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A COMPREHENSIVE REVIEW OF PLANTS USED AS CONTRACEPTIVES

Dusmanta Kumar Pradhan*[1], Manas Ranjan Mishra [1], Ashutosh Mishra [1], Ashok Kumar Panda [2], Rajani Kanta Behera [3], Shivesh Jha [4] and Sanjaya Choudhury [5]

Gayatri College of Pharmacy [1], Sambalpur, Odisha, India
Veer Surendra Sai University of Technology (VSSUT) [2], Burla, Odisha, India
School of Chemistry, Sambalpur University [3], Burla, Odisha, India
Department of Pharmacy, BITS [4], Ranchi, Jharkhand, India
The Pharmaceutical College [5], Barpali, Bargarh, Odisha, India

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Correspondence to Author:

Dusmanta Kumar Pradhan

Associate Professor, Gayatri College of Pharmacy, Jamadarpali, Sambalpur-768200, Odisha, India

E-mail: dkpradhan74@gmail.com

ABSTRACT

Evaluation of herbs for anti-fertility effects has been in progress worldwide for several decades to identify effective and safe substances for control of population explosion. This population explosion will have negative impact on our economic policies and would simultaneously misbalance our socio-economic infrastructure. Family planning has been promoted through several methods of contraception, but due to serious adverse effects produced by synthetic steroidal contraceptives, attention has now been focused on indigenous plants for possible contraceptive effect. Although contraceptives containing estrogen and progesterone are effective and popular, the risks associated to the drugs have triggered the need to develop newer molecules from medicinal plants. Hence, there is a need for searching suitable product from indigenous medicinal plants that could be effectively used in the place of pills.

INTRODUCTION: Since ancient times, mankind has used plants to cure diseases and relieve physical sufferings. Because of better cultural acceptability, better compatibility with the human body, lesser side effects and effectiveness of many traditional medicines is now an accepted fact.

More than 35,000 plant species are being used in various human cultures around the world for medicinal purposes. Nearly 80% of the world populations rely on traditional medicines for primary health care, most of which involve the use of plant extracts [1, 2].

One of the critical problems of the developing countries like India is its geometrical increase in human population that. This increment imposes an extra burden on all aspects of development, especially employment, education, housing, health care, sanitation and environment. This population explosion will have negative impact on our economic policies and would simultaneously misbalance our socio-economic infrastructure, according to National Institute of Population studies.

Today we understand that our sheer numbers have increased so much that they are straining Earth's capacity to supply food, energy and raw materials.

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Thus the control of human fertility in the sense of its limitation is the most important and urgent of all bio-social and medical problems confronting mankind today [2].

Contraception is literally the prevention of conception, but generally is taken to mean the prevention of pregnancy [3]. Family planning has been promoted through several methods of contraception, like contraceptive pills, Copper-T, Tubectomy, Condoms, Diaphragm and coitus interrupts. These methods are mostly female oriented. Contraceptive pills are usually female sex hormone like estrogen, progesterone or their derivatives single or together. The concept of sterilization by female sex hormone is very old and it was initiated in beginning of twentieth century. Novid was the first "pill" approved by FDA for use as contraceptive agent in the USA in 1959. But unfortunately these pills develop some unwanted effects like obesity, dysmenorrheal, vomiting, cardiovascular disorders and carcinoma of breast and uterus. So these pills are not safe for long term use.

Various measures have been taken to minimize the side effects of these pills but there is little success. Due to serious adverse effects produced by synthetic steroidal contraceptives, attention has now been focused on indigenous plants for possible contraceptive effect. Although contraceptives containing estrogen and progesterone are effective and popular, the risks associated to the drugs have triggered the need to develop newer molecules from medicinal plants.

From the advancement of reproductive biomedicine, several hormonal contraceptive pills have been developed but no one is free from different side effects For this purpose, the World Health Organization (WHO) has constituted a population control programme, which includes studies having traditional medical practices. At present global attempt has been taken to search out the effect of herbal product for contraceptive purposes [4].

The development of new fertility regulating drug from medicinal plants is an attractive proposition, because from times immemorial humans have relied on plants and their products as sources of drugs and therapeutic agents, although in recent times, synthetic drugs are used extensively in modern medicine. However many modern medicines are developed through the clues obtained from phytochemicals. More over the phytochemicals even today are important resources for medicine. The plant products are becoming more popular than the synthetic drugs. In recent times it is mainly attributed to their low toxicity and long standing experience of exposure of these drugs in ethnic medicine system like Ayurveda.

Hence, there is a need for searching suitable product from indigenous medicinal plants that could be effectively used in the place of pills. All combination oral contraceptives (COCs) contain both an estrogenic compound and a progestin. Over the years, the amounts and types of these components have changed in attempts to lower side effects and improve efficacy [5].

Herbal contraceptives offer alternatives for women who have problems with or lack access to modern contraceptives options particularly women living in the rural areas in developing nations with very high population like India, China, Africa (Nigeria) and Bangladesh. Studying the potency and toxicity of local plants that are reputed for birth control in the folkloric medicine of these countries may generate greater confidence in and wider acceptance of herbal contraceptives. However, the search for an orally active, safe and effective plant preparation or its compound is yet to be needed for fertility regulation due to incomplete inhibition of fertility or side effects.

Numerous herbs have been used historically to reduce fertility, and modern scientific research has confirmed anti-fertility effects in at least some of the herbs tested. Herbal contraception may never reach the level of contraceptive protection as the pill, but it offers alternatives for women who have difficulty with modern contraceptive options or who just want to try a different way. Very little is known about many of the herbs, or about long term side effect [2].

Hormonal control of Fertility: The most effective method of contraception, the birth control pill, is based on oral administration of steroids. Estrogens and progestins are used either combined or, as with the "minipill", progestins are used alone.

In addition, various combinations of steroids can also be administered as long-acting injectable preparations or via intrauterine systems. The pills to be effective via the oral route, estradiol and progesterone cannot be used since they are metabolized in the gastrointestional tract and liver. As a consequence, synthetic estrogens such as mestranol or ethinyl estradiol are used in combination with various synthetic progestins, such as norethindrone, norethindrone acetate, norgestrel, ethinodiol diacetate or norethynodrel. The hormones are given in a cyclic fashion for 21 days, beginning on day 5 of the menstrual cycle, followed by 7 days of placebo treatment or no pills.

The elevated estrogen and progestin levels inhibit the midcycle LH surge and ovulation by exerting negative feedback effects on the hypothalamus. Irregular LH peaks are sometimes observed, while FSH levels are usually suppressed. Ovarian progesterone production is diminished, but estrogens continue to be secreted. The effects on the endometrium are variable and depend on the type and dosage of the contraceptive. Rapid progression from proliferation to early secretory changes can be observed within a few days from the start of daily intake, followed by regressive changes. Secretory activity is either minimal or absent. The pregnancy rate for combined pills is approximately 2%. [5].

Mechanism of action of Antifertility Plants: Plant drugs have been used since time immemorial for their effects upon sex hormones particularly for suppressing fertility, regularizing menstrual cycle, relieving dysmennoroea, treating enlarged prostate, menopausal symptoms, breast pain and during and after childhood [6].

Specific biological effects under the division of fertility regulating category are non- specific contraceptive or antifertility effects, abortifacient, uterine stimulant and uterine relaxants, labour induction and labour inhibition oxytocic and anti- oxytocic, oestrogenic and anti- oestrogenic, progestrogenic and anti-progesterogenic, ovulatory and anti- ovulatory, androgenic and anti- androgenic, spermicidal and anti-spermatogenic effects [7].

The site of action of antifertility agents in females consists of the hypothalamus, the anterior pituitary, the ovary, the oviduct, the uterus and the vagina. The Hypothalamus controls the action of the uterus via follicle stimulating hormone (FSH) and Luteinizing hormone (LH) releasing hormones. Antifertility agents may therefore exert their effort at this level either by disrupting hormonal function of the hypothalamus and/ or the pituitary, or by interrupting the neural pathway to the hypothalamus that control the liberation of gonadotrophinreleasing hormones. Early researchers in the area of female fertility regulation focused their attention to phytoestrogens following the recognition that excess ingestion of plants containing estrogenic compounds resulted in infertility in animals and humans [6].

The mammalian uterus which is the main site of antifertility effects comprises outer myometrial cells which are responsible for the contraction of the uterus, inner endometrial cells which are secretary and the cervix. The physiology of the uterus and its response to oxytocic drugs differs greatly in different species. Moreover the type of motility and the threshold for the response to oxytocic drugs differs with the phase of the oesterus cycle and the stage of pregnancy [6].

Phytoestrogens are any plant compounds structurally and/ or functionally similar to ovarian and placental estrogens and their active metabolites [8]. They include a vast variety of structurally diverse compound. These include isoflavones found in soy, lignans found in grains, stilbenes found in the skin of grapes and fungal metabolites, for example, macrolides [9]. Plants with estrogenic property can directly influence pituitary action by peripheral modulation of LH and FSH decreasing secretion of this hormones and block ovulation. The decrease in LH and FSH could explain ovulation and estrous cycle blockage by some plant extracts. All substances able to inhibit this release could provoke an ovulation disruption by decreasing the number of mature follicles [10].

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Several active chemical constituents accountable for uterotonic effects are discovered in various plant species from time to time. For instance two triterpenic saponins called ardisiacrispin A and B are isolated and characterized from the crude extracts of *Ardisia crispa* root. This plant root is used by Thai people for washing out dirty blood in woman suffering from menstrual pain. The isolated compounds were responsible for uterocontracting properties in treated rats [11]. An active indole alkaloid compound, Yuehchukene isolated from the plant *Murraya pankalata* is used in China to regulate fertility because it has potent anti-implantation effect [12].

Therefore, in the present study, an attempt has been made to document the anti-fertility activity of the selected medicinal plants.

Following is the list of plants available for anti-fertility activity with their parts used and somewhere mechanism of action to understand this activity.

TABLE 1: INDIGENOUS MEDICINAL PLANTS HAVING ANTIFERTILITY ACTIVITY

Sl. No.	Botanical Name	Family	Parts used	Action	References
1	*Abroma angusta*	Sterculiaceae	Roots	Antiimplantation & Abortification activity	13, 14
2	*Abrus precatorius*	Fabaceae	Seeds	Abortifacient activity	17,15,2,16,14
3	*Acalypha indica*	Euphorbiaceae	Whole plant	Antioestrogenic activity	12, 2
4	*Achillea millefolium*	Asteraceae	Flowers	Contraception Activity	17
5	*Achyranthus aspera*	Amranthaceae	Whole plant Stem bark,root	Antiimplantation & Abortification activity	17,13,18
6	*Adhatoda vasica*	Acanthaceae	Leaves	Antiimplantation & Abortification activity	13,2,18
7	*Aegle marmelos*	Rutaceae	Leaf	Contraception Activity	17,2,16
8	*Aerva lanata*	Amaranthaceae	aerial parts	Anti-implantation	18
9	*Afromosia laxiflora*	Fabaceae	Stem bark	Antigonadotropic activity, Block oestrous cycle	3
10	*Ailanthus excelsa*	Simaroubaceae	Leaf, stem,Bark	Anti-implantation	17, 3
11	*Alangium salvifolium*	Alangiaceae	Stem bark	Abortifacient, anti-implantation	17,1,19,20, 18
12	*Albizzia lebbec*	Mimosacaeae	Seeds,Roots,Pods	Antifertility	1
13	*Allium cepa*	Liliaceae	Bulb	Antiimplantation activity	13
14	*Aloe vera*	Liliaceae	Latex	Spermicidal	19
15	*Amaranthus spinous*	Amaranthaceae	Root	Inhibit fusion of sperm & ovum	15
16	*Amaranthus viridis*	Amaranthaceae	Root	Contraception Activity	1
17	*Anacardium occidentale*	Anacardiaceae	Nut shell	Spermicidal	13
18	*Ananas comosus*	Bromeliaceae	Unripe fruit, leaves	Abortifacient	13, 18
19	*Andrographis paniculata*	Acanthaceae	Dried leaves powder	Antifertility,Arrest oogenesis & depletes estrogen level	3
20	*Arctium lappa*	Asteraceae	Leaves and roots	Abortifacient	1
21	*Ardicia solanacea*	Myrsinacea	Plants excluding roots	Spermicidal activity	13
22	*Aristolochia tagala*	Aristolochiaceae	Whole plant	Anti-implantation	13
23	*Artemisia fricana*	Asteraceae	Leaf	Abortion	1
24	*Artemisia vulgaris*	Compositae	Whole plant	Spermatogenesis	3,21
25	*Aspilia africana*	Asteraceae	Leaves	Antiovulatory activity	17
26	*Austropenckia populnea*	Celastraceae	Pods	Antiimplantation & Abortification activity	3
27	*Azadirachta indica*	Maliaceae	Seed oil	Anti-androgenic Activity	3,1,15,20,14
28	*Bacopa monnieri*	Scrophulariaceae	Plant	Contraception Activity	17
29	*Balanites roxburghii*	Zygophyllaceae	Fruits	Contraception Activity	13,17
30	*Ballota undulate*	Labiatae	Leaves, flower	Antiimplantation activity	17
31	*Barleria prionitis*	Acanthaceae	Root	Antispermaogenic activity	20,2

32	*Biophytum sanctivum*	Oxalidaceae	Leaves	Anti-implantation	4,19
33	*Bougainvillea*	Nyctaginaceae	Leaves	Antifertility	4
34	*Butea monosperma*	Papilionaceae	Seed	Inhibit release of ovum from ovary	1,22,15,14
35	*Calotropis procera*	Ascrophluariaceae	Roots	Anti-implantation	13
36	*Cananga odorata*	Annonaceae	Root, bark	Contraception Activity	17
37	*Cardiospermum helicacabum*	Spindaceae	Whole plant	Anti-implantation	4
38	*Carica papaya*	Caricaceae	Latex of green fruit Seeds	Antiimplantation & Abortification activity	17,13,15,22
39	*Carum carvi*	Apiaceae	Rhizome	Antioestrogenic activity	17
40	*Cassia fistula*	Caesalpiniaceae	Pods, seeds	Antiimplantation activity	17,2
41	*Cicer arietinum.*	Paplionaceae	Seeds	Oestrogenic activity	17
42	*Cissampelos pareira*	Menispermaceae	Leaves	Antioestrogenic activity	2,16,23
43	*Clerodendrum serratum*	Verbenaceae	Whole plant except root	Spermicida	13
44	*Cnidoscolous aconitifolius*	Euphorbiaceae	Leaves	Contraception Activity	13
45	*Cola nitida*	Sterculiaceae	Sterm bark	Antigonadotropic activity, Block oestrous cycle	3
46	*Colebrookia oppositifolia*	Lamiaceae	leaf	Contraception Activity,	17
47	*Combretodendron macrocarpum*	Barringtoniaceae	Stem bark	Antigonadotropic activity	17
48	*Crataeva nurvala*	Capparidaceae	Stem bark	Antioestrogenic activity	3,2
49	*Crotalaria juncea*	Papilionaceae	Seeds	Anti-implantation activity	17,4
50	*Croton roxburghii*	Euphorbiaceae	Bark	Antioestrogenic activity	17
51	*Cumftiga racemosa*	Apocyanaceae	Root	Spermatogenesis	4,17,20
52	*Cuminum cyminum*	Apiaceae	Seed	Contraception Activity	17
53	*Curcuma aromatic*	Zingiberaceae	Rhizome	Antioestrogenic activity	13,15,16
54	*Curcuma longa*	Zingiberaceae	Rhizome	Antiostrogenic activity	17,19
55	*Cyclea burmanni*	Menispermaceae	Roots Resorption	estrogen effect	13
56	*Cyperus rotundus*	Cyperaceae	Rhizomes	Oestrogenic activity	19,24
57	*Daucus carota*	Apiaceae	Seeds	Antiimplantation & Abortification activity	15
58	*Dendrophthoe falcate*	Loranthaceae	Aerial parts	Antioestrogenic activity	3
59	*Derris brevipes* variety *coriacea*	Papillionaceae	Root Powder	Abortifacient activity	3,20,18,25
60	*Dioscorrea bulbifera*	Dioscoreaceae	Tuber	Inhibit oogenesis	4
61	*Dipsacus mitis*	Spindaceae	Root	Increase progesterone secretion	15,1
62	*Embelia ribes*	Myrsinaceae	WholePlant, Fruit	anti-fertility activity	1
63	*Eugenia jambolana*	Myrtaceae	Flowers	Decrease sperm count	3
64	*Ficus religiosa*	Mosaceae	Seed	Inhibit the release of ovum from the ovary	13
65	*Foeniculum vulgare*	Apiaceae	Powder of fruits	contraceptive	3,13,14
66	*Fterocarpus erinaceus*	Fabaceae	Sterm bark	Antigonadotropic activity	13
67	*Guaiacum officinale*	Zygophyllaceae	Aerial parts	Abortifacient	13
68	*Gossipium herbacium.*	Malvaceae	Stem, Roots & Seeds	Antiimplantation & Abortification activity	13
69	*Grewia asiatica*	Tiliaceae	Seeds	Antiimplantation & Abortification activity	13,3,15,2,25
70	*Glycyrrhiza glabra*	Paplionaceae	Roots	Oestrogenic activity	13,4
71	*Hydrocotyle javanica Thunb.*	Apiaceae	Whole plant	Spermicidal	20,26
72	*Hibiscus rosa-sinensis*	Malvaceae	Flowers	Inhibit spermatogenesis	3
73	*Hyptis suaveolens*	Lamiaceae	Leaves	Anti-fertility	3

74	*Jatropha curcus*	Euphorbiaceae	Fruits	Abortifacient	3
75	*Juniperus communis*	Cupressaceae	Seed	Antiimplantation	3
76	*Lawsonia intermis*	Lythraceae	Flower	Inhibit spermatogenesis	2
77	*Liadenbergia indica*	Acanthaceae	Rhizome	Arrest oogenesis	13
78	*Lobelia inflate*	Lobeliaceae	stem	Decrease sperm count and sperm motility	14
79	*Lepidagathis longifolia*	Verbenaceae	Roots	Spermicidal	17,20
80	*Michelia Champaca.*	Magnoliaceae	Bark	Antiimplantation & Abortification activity	13
81	*Mimosa pudica*	Mimosaceae	Root	Contraception and abortion	4,17,1
82	*Martynia annua*	Pedaliaceae	Roots	Contraception Activity	1,20
83	*Maesa indica*	Myrsinaceae	Whole plant excluding roots	Spermicidal	17,2
84	*Mentha arevensis*	Lamiaceae	Leaves	Contraception Activity	4
85	*Mentha longifolia*	Lamiaceae	Leaves	Contraceptive	2
86	*Melia azedarach*	Meliaceae	Seed	Antiimplantation activity	17
87	*Momordica cymbalaria*	Cucurbitaceae	Root	Anti-implantation activity	13,16
88	*Mondia whitei*	Apocynaceae	Root	Antispermatogenic activity	13
89	*Nelumbo nucifera*	Nymphaeaceae	Seeds	Antioestrogenic activity	13,19
90	*Ocimum gratissimum*	Labiataceae	Leaves	Contraception Activity	13
91	*Ougeinia dalbergioides Bth.*	Fabaceae	Stem bark	Spermicidal	13,2
92	*Ocimum sanctum*	Labiatae	Leaves	Decrease sperm count and sperm motility, Abortifacient.	17,2
93	*Oxalis corniculata*	Oxalidaceae	Whole plant	Oestrogenic activity	3,2
94	*Piper longum*	Piperaceae	Roots, Leaves, fruits	Anti-fertility	17
95	*Piper nigrum*	Piperaceae	Fruit powder	Contraception Activity	3
96	*Piper betel*	Pedaliaceae	Petiol	Antiostrogenic activity	13
97	*Punica granatum*	Punicaceae	Fruits	Anti-implantation	1
98	*Pittosporum wightii*	Pittosporaceae	Plants excluding root	Spermicidal	17
99	*Plantago ovata*	Plantaginaceae	Seed	Abortion	17,2
100	*Polygonum hydropiper*	Polygonaceae	Root, Powder	Antiostrogenic activity	3,2
101	*Physalis alkekengi*	Piperaceae	Plants	Anti-implantation	3
102	*Phyllanthus amarus*	Euphorbiaceae	Whole plant	Contraception Activity	4,1,2
103	*Pterocarpus ennaceus*	Fabaceae	Stem bark	Antigonadotropic activity, Block oestrous cycle	13
104	*P lumbago zeylanica*	Plumbaginaceae.	Root	Abortifacient property	3,17,20,2
105	*Pergularia daemia*	Asclepiadaceae	Twig	Anti-implantation, late abortifacient	15
106	*Quassia amara*	Simaroubaceae	bark, leaves	Contraception Activity	3,1,14
107	*Randia dumetorum*	Rubiaceae	fruit	Inhibit spermatogenesis	17,20
108	*Ricinus communis*	Euphorbiaceae	Seed oil	Spermatogenesis	4
109	*Rivea hypocrateriformis*	Convolvulaceae	Aerial parts	Antiovulatory activity	17,2
110	*Rotalaria juncea*	Papilionaceae.	Seed	Abortifacient property	17,3
111	*Rumex steudeli*	Polygonaceae	Root	Contraception Activity	13
112	*Ruta graveolens*	Rutaceae	Root,plant powder	Contraception Activity	13
113	*Sapindus trifoliatus auct.non*	Sapindaceae	Pulp seeds	Antiimplantation & Abortification activity	17
114	*Sesamum indicum*	Pedaliaceae	Seeds	Oestrogenic activity	17
115	*Sesbania sesban*	Fabaceae	Seeds	Antiimplantation activity	17
116	*Striga orobanchioides*	Scrophulariaceae	plant	Antiimplantation activity	14

117	*Strychnos potatorum*	Loganiaceae	Seed	Contraception Activity	1
118	*Solanum xanthocarpum*	Solanaceae	Fruits	Contraception and abortion	1
119	*Tanacetum vulgare*	Asteraceae	flowering tops	abortifacient properties	13,2
120	*Taxus wallichiana*	Taxaceae	Fresh leaves	Abortion	4
121	*Termanillia bellirica*	Combretaceae	Fruits	Spermicidal	3,2
122	*Thespesia populnea soland.*	Malvaceae	Bark and fruit	antiimplantation activity	17
123	*Tinospora cordifolia*	Menispermaceae	Stem	Decrease sperm count and sperm motility	4,14
124	*Trichosanthus cucumerina*	Cucurbitaceae	Plant	Antiovulatory activity	17
125	*Trigonella foenum gracum*	Fabaceae	Seed	Antiostrogenic activity	13,2,18
126	*Tripterygium wilfordii*	Celastraceae	Root	Contraception Activity	2
127	*Woodfordia fruticosa*	Lythraceae	Flowers	Antiimplantation & Abortification activity	3
129	*Wrightia tinctoria*	Apocynaceae	Stem	Atiimplantation activity	1
130	*Zizyphus jujuba*	Rhamnaceae	bark	Antiostrogenic activity	1
131	*Zingiber officinale*	Zingiberaceae	powder of ginger	abortifacients	3
132	*Ziziphus nummularia*	Rhamnaceae	Root bark	induces abortion	3
133	*Zingiber roseum*	Zingiberaceae	Stem	Anti-implantation	1

CONCLUSION: In India birth tare control is a serious issue. After some serious and tedious efforts, the rate of birth control has begun to decline. But due to some very common and painful side effects, use of hormonal contraceptives is being avoided.. Women prefer other measures of contraceptives like Copper-T, Condoms, and Diaphragm etc. Since last 5–10 years alternative system of medicine i.e. Unani, Ayurveda and Homeopathy is gaining measurable attention of general public not only in India but Western world also. Efforts are being made to explore the hidden wealth of medicinal plants for contraceptive use. The results of this study indicate that different extracts of some medicinal plants have good potentials for use in control of birth. Therefore it is high time to provide a potent and harmless oral contraceptive with strength of conventional oral contraceptive.

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