



Testaments of Female Natural Contraceptives: An Update on the Usage of African Herbal Remedies

Oluwasegun Adedokun^{1*}, Kingsley Igharo², Ifedolapo Akindele³, Ibiwumi Adedeji³, Olayinka Ogunmefun^{3,4}, Ume Ogochuwkwu⁵, Nnamani Didacus⁶

¹CBIOS – Universidade Lusofona's Research Center for Bioscience and Health Technologies, Lisbon, Portugal

²Igbinedion College of Health Technology, Edo State, Nigeria

³Department of Pharmacognosy and Natural Products, College of Pharmacy, Afe Babalola University, Nigeria

⁴Department of Biological Sciences, College of Sciences, Afe Babalola University, Nigeria

⁵Department of Pharmaceutical Chemistry, College of Pharmacy, Igbinedion University, Nigeria

⁶Department of Pharmaceutical Technology, College of Pharmacy, Igbinedion University, Nigeria,

ARTICLE INFO

Article history:

Received 10 July 2023

Revised 25 March 2024

Accepted 15 April 2024

Published online 01 May 2024

Copyright: © 2024 Adedokun *et al.* This is an open-access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

ABSTRACT

Traditional herbal methods of birth control have been used by many traditions for hundreds of years because they offer several benefits over modern methods like synthetic hormones, intrauterine devices (IUD), and surgery. This literature review set out to determine which African medicinal plants are used as contraceptives, with the most emphasis on Nigeria and some of the phytochemical constituents that are implicated in the anti-fertility. In this research, we used an e-library search and pertinent books to filter the published literature on the topic of plants with antifertility and contraceptive effects. More than 70 plants were shown to have a wide range of anti-pregnancy effects, including acting as abortifacients, inhibiting sperm motility, and even imitating or interfering with female reproductive hormones. Based on this review, over 15 substances have been identified as potentially having contraceptive effects, including ferutinin, quinovic acid glycosides, nimbolide, resveratrol, gossypol, etc. The lack of rigorous scientific studies and clinical trials that authenticate the efficacy and safety of natural contraceptives has led to persistently low rates of adoption despite the many benefits and various initiatives by government and developmental entities to increase their adoption in Nigeria. In conclusion, increased advocacy is required for scientists to intensify efforts in natural-based contraceptive research for proper validation and complementary effort with current conventional contraceptives.

Keywords: Antifertility, birth control, contraceptive, medicinal plants, Nigeria

Introduction

Contraception also referred to as birth control, anticonception, and fertility control, is the use of devices employed to prevent or delay unintended pregnancy.¹ Fertility control has been practiced since times immemorial, but effective and safe methods of birth control only became available around the 20th century.² The use of contraceptives has helped in managing the poverty crisis owing to overpopulation despite its discouragement by certain cultural sects, religious, political, and moral beliefs.^{3,4}

In 2019, there were 1.9 billion women within the reproductive age range of 15 to 49 years in the World, and 1.1 billion of these women need some kind of contraception.^{5,6} The need for contraception is not being satisfied for 270 million of these people, whereas 842 million are currently utilizing some kind of contraception.⁷ However, in Nigeria, the unmet demand for contraception ranges from 19% among presently married women to 48% among sexually active single women.^{8,9}

*Corresponding author. E mail: f7681@ulusofona.pt,
adedokunsegun05@gmail.com
Tel: +351920452009

Citation: Adedokun O, Igharo K, Akindele I, Adedeji I, Ogunmefun O, Ogochuwkwu U, Didacus N. Testaments of female natural contraceptives: An update on the usage of African herbal remedies. Trop J Nat Prod Res. 2024; 8(4):6757-6764. <https://doi.org/10.26538/tjnpr/v8i4.2>

Official Journal of Natural Product Research Group, Faculty of Pharmacy, University of Benin, Benin City, Nigeria

The utilization of contraceptives in Nigeria has remained persistently inadequate, despite the numerous advantages and various initiatives by

governmental and developmental entities to enhance their adoption, this progress has been retarded due to high illiteracy, poverty, and less awareness among people in the rural areas.² In addition, data from the Nigeria Demographic and Health Survey stated that there was a remarkable surge in the utilization of contemporary contraceptive methods, which rose from 4% to 12% over a span of 28 years namely; 1990 - 2018.^{2,9}

Herbal contraceptive techniques have been utilized for centuries across various cultures and traditions, and they present numerous advantages over synthetic hormones, intrauterine devices, or surgical interventions.¹⁰ The utilization of this approach is deemed to be less hazardous and milder towards the physiological system, as it refrains from disrupting the inherent hormonal equilibrium or inflicting harm to the reproductive structures as is the case of sterilization.⁵ The utilization of this approach is deemed to be less hazardous and milder towards the physiological system, as it refrains from disrupting the inherent hormonal equilibrium or inflicting harm to the reproductive structures as is the case of sterilization.¹¹ The primary constraint of herbal contraceptives is the absence of rigorous scientific studies and clinical trials that authenticate their efficacy and safety.^{12,13} However, in order to have detailed compiled data for researchers who are interested in the development of modern female contraceptive therapy that are less toxic, this research aimed at documenting the various medicinal plants used in ethno-medicine in the prevention of pregnancy over the years, also to compile the compounds reported to possess female contraceptive potential.

Material and Methods

The present study involved the collection of published literature pertaining to the antifertility and contraceptive properties of plants through the utilization of research e-library search such as Google, Pubmed, Google Scholar, etc.¹¹ A systematic approach to screening contemporary literature was implemented through the utilization of these readily accessible web search platforms. The botanical nomenclature, taxonomic classification, vernacular nomenclature, plant parts utilized, ethnobotanical applications, traditional knowledge, and potential bioactive chemical constituents were all integrated into the analysis.¹³ The literature review primarily centered on research papers that highlight the diverse benefits of medicinal plants and underscore the significance of traditional medicine systems. All studies, irrespective of their year of publication, method of analysis, or phytochemical screening conducted, were incorporated.¹³

Results and Discussion

Medicinal plants in Nigeria with ethnomedicinal usage as male/female contraceptive

Various plant parts of medicinal plant species are used as herbal contraceptives in different locations in Nigeria. Their mode of administration varies in every region such as oral decoction, incision where cuts are made to the leg of the patient and the dried leaves are applied, wearing of a ring soaked in the plant extract, etc (Table 1). Some mechanisms of action as an abortifacient, sperm count reduction, and induction of labour in females are also included (Table 1). As with many other African nations apart from Nigeria, the Africa continent struggles to provide its citizens with reliable and inexpensive birth control options.^{13,34} In this regard, there has been renewed interest in the use of medicinal herbs as contraceptives owing to their theoretical efficacy, low cost, and widespread social acceptability.^{12,30} There has not been substantial research and clinical validation of the effectiveness, safety, and appropriate dose of these herbs as contraceptives.²⁵ But never the less, the usage of some indigenous herbal contraceptives among women in Urhobo land, Nigeria and other tribes in Africa to prevent pregnancy among married, prevent unwanted pregnancy among unmarried girls, and to punish a daughter for marrying against the family is gradually gaining significant attention in Nigeria and other African nations.⁸

Reported compounds with contraceptive potential

Some botanical compounds have been investigated for their prospective contraceptive effects. It is noteworthy that although these compounds have exhibited contraceptive potential in certain investigations;

Ferutinin

Ferutin is a compound that is present in *Ferula hermonis* and is claimed to exhibit anti-implantation and anti-fertility properties by disrupting the hormonal modulation of the female reproductive system.¹⁴

Quinovic acid glycosides

Quinovic acid glycoside is present in *Uncaria tomentosa* (commonly known as Cat's claw), the compound has been demonstrated to possess anti-fertility property by impeding spermatogenesis and influencing sperm motility.^{15,16}

Nimbolide

The compound was isolated from *Azadirachta indica* (Neem) and has been suggested to possess contraceptive properties by impeding the biosynthesis of male reproductive hormones and impeding the motility of sperm.¹⁷

Anethole

The compound is present in *Pimpinella anisum*, and it has been shown that the compound possess anti-implantation and anti-fertility properties. It is believed that anethole may disrupt hormone receptor binding, leading to these effects.¹⁸

Resveratrol

Resveratrol, a compound present in grapes and berries, has been studied for its probable contraceptive properties through the regulation of hormone levels and the hindrance of sperm function.¹⁹⁻²¹

Gossypol

The compound is obtained from cotton seeds, It has also been investigated as a potential male contraceptive agent due to its ability to impede spermatogenesis and diminish sperm motility.²²⁻²⁵

Curcumin

Curcumin is known to be present in *Curcuma longa*, Researches have demonstrated its anti-fertility property by impeding implantation and disrupting the female reproductive cycle.²⁶⁻²⁸

Quassinoids

The compound is present in *Quassia amara* (*Quassia*) and studies have shown that the compound exhibited contraceptive activity. The compound has been shown to possess a negative impact on sperm motility and prevent implantation.^{29,30}

Pristimerin

Pristimerin was isolated from *Tripterygium wilfordii*, the compound has been reported to possess contraceptive properties. Specifically, it has been found to impede spermatogenesis and hinder sperm function.³¹

Diosgenin

Diosgenin was also reported to be isolated from *Dioscorea* species (commonly known as Yam) and has been investigated for its potential anti-fertility properties through modulation of hormone levels and inhibition of sperm function.^{30,32-34}

Isoliquiritigenin

The compound was isolated from *Glycyrrhiza glabra* (Licorice), researches also suggest that the compound exhibits contraceptive properties by impeding implantation and disrupting hormone receptor binding.³⁵

Taraxerol

Taraxerol was reported to be isolated from different plant sources, among which is *Centella asiatica*. Its potential anti-implantation properties have been investigated, which may be attributed to its ability to interfere with the female reproductive cycle.³⁶

Harmine

Harmine was isolated from *Peganum harmala*, commonly known as Syrian Rue. It is believed that harmine may exert its antifertility effects by modulating hormone levels and impeding the process of fertilization.^{37,38}

Kaempferol

Kaempferol is a naturally occurring flavonoid that has been identified in several plant sources, including tea, broccoli, and *Ginkgo biloba*. Studies have suggested that this compound may possess contraceptive properties by impeding implantation and disrupting hormone receptor binding.³⁹

Thymoquinone

Thymoquinone is obtained from *Nigella sativa* (Black seed)^{30,40} and has been investigated for its potential anti-fertility properties. Its mechanism of action involves the inhibition of sperm function and interference with implantation.^{30,41,42}

It is crucial to underscore that the aforementioned compounds and their potential as contraceptives are still under investigation. Therefore, their utilization as contraceptives should be approached with prudence until additional research confirms their safety and effectiveness.^{30,41,43} It is important to mention that these mentioned secondary metabolites have been reported to play key roles in different sexual channels in males and females. These roles might be via spermicidal role, alteration in hormonal balance, alteration in implantation, etc.⁴⁴

Table 1: Review of medicinal plants with ethnomedicinal usage as contraceptives in Nigeria

S/N	Family	Botanical Name	Local Name	Common Name	Plant Part Used	Method of Preparation/ Administration
	Fabaceae	<i>Acacia polyacantha</i>	Karki		S	Powdered
	Combretaceae	<i>Anogeissus leiocarpus</i>	Markee		L	Powder mixed with water
	Meliaceae	<i>Azadirachta indica</i>	Dongoyaro, Dar bejiya° (H)/ ganyi (F)	Neem	St, B, R, L	Stem bark Boiled in Water with red potash
	Meliaceae	<i>Boscia senegalensis</i>	Billoo		R	Boiled in water
	Caesalpiniaceae	<i>Cassia arereh;</i>	Màrgáá (H)/ cabbi (F)		R, L	Boiled in water, The Boiled leaves are eaten
	Vitaceae	<i>C. sieberana</i>	Loda		L	Boiled in water
	Labiatae	<i>Cissus populnea</i>	Mashaayii		S	Powdered
	Bignoniaceae	<i>Clerodendrum</i>	Kunkuishi a		R, B	Boiled in Water with potash
	Anacardiaceae	<i>capitatum</i>	Faaruu		St, B	Boiled with potash
	Lythraceae	<i>Kigelia Africana</i>	Lali		R	Boiled in water
	Capparaceae	<i>Lannea microcarpa</i>	Kidis		R	Boiled in water
	Caesalpiniaceae	<i>Lawsonia inermis</i>	Kalgo		St, B	Boiled in Water with potash
	Mimosoideae	<i>Oryza spp</i>	Kirya		St, B	Boiled in water with potash
	Poaceae	<i>Piliostigma reticulatum</i>	Ayangwaa		L	Boiled in water
	Olacaceae	<i>Prosopis Africana</i>	Tsaada		S	Powdered
	Mimosadae	<i>Albizia chevalieri</i>	Katsari		B, S (male plant)	Boiled in Water
	Poaceae	<i>Chloris pilosa</i>	Kafarfa kara		L	Powdered and Taken with Milk
	Fabaceae	<i>Crotalaria spp</i>	Biyar raana		F,S	Boiled in Water
	Fabaceae	<i>Dalbergia saxatilis</i>	Runhu		St, B	Powdered and Taken with Milk
	Fabaceae	<i>Erythrina</i>	Jinjirya		F, S	Boiled in Water
	Malvaceae	<i>senegalensi s</i>	Tsu		S (male plant)	Powdered and Taken with Milk
	Arecaceae	<i>Pavonia hirsuta</i>	Zabiya		L	Leaf eaten Raw
	Mimosoideae	<i>Phoenis dactylifera</i>	Kiriya		R, B	Powdered
	Euphorbiaceae	<i>Prosopis Africana</i>	Zurma		S	Powdered
	Strychnaceae	<i>Ricinus communis</i>	Taura		St, B	Powdered
	Sapotaceae	<i>Strychnos spinosa</i>	Kade		St, B	Powdered and Taken with Milk
	Olacaceae	<i>Vitellana paradixa</i>	Tsaada		R, B	Powdered and Taken with Milk
	Mimosadae	<i>Ximenia Americana</i>	Katsari		B, S (male plant)	Powdered and Taken with Milk
	Fabaceae	<i>Acacia nilotica</i> (L.) Willd. ex Del.	Bàgààrúúwáá (H)/ gawdi (F)		S	Seeds soaked in water
	Fabaceae	<i>Acacia seyal</i> Del.	Kiiraafi (H)/ bulki (F)		L, Rs	Decoction of leaves and roots
	Annonaceae	<i>Annona senegalensis</i> Pers.	Gwándàndààjì (H)/ dukuu-hi (F)		L, Rs	Decoction of leaves and roots is taken orally
	Orchidaceae	<i>Ansellia congoensis</i> Rodigas	Màntàúúwáá (H)		L	The boiled leaves are eaten

Asclepiadaceae	Calotropis procer a (Aiton) W.T. Aiton	Tùmfááfiyáá (H)/ ba(m)bam-bi (F)	Rs, L	Juice from the leaf	
Caricaceae	Carica papaya L.	Gwándà (H)/ dukku-hi (F)	L	Juice from the leaf is used for contraceptive purpose.	
Rutaceae	Citrus aurantifolia (Christm.) Swingle	Lèèmóó (H)/ lemuu-re (F)	L, F	Leaves, fruit, Leaf juice	
Fabaceae	Crotalaria mucronata Desv.	Bìi(yà) ráánáá / tsakutsaku (F)	Whole plant	Whole plants are crushed and taken orally.	
Poaceae	Cynodon dactylon (L.) Pers.	Karyàgarma (H)/ sirkiyamho (F)	R	Decoction leaves are taken orally.	
Fabaceae	Detarium microcarpum Guill. & Perr.	Táuráá (H)/ konkee-hi (F)	L	Decoction of leaves is taken orally	
Rubiaceae	Gardenia erubescens Stapf & Hutch.	Gáudē (H)/ diingaa-li (F)	Rs	The boiled leaves are taken for contraceptive purpose.	
Combretaceae	Guiera senegalensis J. F. Gmel	Sààbàràà (H)/ geelooki(F)	L	Decoction of leaves is taken orally.	
Phyllanthaceae	Hymenocardia acida Tul.	Jányáárò (H)/ yawasotoje (F)	L	Decoction of leaves is taken orally	
Meliaceae	Khaya senegalensis (Desr.) A. Juss.	Mádààcìí (H)/ daalee-hi (F)	L	The boiled leaves are taken	
Lythraceae	Lawsonia inermis L.	Lállè (H)/ nalli (F)	L	Decoction of the whole plant is taken internally.	
Anacardiaceae	Mangifera indica L.	Màngwàrò (H)/ mangoroo- hi (F)	L	The boiled leaves are taken	
Rubiaceae	Mitragyna inermis (Willd.) O Ktze.	Gííyyàýáá (H)/ k(w)oo-li (F)	L	The boiled leaves are taken	
Rubiaceae	Nauclea diderrichii (De Wild. & T. Durand) Merrill	Tàfááshíyà (H)/	L	The boiled leaves are taken	
Bignoniaceae	Newbouldia laevis Seem.	Àdùrúúkù (H)/ naawdi (F)	L	A decoction is taken by mouth before sexual intercourse.	
Caesalpiniaceae	Ocimum gratissimum Linn	Dáddóóyátágídáá (H)	L	Juice from the leaves is used for contraceptive purpose.	
Euphorbiaceae	Ricinus communis L.	Zùrmàn (H)/ kolakolaa-hi (F)	S	Seed is used as a contraceptive.	
Polygalaceae	Securidaca longepedunculata Fres.	Sányáá (H)/ aalali (F)	L	The boiled leaves are taken for contraceptive purposes.	
Combretaceae	Terminalia spp.	Báushè (H)/ kuula-hi(H)	L	Juice from the leaves is taken orally	
Asteraceae	Vernonia amygdalina Delile	Shiwáákáá (H)/ kadkadē (F)	L	Decoction of leaves and roots is taken orally	
Malvaceae	Waltheria indica L. <i>Lophira lanceolata</i>	Hànkúfáá (H)/ kafaffi (F) Ikuranomso	L Savanna false St, Rs	The boiled leaves are taken shea	
	<i>Burkea africana</i>	Gbagbongom	Wild syringa	St, Rs	
	<i>Boehaavia diffusa</i>	Etiponla	Hogweed	L	Ring
	<i>Parkia bigglobo</i>	Iru	Locust beans	S	Ring

	<i>Carica papaya</i>		Ibepe	Pawpaw	B	Ring/Decoction
	<i>Aframomum melegueta</i>		Ataare	Alligator pepper	S	Ring/Incision
	<i>Xylopiya aethipica</i>		Eeru alamo	Negro or Ethiopian pepper	F	Decoction
	<i>Tetrapleura tetraptera</i>		Aidan	Aidan tree	F	Decoction
	<i>Citrus limon</i>		Osan wewe	Lime	Juice	Decoction
Acanthaceae	<i>Acanthus montanus</i> (Ness) Anderson	T.	Konowei-emimi, emimi	idule- Leopard's claw	L	Chewing, regularly
Alliaceae	<i>Allium sativum</i> L.		Nkarika	Garlic	B	To be chewed regularly and immediately after sex
Anacardiaceae	<i>Spondias mombin</i> L.		Iginiyan	Hog plum, yellow mombin	L	Pound leaf with limestone, To be chewed regularly and immediately after sex
Annonaceae	<i>Xylopiya aethiopica</i> (Dunal) Rich	A.	Ikani	Ethiopian pepper	F	Fruits pounded with <i>Ocimum gratissimum</i> leaves and <i>Piper guineense</i> , Insertion into the vagina 3–4 times daily during the days of intercourse
Araceae	<i>Colocasia esculenta</i> (L.) Schott.		Odu	Cocoyam Mama koko	S	Extract juice and insert into the vagina during the days of intercourse Daily insertion into the vagina for 3 days
Asteraceae	<i>Aspilia africana</i> (Pers.) Adams	C.D	Younkore	Hemorrhage plant	L / R	Root or leaf pounded with native chalk, Insertion into vagina during the days of intercourse. Daily insertion into the vagina for 3 days
Asteraceae	<i>Ageratum conyzoides</i> L.		Furotuoru	Goatweed	L	Leaves pounded with <i>Aframomum melegueta</i> seeds, Insertion into the vagina during the days of intercourse. Daily insertion into the vagina for 3 days
Asteraceae	<i>Acmella caulirhiza</i> Delile		Kala awou igina	Brazil cress	L/F	A little more flower than a leaf in quantity, pound together to extract juice, Juice inserted into the vagina during the days of intercourse
Asteraceae	<i>Vernonia amygdalina</i> Delile		Diri esen	Bitter leaf	L/R	Pound with the leaves of <i>Chloris pilosa</i> Extract the juice in water and filter, To be drunk regularly
Bignoniaceae	<i>Newbouldia laevis</i> P. Beauv.		Iginiga Obrizzii	<i>Newbouldia</i>	L	Extract the juice in a small quantity of water, To be drunk regularly
Caricaceae	<i>Carica papaya</i> L.		Indu	Pawpaw	L/S/R	Leaves/stem/root with <i>Physalis angulata</i> leaves extracted into illicit gin, Extract leaf in beer and dilute with water, Chew leaf regularly To be drunk regularly Extract root/stem in illicit gin

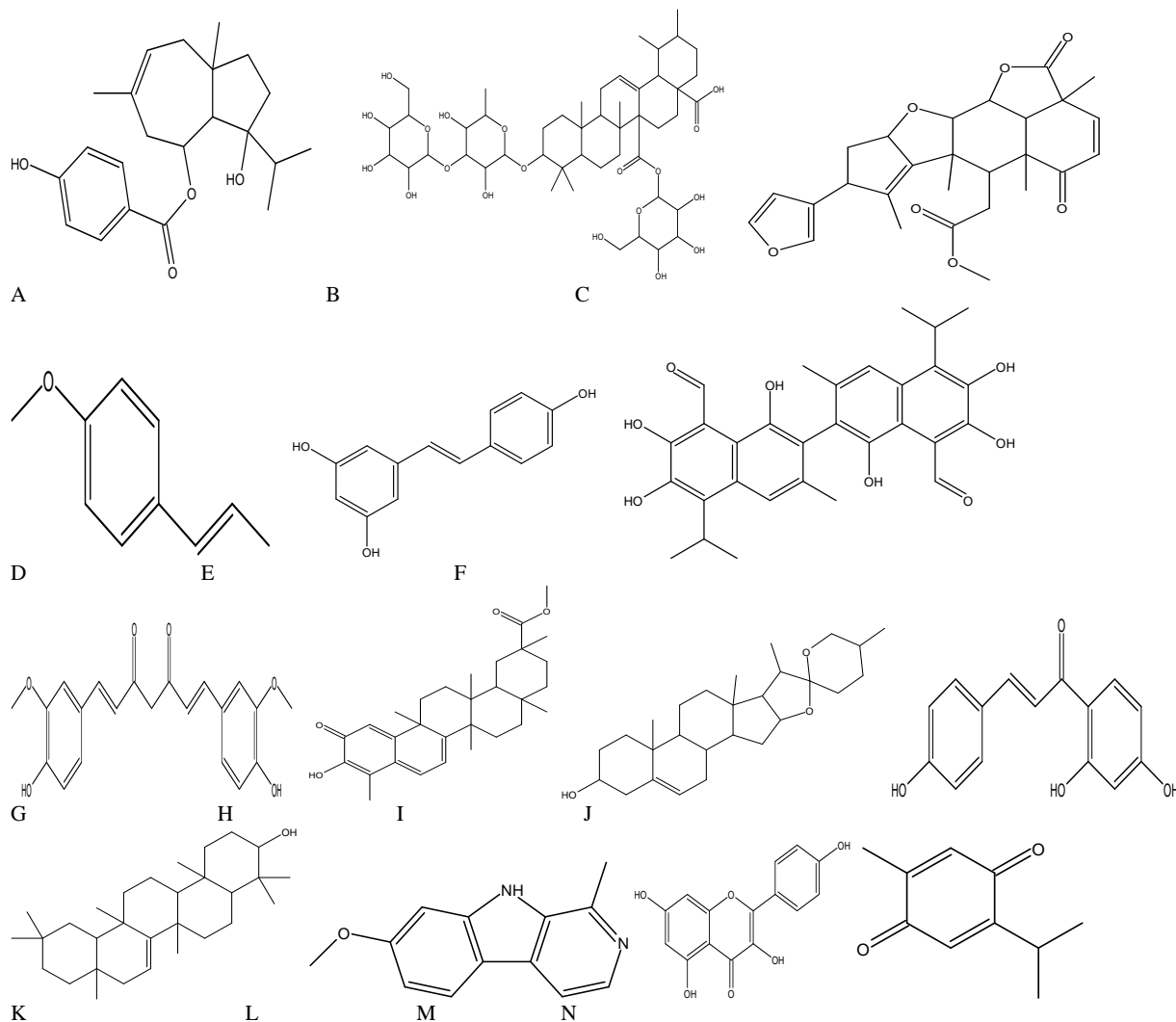


Figure 1: Compounds with contraceptive potential

A - Ferutin, B - Quinovic acid glycoside, C - Nimbolide, D - Anethole, E - Resveratrol, F - Gossypol, G - Curcumin, H - Pristimerin, I - Diosgenin, J - Isoliquiritigenin, K - Taraxerol, L - Harmine, M - Kaempferol, N - Thymoquinone

Although limited success stories have been found about male/female natural contraceptives, which also require more efforts in the investigation and bioactivity-guided isolation of contraceptive principles from promising African medicinal plants with promising contraceptive activity.⁴⁵ This review showed some compounds such as nimbolide, resveratrol, gossypol, etc. these natural principles have been shown to possess contraceptive potential with limited scientific proof that require an in-depth validation and possible establishment of mechanism of action.^{22,26,44} More efforts are also expected to be channelled toward development of more potent derivatives from potent natural contraceptive principles using structure-activity relationship.⁴⁴ Natural products with contraceptive ability are usually less toxic, biocompatible, and biodegradable, serve as lead for the development of more potent derivatives, and are easily available, but are usually characterized by poor yield, prolonged and difficulty in isolation, and high variability while synthetic drug candidates are more toxic, non-degradable in some occasions, high and complicated cost of synthesis in certain occasions.^{30,46}

Combination of Plants Used as Contraceptives in Nigeria

Several reports have been recorded about polyherbal formulations with ethnomedicinal usage in the management of fertility. Some of these plants may work alone or in combination with other plants (Table 2). Findings from this research also unveiled 73 different species and 11 formulations of plant-based contraceptives that needed more comprehensive validation and development. The usage of poly-herbal

formulations is thereby encouraged for more improved activity, which might be needed due to polypharmacology that might occur during the usage of such formulations.²⁶

It is noteworthy to state that secrecy was a major challenge during this research, hence the reliance on written documents from online sources. More scientific validations are expected to be carried out and so that the promising lead compounds can be isolated for improved structural modification.³⁴

Conclusion

This review collates the various medicinal plants in Nigeria and some African countries that have been reported among locals in the indigenous mode of preventing contraception. More efforts are required to confirm these medicinal herbs' effectiveness, safety, and optimum dose for contraceptives. To learn more about their contraceptive mechanisms, assess their long-term effects, and develop standardized guidelines for their usage, well-designed clinical studies are required. In conclusion, there is encouraging evidence that phytochemical elements of medicinal plants might be used as birth control in Nigeria. To fully realize their promise, further study, regulation, and cooperation are required to ensure that they are incorporated into the healthcare system in a way that ensures effectiveness, safety, and accessibility for all people looking for contraceptive choices.

Table 2: African polyherbal formulations with male/female antifertility potential

Name of Plant 1	Name of Plant 2	Name of Plant 3	Mechanism of Action	Reference
<i>Clerodendrum capitatum</i>	<i>Acacia polyacantha</i>	<i>Ximenia Americana</i>	abortifacients	47
<i>Lawsonia inermis</i>	<i>Cassia arereh;</i> C. <i>sieberana</i>	-	abortifacients	47
<i>Piliostigma reticulatum</i>	<i>Prosopis Africana</i>	<i>Lannea microcarpa</i>	abortifacients	47
<i>Cissus populnea</i>	<i>Anogeissus leiocarpus</i>	<i>Sorghum bicolor</i>	abortifacients	47
<i>Lawsonia inermis</i>	<i>Cassia arereh;</i> C. <i>sieberana</i>	<i>Azadirachta indica</i>	abortifacients	47
<i>Oryza spp</i>	<i>Boscia senegalensis</i>	<i>Prosopis Africana</i>	abortifacients	47
<i>Strychnos spinosa</i>	<i>Dalbergia saxatilis</i>	<i>Vitellana paradixa</i>	contraceptives	47
<i>Boehavia diffusa</i>	<i>Parkia bigglobo</i>	<i>Aframonium melegueta</i>	male contraception is used as a ring	47
<i>Carica papaya</i>	<i>Aframonium melegueta</i>		male contraception is used as a ring	47
<i>Carica papaya</i>	<i>Tetrapleura tetraptera</i>		male contraception applied by incision	47
<i>Citrus limon</i>	Potash (potassium carbonate)		male contraception administered as an Oral Decoction	47

Conflict of Interest

The authors declare no conflict of interest.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

Acknowledgements

We authors thank the entire teaching and technical staff of the Department of Pharmacognosy and Natural Products, College of Pharmacy, Afe Babalola University, Nigeria for the assistance and technical availability.

References

- Baird DT, Evers JLH, Gemzell-Danielsson K. Family planning 2011: Better use of existing methods, new strategies and more informed choices for female contraception. Hum Reprod Update. 2012;18(6). doi:10.1093/humupd/dms021
- The Use of Contraceptives in Nigeria: Benefits, Challenges and Probable Solutions. J Law, Policy Glob. Published online 2019. doi:10.7176/jlpg/86-09
- Schreiber CA, Barnhart K. Contraception. In: Yen & Jaffe's Reproductive Endocrinology: Physiology, Pathophysiology, and Clinical Management: Eighth Edition. 2019. doi:10.1016/B978-0-323-47912-7.00036-6
- Baird DT, Castelo-Branco C, Collins J. Female contraception over 40. Hum Reprod Update. 2009;15(6). doi:10.1093/humupd/dmp020
- Dhingra AK, Chopra B. Herbal Remedies for Birth Control: An Alternative to Synthetic Hormonal Contraceptives. Curr Womens Heal Rev. 2020;16(4). doi:10.2174/1573404816999200511002829
- Braaten KP, Dutton C. Overview of female permanent contraception - UpToDate. Published online 2021.
- Woodhams E, Gilliam M. Barrier methods. In: Contraception for Adolescent and Young Adult Women. 2014. doi:10.1007/978-1-4614-6579-9_5
- Abiodun O. Use of emergency contraception in Nigeria: An exploration of related factors among sexually active female university students. Sex Reprod. Healthc. 2016;7. doi:10.1016/j.srhc.2015.10.004
- Udombos CG, Amoateng AY. Modelling Trends in Contraception Usage in Nigeria and Ghana. J Health Manag. 2018;20(3). doi:10.1177/0972063418779901
- Moroole MA, Materechera SA, Otang-Mbeng W, Hayeshi R, Bester C, Aremu AO. Phytochemical Profile, Safety and Efficacy of a Herbal Mixture Used for Contraception by Traditional Health Practitioners in Ngaka Modiri Molema District Municipality, South Africa. Plants. 2022;11(2). doi:10.3390/plants11020193
- Devi P, Kumar P, Nidhi N, Dhamija I. Antifertility Activity of Medicinal Plants on Male and Female Reproduction. Int J Pharm Sci Res. 2015;6(3). 988-1001.
- Gupta R, Sharma R. A review on medicinal plants exhibiting antifertility activity in males. Indian J Nat Prod Resour. 2006;5(5). 243-272.
- Moroole MA, Materechera SA, Mbeng WO, Aremu AO. Medicinal plants used for contraception in South Africa: A review. J Ethnopharmacol. 2019;235. doi:10.1016/j.jep.2019.02.002
- Hammam A mohsen M, Elmotayam AK, Elnattat WM. Assessment of *Ferula hermonis* Boiss fertility effects in immature female rats supported by quantification of ferutin in via HPLC and molecular docking. J Ethnopharmacol. 2022;289. doi:10.1016/j.jep.2022.115062
- Yépez AMP, de Ugaz OL, Alvarez CMP. Quinovic acid glycosides from *Uncaria guianensis*. Phytochemistry. 1991;30(5). doi:10.1016/0031-9422(91)84223-F
- Aquino R, De Tommasi N, De Simone F, Pizza C. Triterpenes and quinovic acid glycosides from *Uncaria tomentosa*. Phytochemistry. 1997;45(5). doi:10.1016/S0031-9422(96)00716-9
- Biosci IJ, Nishan M, Subramanian P. Pharmacological and non pharmacological activity of *Azadirachta indica* (Neem) - A review. Int J Biosci. 2014;5(6). 104-112.
- Mahboubi M, Mahboubi M. *Pimpinella anisum* and female disorders: A review. Phytomedicine Plus. 2021;1(3). doi:10.1016/j.phyplu.2021.100063
- Song JH, Hwang B, Chung HJ. Peanut sprout extracts cultivated with fermented sawdust medium inhibits benign prostatic hyperplasia *in vitro* and *in vivo*. World J Mens Health. 2020;38(3). doi:10.5534/wjmh.190173
- Maia H, Haddad C, Pinheiro N, Casoy J. Advantages of the association of resveratrol with oral contraceptives for management of endometriosis-related pain. Int J Womens Health. 2012;4(1). doi:10.2147/ijwh.s36825
- Chen Y, Xu H, Liu C. LncRNA DIO3OS regulated by TGF-β1 and resveratrol enhances epithelial mesenchymal transition of benign prostatic hyperplasia epithelial cells and proliferation of prostate stromal cells. Transl Androl Urol. 2021;10(2). doi:10.21037/TAU-20-1169
- Waites GMH, Wang C, Griffin PD. Gossypol: Reasons for its failure to be accepted as a safe, reversible male antifertility drug. Int J Androl. 1998;21(1). doi:10.1046/j.1365-2605.1998.00092.x
- Coutinho EM, Athayde C, Atta G. Gossypol blood levels and inhibition of spermatogenesis in men taking gossypol as a

- contraceptive. A multicenter, international, dose-finding study. *Contraception*. 2000;61(1). doi:10.1016/S0010-7824(99)00117-1
24. Hoshiai H, Uehara S, Mori R, Nagaike F, Tsuiki A, Suzuki M. Gossypol as Oral Contraceptive for Male: Trial Case Report. *Tohoku J Exp Med*. 1982;138(3). doi:10.1620/tjem.138.275
 25. Coutinho EM. Gossypol: A contraceptive for men. *Contraception*. 2002;65(4). doi:10.1016/S0010-7824(02)00294-9
 26. Saifi B, Haftcheshmeh SM, Feligioni M. An overview of the therapeutic effects of Curcumin in reproductive disorders with a focus on the antiinflammatory and immunomodulatory activities. *Phyther Res*. 2022;36(2). doi:10.1002/ptr.7360
 27. Naz RK, Lough ML. Curcumin as a potential non-steroidal contraceptive with spermicidal and microbicidal properties. *Eur J Obstet Gynecol Reprod Biol*. 2014;176(1). doi:10.1016/j.ejogrb.2014.01.024
 28. Nora H, Rajuddin, Hafizudin, Suhanda R, Indirayani I. Curcumin, a potential oral herbal male contraceptive: a review article. *Bali Med J*. 2022;12(1). doi:10.15562/bmj.v12i1.3937
 29. Knetzger N, Bachtin V, Lehmann S, Hensel A, Liebau E, Herrmann F. The anthelmintic quassinoids ailanthone and bruceine a induce infertility in the model organism *Caenorhabditis elegans* by an apoptosis-like mechanism induced in gonadal and spermathecal tissues. *Molecules*. 2021;26(23). doi:10.3390/molecules26237354
 30. Abarikwu SO, Onuah CL, Singh SK. Plants in the management of male infertility. *Andrologia*. 2020;52(3). doi:10.1111/and.13509
 31. Mannowetz N, Miller MR, Lishko P V. Regulation of the sperm calcium channel CatSper by endogenous steroids and plant triterpenoids. *Proc Natl Acad Sci U S A*. 2017;114(22). doi:10.1073/pnas.1700367114
 32. Khosravi Z, Sedaghat R, Baluchnejadmojarad T, Roghani M. Diosgenin ameliorates testicular damage in streptozotocin-diabetic rats through attenuation of apoptosis, oxidative stress, and inflammation. *Int Immunopharmacol*. 2019;70. doi:10.1016/j.intimp.2019.01.047
 33. Widiastuti EL, Sutyarso, Susanto GN, Rudini M, Kanedi M. Ameliorative properties of crude diosgenin from *Costus speciosus* and taurine on testicular disorders in alloxan-induced diabetic mice. *Biomed Pharmacol J*. 2017;10(1). doi:10.13005/bpj/1075
 34. Waizel-Bucay J. The traditional use of the species of the genus *Dioscorea*. *Rev Fitoter*. 2009;9(1). 52-67.
 35. Adesina S, Iwalewa E, Johnny I. *Tetrapleura tetraptera* Taub- Ethnopharmacology, Chemistry, Medicinal and Nutritional Values- A Review. *Br J Pharm Res*. 2016;12(3). doi:10.9734/bjpr/2016/26554
 36. Surendran S, Prasannan P, Jeyaram Y, Palanivel V, Pandian A, Ramasubbu R. Knowledge on ethnogynaecology of Indian Tribes- a comprehensive review. *J Ethnopharmacol*. 2023;303. doi:10.1016/j.jep.2022.115880
 37. Benatoui R, Bairi A, Tahraoui A. Modulatory effect of harmine on spatial memory, fertility via mao inhibition, preventing anemia and anti-nociception upon footshock stress at three stages of pregnant rats. *Univers J Pharm Res*. Published online 2021. doi:10.22270/ujpr.v6i5.671
 38. Mahajan R, Gajare S. Manifestation of erectile dysfunction with adaptogenic antioxidant aphrodisiac plants. *Int J Pharm Biomed Res*. 2012;3(1). 52-68.
 39. Singh D, Sharma SK, Shekhawat MS, Yadav KK, Sharma RA, Yadav RK. Antifertility activity of kaempferol-7-O-glucoside isolated from *Cassia nodosa* bunch. *Electron J Environ Agric Food Chem*. 2012;11(5). 52-67.
 40. Whaley AK, Burtseva Y V., Kuldyrkaeva EV. A Method for the Isolation of Thymoquinone from Black Caraway Seed Oil (*Nigella sativa* L.). *Drug Dev Regist*. 2023;12(3). doi:10.33380/2305-2066-2023-12-3-29-40
 41. Mahomoodally MF, Aumeeruddy MZ, Legoabe LJ, Montesano D, Zengin G. *Nigella sativa* L. and Its Active Compound Thymoquinone in the Clinical Management of Diabetes: A Systematic Review. *Int J Mol Sci*. 2022;23(20). doi:10.3390/ijms232012111
 42. Islam MT, Khan MR, Mishra SK. An updated literature-based review: phytochemistry, pharmacology and therapeutic promises of *Nigella sativa* L. *Orient Pharm Exp Med*. 2019;19(2). doi:10.1007/s13596-019-00363-3
 43. Elmaci I, Altinoz MA. Thymoquinone: An edible redox-active quinone for the pharmacotherapy of neurodegenerative conditions and glial brain tumors. A short review. *Biomed Pharmacother*. 2016;83. doi:10.1016/j.biopha.2016.07.018
 44. Emma Mendonca MFT. Kaempferol Exhibits Progestogenic Effects in Ovariectomized Rats. *J Steroids Horm Sci*. 2013;05(03). doi:10.4172/2157-7536.1000136
 45. Adedokun O, Gbolade A, Ayinde B. 13, 14-Epoxyoleanan-3-ol-acetate: A Male Fertility-Enhancing Constituent from Hexane Fraction of *Momordica charantia* L. (Cucurbitaceae). *Turkish J Pharm Sci*. 2022;19(2):180-186. doi:10.4274/tjps.galenos.2021.48264
 46. Jones WP, Kinghorn AD. Extraction of plant secondary metabolites. *Methods Mol Biol*. 2012;864. doi:10.1007/978-1-61779-624-1_13
 47. Pathak A, Mallurwar V, Kondalkar AK, Soni S. A review of plants with anti-fertility activity. *Niger J Nat Prod Med*. 2006;9(1). doi:10.4314/njnp.v9i1.11824
 48. Kadam A, Gaykar B. A Review On Medicinal Plants Exhibiting Antifertility and Contraceptive activities. *J Basic Sci*. 2015;4(03).
 49. Chakraborty AK, Gaikwad AV, Singh KB. Phytopharmacological review on *Acanthospermum hispidum*. *J Appl Pharm Sci*. 2012;2(1). 144-148.