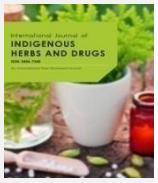
Review Article

International Journal of Indigenous Herbs and Drugs
Content Available at www.saap.org.in ISSN: 2456-7345



INDIGENOUS PLANTS AS ORAL HERBAL CONTRACEPTIVE: AN UPDATED REVIEW

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Article Info

Article History
Received on: 04-07-2023
Revised on: 22-07-2023
Accepted on: 27-08-2023

Abstract

The exponential growth of the human population in a growing nation like India is one of its most serious issues. Contraceptives that are readily available and acceptable are required in many poorer countries to reduce population growth and in all countries to prevent maternal morbidity and mortality arising from unintended pregnancies. Worldwide, women consume contraceptives at a rate of about 90%.Commercially available birth control tablets are deleterious to women's health and occasionally death. Such pills can lead to fat deposition in the liver, kidneys, and uterus, a rupture of the uterus epithelial layer, irregular and unpleasant menstruation, breast cancer, and finally irreversible infertility. They can also impede metabolism and subsequent pregnancy. When considering the treatment of illnesses that often aren't treatable by allopathic medicine, the term "herbal plants" became a prevalent one that entered everyone's consciousness. Ancient physicians were cognizant of plants that may be used as contraceptives. Herbs with an anti-fertility effect include herbal contraceptives. Although less effective than pills, herbal contraceptives can be used as a less harmful option. Modern research on contraception has recently turned its attention to the study of natural herbal contraception.

Keywords: Contraception, Infertility, Anti-fertility, menstruation.

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DOI: https://doi.org/10.46956/ijihd.v8i4.479

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Introduction

One of the major issues in emerging nations like India is overpopulation, which would increase by 9.2 billion people by the year 2050.1Rahul.The current population of India in 2023 is 1,428,627,663, a 0.81% increase in 2022. Over 139 million women and girls in India, use modern methods of contraception, About 58 percent of the currently married, nonpregnant women, aged 15–49 years in India, were using some contraceptive methods. As a result of contraceptive use in India, more than 54.5 million unintended pregnancies were prevented, and 1.8 million unsafe abortions and 23,000 maternal deaths were averted in the last year. In order to avoid pregnancy, people utilize fertility control, sometimes referred to as contraception and birth control [1]. These birth control tablets affect the ovary and uterus and interfere with their natural function they are primarily used by women [2]. As a panacea for a wide range of human issues, medicinal herbs are a wonderful gift from nature [3]. Despite the fact that the appropriate scientific explanation for phytotherapy is still extremely new, it has a very extensive history in India. Due to their increased cultural acceptance, improved human body compatibility, fewer side effects, and lower cost 80% of the world's population uses traditional medicines, the majority of which employ plant extracts. More than 35,000 plant species are used for medical purposes by various human societies around the globe.

Nearly all conventional medicine now includes herbal remedies and their derivatives. Approximately 75% of people in developing countries obtain herbal medical care, compared to more than 50% of those in wealthy countries, especially for diseases linked to a certain lifestyle. The World Health Organization (WHO) has established a Task Force on Plant Research for Fertility Regulation with the goal of discovering new non-steroidal oral contraceptives that are both effective and safe [4].

Herbs with an anti-fertility effect include herbal contraceptives. It can affect fertility in a number of different ways, which can influence the ovary, and the

uterus, normal hormone synthesis, or even inhibit specific hormones. Some plants have the capacity to prevent implantation; these plants can be used as emergency contraception and administered as needed. Additionally, several herbs have been reported to impair the normal generation or movement of sperm. Studying the potency and toxicity of regional plants used as birth control in these nations' folkloric medicine may increase faith and adoption of herbal contraceptives. This paper discusses the efficacy of synthetic drugs over herbal contraception.

Some Medicinal Plants With Anti-Fertility Potential

Sapindustrifoliatus: [Sapindaceae]

Sapindustrifoliatus (ST) Linn., Effect of butanol extract of fruits of *Sapindustrifoliatus Linn.*was observed (Ria Palon et al., 2013) thefemale albino rat after theoral administration of 20mg/kg,30mg/kg. A dose and duration-dependent effects exhibit strong post-coital pregnancy interceptive action. The treatment resulted in several levels of the hypothalamic-pituitary-gonadal (HPG) axis due to altered levels of gonadotrophic hormones. Alterations in gonadal hormone levels can also provide an unfavorable uterine environmentwhich can result in anti-implantation activity [5].

Talinum paniculatum: [Talinaceae]

Som Java, also known as *Talinum paniculatum (Jacq.) Gaertn* was allegedly discovered in female Wistar rats after oral dose (CatthareeyaThanamool et al., 2013). Methanolic preparations of (100 and 1,000 mg.kg-1 B.W.) the root and leaves demonstrated anti-implantation and early abortifacient actions in a dose-dependent manner. *T. paniculatum* extracts were found to boost the anti-implantation activity in pregnant rats in a dose-dependent manner. The decline in implantation sites and increase in abortifacient activity indicate that the treatment using leaf extract at a dose of 1,000 mg.kg-1 BW had stronger anti-fertility effects [6].

Ocimumbasilicum:[Lamiaceae]

Ocimum Linn, a kind of basil, was researched by (Alia Bilal et al., 2013). This plant, sometimes known as sweet basil, is commonly used as a decorative plant and in cooking. *Ocimumbasilicum* leaves extract (364 mg/kg and 624 mg/kg) was examined for its anti-ovulatory, anti-implantation, and abortifacient effects. The duration of the diestrus phase and estrus cycle both significantly increased. Additionally, a notable increase in ovarian tissue cholesterol content and a substantial drop in ovarian weight were observed. The hydroalcoholic extract of *Ocimumbasilicum* hinders healthy ovulation by changing the estrus cycle and lengthening the diestrus phase [7].

Datura stramonium: [Solanaceae]

Datura stramonium Linn., sometimes known as jimsonweed (Priyanka Soniet al.2013) The impact of petroleum ether, ethanol, and aqueous extracts of *Datura stramonium Linn*. leaves on the estrous cycle in female albino rats was examined in the active ethanol extract. The plant extracts were given at two doses of 200 and 400 mg/kg, respectively. The 200 mg/kg dosage of ethanol extract enhanced the duration of the estrous cycle by directly increasing the diestrous phase, but the 400 mg/kg dose significantly decreased the proestrous phase while increasing the duration of the diestrous phase. The ethanolic extract of *D. stramonium* displayed the most antifertility efficacy of the three extracts examined. The ethanol extract generated a transitory and reversible change in the estrous cycle. As a result, the extracts inhibited ovulation, resulting in a decrease in cyclicity. The ethanol extract of *D. stramonium* Linn leaves appear to be anti-estrogenic, either by inhibiting estrogen receptors or by decreasing estrogen levels [8].

Drynariaquercifolia :[Polypodiaceae]

Fresh rhizomes of the plant *Drynariaquercifolia (L.) J. Smith*was seen (Banani Das et al., 2014). In this experiment, pet-ether extracts PEDQ, ethyl acetate extracts EADQ, acetone extract ACDQ, methanol extracts MEDQ, and aqueous extract AEDQ were employed; MEDQ and AEDQ were the only ones to provide statistically significant results. Following oral administration of 200 mg/kg of test samples (AEDQ and MEDQ), anti-implantation tests on a female albino rat demonstrated this was successful. the potency of the plant's aqueous (68%) and methanol (87%) extracts on uterotonic activities. The methanolic extract has demonstrated increased efficacy for both abortifacient and anti-implantation performance and also impacted hormone release levels.The number of living fetuses significantly changed following the administration of the extracts at a dose of 200 mg/kg body weight, as did the percentage of post-implantation embryonic loss and the percentage of fetal survival, suggesting the extracts' abortifacient action [9].

Artemisia vulgaris:[Asteraceae]

Artemisia vulgaris L. is most often known as mugwort. In the methanolic experiments, the plant extract was tested at two dose levels, 300 and 600 mg/kg, for its effect on implant formation (Afsar Shaik et al., 2014). According to the anti-implantation studies, oral administration of the methanolic extract of *A. vulgaris* leaves at a dose of 600 mg/kg of body weight resulted in a much lower number of implantation sites. MEAV's (methanolic extract of *A. vulgaris*) anti-implantation potency ranged from 50% to 100%, depending on the dose. At a concentration of 600 mg/kg, the methanol extract clearly displayed estrogenic activity, as evidenced by the noticeably elevated weights of the reproductive organs [10].

Ocimumsanctum:[Lamiaceae]

The antifertility efficacy of eugenol (EUG) and *Ocimum sanctum (OS)* leaf extract in female albino rats and male albino rats was studied (Venkataramanaiah Poli et al., 2018). EUG (99% pure) at 0.4ml/day/rat and OS Linn. (Tulsi) leaf extract at 500mg/kgoral administration. The entire duration of the estrous cycle was extended by EUG, while no significant differences were seen with OS leaf extract treatment. EUG increased blood estradiol and progesterone levels, but OS leaf extract only increased

progesterone levels. FSH, LH, and prolactin levels did not alter much in either treatment.Both treatments result in a considerable decrease in testosterone. Ovarian proteins were found to be elevated in both dosages. The injection of EUG and OS leaf extract significantly increased blood estrogen and progesterone levels, resulting in decreased ovulation frequency and reproductive impairment [11].

***Cissus rotundifolia*:**[Vitaceae]

Tana River County frequently has *Cissus rotundifolia (Forssk.) Vahl*. (Anita Mary Mziray et al., 2020). Following oral administration of 400 mg/kg and 800 mg/kg of aqueous extract, the effect was shown in female Wistar rats. Proestrus and metestrus phases were significantly increased by the plant extract in a dose-dependent manner, but estrus and diestrus phases were significantly decreased.A dose-dependent reduction in the fertility index was seen after treatment. Pre- and post-mating treatment regimes both significantly altered gestational length and litter size. When used in conjunction with post-mating treatment, *Cissus rotundifolia* significantly affected the fertility index at both doses (400 and 800 mg/kg). At both dosages,*Cissus rotundifolia* had the most significant impact on the fertility index [12].

Cynodondactylon: [poaceae]

Bermuda grass is *Cynodondactylon (L.*) Pers was observed by (Arati Malpani et al., 2020). The antifertility action of ether (ErCD), chloroform (CeCD), and ethyl alcohol (EyCD) extracts of the entire plant of *Cynodondactylon* in female Wistar albino rats. An antifertility investigation was conducted in female Wistar rats using two dosage levels (200 and 400 mg/kg, orally) of EyCD. The EyCD-treated rats had the greatest decrease in pregnancy (83.33%). Estimation of EyCD on vaginal cornification, estrogen-induced uterotrophic test, and deciduoma model revealed vaginal cornification, a substantial increase in uterine weight and uterine proliferation in histopathology, and decreased deciduoma development, respectively.The low and high dosages of extracts ErCD, CeCD, and EyCD (200 and 400 mg/kg) reduced pregnancies by 16.67%, 66.7%, and 83.34%, respectively, in relation to cholesterol and alkaline phosphatase. Significant antifertility action, substantial vaginal cornification, and increases in uterine and body weight of bilaterally ovariectomized juvenile rats in the current study demonstrate phytoestrogen activity of the EyCD.*C.dactylon* has been proven to impede pregnancy in a dose-dependent manner and to have strong antifertility effects [13].

Plumeria acuminata:[Apocynaceae]

Plumeria acuminata (L.), often known as Frangipani (Eng.), was discovered by (Jay P Rabadia et al., 2022). Female Wistar rats were given oral doses of 100, 200, and 400 mg/kg of ethanolic extracts to test for antifertility efficacy. After PAL and PAR therapy, estrogen, LH, and progesterone levels fell dose-dependently, whereas FSH levels increased. The therapy decreased estrogen, progesterone, and luteinizing hormone levels while increasing follicle-stimulating hormone levels. Observing cystic follicles and atrophied squamous cells during histological examination indicated anatomical changes in reproductive organs [14].

Jatropha variegate:[Euphorbiaceae]

The Ebki shrub is also known as *Jatropha variegata (Forsk.) Vahl* (Wahibah Taher Alhaj et al., 2022). The female Wistar rats were given oral doses of 150 mg/kg and 300 mg/kg of methanolic extract. *J. variegata* extract also exhibited a significant abortifacient activity, particularly at a dose of 300 mg/kg., The plant extract also resulted in a dose-dependent increase in the number of lost implants and in the number of resorbed fetuses in female rats. The inability of a female to carry a viable embryo is predicted by a greater resorption index and a larger number of lost implants, which are regarded as markers of decreased fertility. At dosages of 150 and 300 mg/kg, the methanol extract of *J. variegata* fruit showed 50% and 93% abortifacient efficacy, respectively. At a concentration of 300 mg/kg extract also had considerable estrogenic action, as demonstrated by the weight gain of rat ovaries [15].

Azadirachta indica:

Azadiracht indica A. Juss (MacDonald Idu et al., 2022) It was referred to as a separate tree called neem. Male and female Wistar rats were used in a comparative investigation of the spermicidal and contraceptive effects of *Azadirachta indica* seed aqueous extract. Male hormonal levels significantly decreased at 2.5, 5, and 10 mg/kg of A. indica (0.73, 0.50, and 1.08 ng/ml) as well as the number of sperm cells (102.5, 111.5, and 97 counts) after 24 hours, according to the results of the spermicidal activity. In the day 14 post-coital trial, the contraceptive study resulted in a substantial decrease in estrogen (1.46 ng/ml), luteinizing hormone (0.094 mg/dl), and progesterone (1.82 ng/ml) at 5 mg/kg compared to the control. The treated uterus' histology did not deteriorate. At a lower dosage, the extract triggered spermicidal and contraceptive properties. The *Azadirachta indica* seed precisely triggered the herbal spermicidal and contraceptive effects in this investigation at a decreased dosage [16].

Table 1: List of plants with potential antifertility activity:

S. no.	Plant name	Family	Activity	Part used	References
1.	*Caesalpinia bonducella*	*Caesalpiniacceae*	Anti- spermatogenic	Seed	17
2.	*Carica papaya*	*caricaceae*	Abortifacient	Seed	18
3.	*Cassia tora*	*Fabaceae*	Anti- androgenic	Seed and stem	19
4.	*Crocus sativus*	*Iridaceae*	Anti- implantation	Flower	20
5.	*Ficus religiousa*	*Moraceae*	Anti- implantation	Fruit	21
6.	*Gloriosa superba linn.*	*colchicaceae*	Abortifacient	Root	22
7.	*Micheliachampaca*	*Magnoliaceae*	Anti- implantation	Leaf	23
8.	*Moringa oleifira*	*moringaceae*	Anti- implantation	Leaf	24
9.	*Musa paradisiaca l.*	*musaceae*	Anti- ovulatory	Stem	25
10.	*Ocimumgratissimum*	*lamiaceae*	Anti- spermatogenic	Leaf	26
11.	*Piper betle*	*Piperaceae*	Anti- estrogenic	Petiole	27
12.	*Piper nigrum*	*Piperaceae*	Anti- spermatogenic	Fruit	28
13.	*Rhodomyrtus tomentosa*	*Myrtaceae*	Anti- spermatogenic	Leaf	29
14.	*Tecoma stans*	*Bignoniaceae*	Anti- spermatogenic	Leaf	30

15.	*Tecomellaundulata*	*Bignoniaceae*	Anti- spermatogenic	Leaf	31

Discussion

Human fertility must be monitored in order to achieve population management. Traditional medicine offers us a number of strategies for preventing human fertility. Hormonal contraceptives include birth control tablets, skin patches, condoms, intrauterine devices, and other methods.32Currently, scientifically proven methods of contraception and contraceptive medicines are widely utilized. Synthetic contraceptives that are known to interact with the endocrine system and natural hormones can have substantial reproductive, neurological, developmental, and metabolic side effects. The hunt for safer medications, as well as a preference for natural contraception pills and procedures, are areas of scientific focus. The primary goals of research into innovative natural contraceptives would be to ensure efficacy, safety, and user compliance. Many plants have been shown to have antifertility effects in both men and females. Some of these plants showed spermicidal properties as well as changed hormone levels.33

Herbal extracts can interfere with fertility in a variety of ways. They can impact female reproductive organs such as the ovaries and uterus, or they can impede hormone release because they contain phytoestrogen and progesterone or mimics of these hormones.Various experiments on the animal model revealed that these herbal compounds had fewer negative effects than chemically synthesized contraceptives, which typically comprise a variety of hormone combinations.

Acknowledgment

None

Conflict of interest

Authors are declared that no conflict of interest

Funding

No Funding

Ethical Consideration and Inform Consent

Not Applicable

Conclusion

People are growing increasingly interested in using herbal goods rather than chemical/synthetic ones since herbal products are considerably safer and may be used for a long length of time without having any detrimental influence on health. Herbal products are far more effective and superior to commercially available chemical and hormonal birth control methods. Long-term use of these commercially accessible products will render the user infertile and vulnerable to a variety of life-threatening disorders. So, in order to avoid the negative consequences of contraceptive pills and other synthetic medicines, we should focus more on the commercialization of herbal products for the benefit of all humans, regardless of gender. Many studies have already been conducted on the aforementioned subject, and many more are now underway, and now is the time to focus even more on making the best use of nature in the form of pharmaceuticals and so on.

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