are some of the chemical compounds that have an impact on testicular function. These chemicals also belong to different groups that are

steroidal and non-steroidal. While there are several contraceptive methods available, one of the most difficult endeavors in the field of pharmaceutical and medical sciences is the hunt for newer, more powerful. Several initiatives have been launched to uncover the hidden treasure of medicinal plants that may be used as contraceptives. A large portion of the world's population continues to have access to herbal medicine as one of the major kinds of treatment for maintaining health and treating illnesses. Information on the screening of plants with antifertility activity has been steadily accumulating[25,26,27,28,29]. The antifertility program may benefit from the folklore knowledge and old literature about the plants and herbs. Many plants have recently been discovered, and several researchers have evaluated extracts and active ingredients from diverse plant components, including seeds, roots, leaves, flowers, stems, and stem barks.

Table 1: Medicinal plants exhibiting antifertility activity in females

S. No	Botanical Plants	Family	Parts	Activity
1.	Abroma angusta	Sterculiaceae	Roots	Antiimplantation & Abortification activity[37,38]
2.	Abrus precatorius	Fabaceae	Seeds	Abortifacient activity[40,40,40,39]
3.	Acalypha indica	Euphorbiaceae	Whole plant	Antioestrogenic activity[39,43]
4.	Achillea millefolium	Asteraceae	Flowers	Contraception Activity[40]
5.	Achyranthus aspera	Amranthaceae	Whole plant	Antiimplantation & Abortification activity[42,37,40]
6.	Acacia leucophloeoa	Fabaceae	Roots	Antifertility activity[40]
7.	Abies webbiana	Pinaceae	Leaf	Anti implantation activity[40]

8.	Adhatoda vasica	Acanthaceae	Leaves	Antiimplantation & Abortification activity[37,39,40]
9.	Aegle Marmelos Corr	Rutaceae	Leaf	abortifacient activity[40]
10.	Aerva lanata	Amaranthaceae	Aerial part	Anti implantation[40]
11.	Afromosia laxiflora	Fabaceae	Stem bark	Antigonadotropic activity, Block oestrous cycle[40]
12.	Ailanthus excelsa	Simaroubaceae	Leaf & Bark	Anti-implantation[40,40]
13.	Alangium salvifolium	Alangiaceae	Sem bark	Abortifacient, anti-implantation[42,49,50,51,40]
14.	Albizia lebbec	Mimosaceae	Seeds Roots,	Antifertility[49]
15.	Allium cepa	Liliaceae	Bulb	Antiimplantation activity[37]
16.	Amaranthus spinous	Amaranthaceae	Roots	Inhibit fusion of ovum[40]
17.	Amaranthus viridis	Amaranthaceae	Root	Contraception Activity[40]
18.	Ananas comosus	Bromeliaceae	Fruit, leaves	Abortifacient[40]
19.	Aristolochia tagala	Aristolochiaceae	Whole plant	Anti-implantation[37]
20.	Artemisia africana	Asteraceae	Leaf	Abortion[40]
21.	Aspilia africana	Asteraceae	Leaves	Antioviulatory activity[40]R
22.	A.ropenckia populnea	Celastraceae	Pods	Antiimplantation & Abortification activity[48]
23.	Azadirachta indica	Maliaceae	Leaf	antiandrogenic property[39,49,40, ,38]
24.	Bacopa monnieri	Scrophulariaceae	Whole plant	Contraception Activity
25.	Balanites roxburghii	Zygophyllaceae	Fruit	Contraception Activity[37]

CONCLUSION

In emerging nations, population growth is the main driver of poverty and pollution. For a lengthy period of time, several possible methods for inducing infertility have been examined. For men and women who have issues using or don't have access

to contemporary contraceptives, especially those living in rural parts of developing countries with large populations, like India, herbal contraceptives provide alternatives. Yet, owing to inadequate suppression of fertility or adverse effects, the search for an orally active, safe, and

effective plant preparation or its constituent is still required for fertility management. It is abundantly obvious from this research that medicinal herbs are essential in the fight against several ailments. Many plant extracts used as medicines have potent anti-fertility properties. The antifertility medication may function via many mechanisms or just one. These include the rapid expulsion of the fertilized ova from the fallopian tube or by the tube locking mechanism; as a blastocyst-toxic agent; by inhibiting implantation due to an imbalance in the hormones estrogen and progesterone; or through foetal absorption or abortion, possibly as a result of inadequate nutrition for the uterus and the embryo in females, and for the male sperm production as well as the endocrine function of the testes. Animals' weight, histology, and endocrine function alterations have all been used to study how plants affect the male reproductive system. The researchers hypothesized that it may result from a direct inhibitory impact of the test or hormonal activity, which would prevent the synthesis or release of gonadotropins from the pituitary gland.

The review's findings demonstrated that the aforementioned medicinal herbs had dose-dependent anti-fertility properties. The findings of this research suggest that several medicinal plant extracts have significant potential for use in birth control. So, it is concluded that this analysis may direct researchers' attention toward clinical trials that may greatly advance science and benefit society.

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