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Unlocking nature's secrets: Medicinal plants for enhanced female fertility

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Background: Infertility is a social challenge common among couples ranging from sub-Sahara, Asia and different parts of the world. Infertility occurs as result of malformation of the uterus, poor diet, illness, and continuous unprotected sexual activity.

Aim: To provide an update on medicinal plants used across regions in the world capable of healing female infertility.

Setting: This article provides a world overview of medicinal plant activity from different regions across the globe. The use of modern medicine is effective but often not at the reach of the majority.

Methods: The article summarises previous literature on the use of medicinal plants in female fertility treatments. Findings indicated the importance of traditional healers in woman's infertility. The traditional healers used materials prepared from herbs. Herbs are derived from plants and plant extracts of various natural resources, including plant leaves, bark, flowers, roots, fruits, and berries.

Results: Female infertility has been proven to respond well to herbal-based therapy. Women's infertility is a condition that is receiving more attention concerning medicinal herbs. Several kinds of plants have been used in different regions of the world to cure female infertility. The performance of the various medicinal plants depends on accumulation of bioactive ingredients.

Conclusion: Modern plants have shown potential in enhancing female fertility through their various therapeutic properties and bioactive compounds. Overall, while there is promise in using plants for female fertility holds promise, further research and clinical trials are necessary to establish their safety and effectiveness.

Contribution: These herbs can be used as an alternative or supplemental therapy for female infertility, and further research is required to determine their effectiveness and safety.

Keywords: infertility; medicinal plants; women's health; traditional medicine; fertility.

Introduction

Infertility is recognised globally as a significant public health concern, imposing burdens on societies (Kochar et al. 2017). It affects numerous nations and healthcare systems. Infertility is a social and mental problem with high prevalence across the globe. Approximately one in every six individuals of reproductive age worldwide experiences infertility (Vander Borght & Wyns 2018). The occurrence of infertility has risen globally by 2.91%–3.70%, leading to an increase in disability-adjusted life years from 2.93% to 3.96% (Vander Borght & Wyns 2018). Higher socioeconomic indices correlate with increased infertility rates and disability-adjusted life probability among women (Zegers et al. 2009). In regions like South Asia, sub-Saharan Africa, North Africa, Middle-East, Central and Eastern Europe, and Central Asia, infertility presents significant challenges, often accompanied by social and cultural stigmas. Various reproductive issues, including leucorrhoea in Bangladesh, menstrual discomfort in Trinidad and Tobago, and womb issues in Bangladesh, contribute to the complexity of infertility (Hossain & Rahman 2015; Lans 2007).

Nutrition, infections, and uterine abnormalities are common factors in infertility-related issues, with conditions such as tubal infertility, cervical issues, and hormonal imbalances contributing to female infertility (Vander Borght & Wyns 2018). Fertility care encompasses prevention, diagnosis, and treatment, yet many countries lack access to such care, particularly those with poor and moderate incomes. Traditional medications and micronutrients play significant roles in treating female infertility (Abuzeid et al. 2014; El-Mansi et al. 2023). Chinese herbal medicine therapy has

TABLE 1: Population size, infertility, and fertility shortfall in 17 countries of sub-Saharan Africa.

Country	1980 population (Millions)	Women childless at the end of childbearing (%)	Shortfall in total fertility because of infertility birth per woman
Zaire	28.3	20.5	1.9
Sudan	18.4	8.7	0.6
Tanzania	17.9	11.4	0.9
Mozambique	10.5	13.8	1.2
Cameroun	8.4	17.9	1.6
Ivory Coast	8.0	9.9	0.8
Angola	7.1	11.5	0.9
Mali	6.9	7.7	0.5
Upper Volta	6.9	5.9	0.3
Zambia	5.8	14.0	1.2
Senegal	5.7	4.0	0.1
Niger	5.3	8.9	0.6
Guinea	5.0	6.0	0.3
Chad	4.5	11.0	0.9
Central Republic	2.3	17.3	1.6
Congo	1.5	20.5	1.9
Gabon	0.5	20.5	3.2
All countries	-	12.1	1.0

shown promise in enhancing fertility indicators, while antioxidants and vitamins are also utilised in infertility treatments (Jiang & Li 2017; Naseri et al. 2019; Silva et al. 2019). Researchers have debated the use of modern medication versus traditional medication because of issues like poor live birth rates and high costs. Consequently, infertile couples increasingly turn to complementary therapies like herbal medication, which offers phytoestrogenic, antioxidant, and nutritional benefits (Ascenzic et al. 2021; Miner et al. 2018).

Medicinal plants have been utilised for centuries to address various health conditions, including infertility. This review aims to provide an update of medicinal plants used across regions in the world capable of healing female infertility and compile a list of medicinal plant species historically used in various regions to boost female fertility.

Methodology

This review summarises previous research on the use of medicinal plants as a therapeutic in female fertility enhancement. The following keywords were employed to gather information from the literature: 'medicinal plants', 'female fertility', 'traditional medicine', 'conventional medicine', and 'fertility therapies'. Scientific databases including Google Scholar, PubMed, Science Direct, as well as Research Gate were specifically used to source data. Furthermore, taxonomic verifications of the plants were validated by use of the database of plants[1] for this review.

Infertility treatment in sub-Sahara

The popularity of traditional herbal medicine has grown, especially in African cultures, because of its compatibility with local beliefs and minimal adverse effects (Ralapanawe et al. 2023). Knowledge of herbal medicine is passed down orally through generations and sustained through observations, spiritual encounters, and narratives (Mokgobi 2014). Globally, up to 80% of the population relies on traditional medicines for basic healthcare needs, with therapeutic plants extensively used in developing countries like Cameroon, Uganda, and Nigeria (Agize, Demissew & Asfaw 2013; Jiofack et al. 2010; Kamatenesi-Mugisha et al. 2007; WHO 2003).

Herbal medicines encompass various plant materials for therapeutic purposes, utilised in human and occasionally animal health (Phua et al. 2009; WHO 2003). Women's well-being is affected by infertility, particularly in sub-Saharan Africa, where over 30% of women are infertile according to the World Health Organization (WHO) data (Chimbatata & Malimba 2016). Despite the availability of Western medications, indigenous healing practices (IHPs) are widely used to manage infertility, with many women in Nigeria preferring traditional and spiritual healers over Western medicine (Sulyman et al. 2016).

Age-appropriate women have access to ongoing information about secure new Western treatments for infertility. However, they continue to use native practices. Many women in South Africa seek the advice of Indigenous Health Care Practitioners (IHCPs) for various issues related to the female reproductive system, including infertility (Joseph 2018). Some women use dual treatment and believe indigenous practitioners helped them. Traditional healers utilise 12 plant species for treating female reproductive issues: *Bidens pilosa, Brachylaena discolour, Capsicum chinese, Chamaesyce prostrata, Cyperus papyrus, Elaeodendron transvaalense, Euphorbia ingens, Geigeria aspera var. aspera, Heteropyxis transvaalensis, Kleinia longiflora, Mundulea sericea, Pelargonium spp*. Black South Africans' culture heavily emphasises female fertility as it ensures the tribe's survival and growth (Veale et al. 2014). James et al. (2018) reported women regaining fertility in Sierra Leone using IHCPs. These IHCPs have been utilised for treating infertility (Begashaw et al. 2017). A qualitative study in Sri Lanka indicated the use of herbs, food, and rituals since ancient times to manage infertility causes in women (Srishan et al. 2020). In Karnataka, India, cultural approaches to infertility therapy are prevalent, with women turning to herbal remedies and faith healing (Udgiri & Patil 2019). Ofosu-Budu and Hänninen (2021) highlighted unhealthy sexual behaviour and unintended pregnancies resulting in unlawful abortions, putting women at infertility risk. Infertile women in Ghana contact indigenous practitioners after hospitals cite unexplained infertility causes (Ofosu-Budu & Hänninen 2021). Indigenous practitioners remain crucial in disease prevention in Zimbabwe because of limited access to Western healthcare (Odmell, Mamimine & Kudakwashe 2018). Mdhluli (2019) posited that infertility may stem from demonic forces, prompting women to seek spiritual healers for prayers and holy water preparations to cast out curses leading to infertility.

1.http://www. theplantlist.org/.

Infertility cure in Mexico, Central and Latin America

Traditional medical practices have been integral to basic healthcare worldwide for millennia. Ancient civilisations like the Maya, Inca, and Aztecs in Mexico, as well as China's Traditional Chinese Medicine (TCM) system, date back around 5000 years. Mexican Traditional Medicine (MTM) integrates ancient healing practices from these civilisations with African and Spanish-Catholic influences, emphasising harmony between physical, emotional, and mental health (Bogavac et al. 2017). Nahua women in northern Veracruz, Mexico, utilised approximately 80 plant species medicinally, with married women, particularly those with children, possessing extensive knowledge. Twenty-six plant species were used for reproductive health issues, including conception, menstruation, pregnancy, and the postpartum period. For instance, *Priva lappulacea* (L.) Pers. was used to prevent miscarriages, while a tea made from *Hamelia patens* Jacq. and *Bombax ellipticum* Kunth was used for sterilisation (Cabada et al. 2023; Castillo-Juárez 2009; Maduro 1983).

Korean Herbal Medicine (KHM) employs decoctions to treat infertility, often administered before or after procedures like in vitro fertilisation (IVF) or intrauterine insemination (IUI). Patients may receive KHM alongside ovulation-inducing drugs like clomiphene citrate, without additional traditional Korean medical practices such as acupuncture or cupping (Nandi et al. 2016). Examples of KHM remedies include *Chokyungsoyo-san*, *Chokyungonshin-tang*, and *Guichulleekyung-tang*. Moreover, Korean traditional medicine is used to address infertility concerns. Herbal decoctions, such as *Chokyungsoyo-san*, *Chokyungonshin-tang*, and *Guichulleekyung-tang*, are administered to patients before or after assisted reproductive procedures like IVF or IUI (Nandi et al. 2016). In some cases, these herbal remedies are combined with ovulation-inducing drugs like clomiphene citrate to enhance fertility outcomes.

In addition to Mexican and Korean traditional medicines, other cultures also rely on herbal remedies for reproductive health. For instance, Nahua women in northern Veracruz, Mexico use a variety of plants to address conditions related to conception, menstruation, pregnancy, and postpartum recovery (Cabada et al. 2023; Castillo-Juárez 2009). These traditional practices reflect a holistic approach to healthcare, emphasising the interconnectedness of physical, emotional, and mental well-being.

Traditional herbal plants for infertility cure

The utilisation of plant species holds significant promise for achieving equity in healthcare delivery and fostering national development through bioprospecting and the advancement of indigenous knowledge. The genus *Syzygium*, a member of the Myrtaceae family comprising 1200–1800 species, is extensively employed in traditional medical practices across Asia and globally, with therapeutic functions that play a vital role in healthcare systems worldwide (Akkol et al. 2021; Sánchez-Fernández et al. 2021). Particularly, *Syzygium* ssp. exhibits a wide geographic distribution from Africa to the Pacific, with diverse species utilised for treating various ailments with culturally acceptable and compatible properties, minimising negative side effects (Bari, Nassar & Aly 2021; Hoque et al. 2021). Notably, *Syzygium cordatum* Hochst ex C Krauss. leaf, root, and bark have shown efficacy in treating a range of conditions including stomach aches, diabetes, and venereal diseases (Dharani 2016).

Pomegranate (*Punica granatum*) is rich in beneficial compounds such as vitamin C, polyphenols, and phytoestrogens like genistein and daidzein, making it adaptable and effective in treating various health issues (Battineni, Boggula & Bakshi 2017). Similarly, extracts from *Matricaria chamomilla*, commonly known as chamomile, have demonstrated efficacy in enhancing reproductive health by modulating hormone levels and improving follicular development (Shoorei et al. 2018). *Vitex agnus-castus*, a herb from the Verbenaceae family, is utilised for treating menstrual issues and acne, with its isoflavones and flavonoids affecting hormone release and increasing endometrial blood flow (Amégbor et al. 2012; Goodarzi & Akbari 2016).

Ashwagandha, also known as Indian ginseng, offers benefits for women facing fertility challenges, with its oestrogenic properties and potential to restore hormonal balance (Nasimi et al. 2018). Red clover (*Trifolium spp.*) and Licorice (*Glycyrrhiza glabra*) contain phytoestrogenic chemicals that mimic hormone synthesis, providing relief from menopausal symptoms and addressing oestrogen-dependent disorders (Hidalgo et al. 2005; Ztürk et al. 2018). Moreover, plant extracts from *Cinnamomum* species, including cinnamon, offer safer alternatives to conventional treatments for conditions like endometriosis, with their antioxidant and anti-inflammatory properties (Ji et al. 2011). Fennel (*Foeniculum vulgare*) extracts have demonstrated efficacy in reducing uterine contractions and alleviating dysmenorrhoea, showcasing their potential to improve reproductive health (Sautour et al. 2004). Additionally, *Nigella sativa* extracts have shown promise in treating conditions like polycystic ovarian syndrome (PCOS) through their phytoestrogenic and flavonoid components, influencing hormonal pathways (Khani et al. 2021).

Incorporating these plant-based remedies into healthcare systems could provide holistic approaches to addressing reproductive health issues, leveraging the rich therapeutic potential of plants and indigenous knowledge for improved health outcomes. Bioprospecting and indigenous knowledge can promote equity in healthcare delivery and national development. Plant species will aid in their preservation and may lead to the discovery of beneficial substances useful in the treatment of infertility (See Table 1 and Table 2). The following plant has been found relevant. The genus *Syzygium* belongs to the family Myrtaceae. There are 1200–1800 species. These plants are a genus employed in the traditional medical practices of Asian nations, particularly in China, India,

TABLE 2: Medicinal plants used in female fertility practices.

Scientific name	Common name	Family	Uses	References
Adiantum poiretii Wikstr.	Yaru chaqui	Pteridaceae	Postpartum care	Ortiz and Browner (1985); Browner (1985)
Adiantum tenerum Sw.	Brittle maidenhair fern	Pteridaceae	Postpartum care	Smith-Oka (2008)
Agave atrovirens Karw. ex Salm-Dyck	Maguey peluquero	Asparagaceae	Postpartum care	Cetto (2009)
Ageratina ligustrina (DC.) R.M. King & H. Rob	Privet-leaved ageratina	Compositae	Postpartum care	Ortiz and Browner (1985); Browner (1985)
Allium sativum L.	Garlic	Amaryllidaceae	Oxytocic and induces labour or speeds birth	Ortiz and Browner (1985)
Aloe vera (L.) Burm.f	Aloe	Xanthorrhoeaceae	Unspecified obstetric problems	Alonso et al. (2017)
Anoda cristata (L.) Schltdl	Crested anoda	Malvaceae	Treats infertility	Browner (1985)
Arbutus xalapensis Kunth	Texas madrone	Ericaceae	Postpartum care	Ortiz and Browner (1985); Browner (1985)
Arnica montana L.	Mountain arnica	Compositae	Unspecified obstetric problems	Alonso et al. (2017)
Arundo donax L.	Cana-brava	Poaceae	Postpartum care	Ortiz and Browner (1985); Smith-Oka (2008)
Baccharis salicina Torr. & A.Gray	Pineable	Compositae	Oxytocic and induces labour or speeds birth; treats infertility; prevents miscarriages	Ortiz and Browner (1985)
Bidens pilosa L.	Black jack	Compositae	Promotes fertility	Browner (1985)
Brickellia secundiflora (Lag.) A.Gray	Jara blanca	Compositae	Postpartum care; treats infertility; prevents miscarriage	Ortiz and Browner (1985); Browner (1985)
Buddleja cordata Kunth	Tepozán	Scrophulariaceae	Postpartum care	Vargas (2021)
Buxus sempervirens L.	Boxwood	Buxaceae	Postpartum care	Vargas (2021)
Byrsonima crassifolia (L.) Kunth	Golden spoon	Malpighiaceae	Inflamed uterus	Leonti et al. (2001)
Calea ternifolia Kunth	Zacatechichi	Asteraceae Bercht. & J. Presl	Postpartum care	Browner (1985)
Chenopodium incisum Poir	Goosefoot	Amaranthaceae	Oxytocic and induces labour or speeds birth	Vargas (2021)
Chromolaena odorata (L.) R.M.King & H.Rob	Siam weed	Compositae	Postpartum care	Browner (1985)
Chrysactinia mexicana A.Gray	Damianita daisy	Asteraceae	Promotes fertility	Gonzalez (2010)
Citrus aurantiifolia (Christm.) Swingle	Key lime	Rutaceae	Contraceptive	Browner (1985)
Clidemia setosa (Triana) Gleason	Santa Marta	Melastomataceae	Treats infertility	Browner (1985)
Cocos nucifera L.	Coconut palm	Arecaceae	Stops haemorrhage during labour	Reimers et al. (2019)
Critonia quadrangularis (DC.) R.M.King & H.Rob	Tabaquillo	Compositae	Postpartum care	Ortiz and Browner (1985); Browner (1985)
Crescentia cujete L.	Cujete	Bignoniaceae	Oxytocic and induces labour or speeds birth	Ortiz and Browner (1985); Browner (1985)
Cuminum cyminum L.	Cumin	Apiaceae	Oxytocic and induces labour or speeds birth	Browner (1985)
Desmodium incanum DC	Zarzabacoa comun	Fabaceae	Antiabortifacient	Leonti et al. (2001)
Dioscorea composita Hemsl.	Barbasco	Dioscoreaceae	Contraceptive	Vargas (2021); Leonti et al. (2001)
Dodonaea viscosa (L.) Jacq.	Native hop bush	Sapindaceae	Postpartum care; spasmolytic activity; treats infertility; prevents miscarriage	Ortiz and Browner (1985); Browner (1985)
Dysphania ambrosioides (L.) Mosyakin & Clemants	Epazote	Amaranthaceae	Oxytocic and induces labour or speeds birth	Ortiz and Browner (1985); Browner (1985)
Epiphyllum crenatum (Lindl.) Don	Climbing orchid cactus	Cactaceae	Antiabortifacient	Reimers et al. (2019)
Erigeron karvinskianus DC.	Mexican fleabane	Asteraceae Bercht. & J.Presl	Osteoporosis	Cruz et al. (2021); Alonso et al. (2017)
Erythrina caribaea Krukoff & Barneby	Coral-tree	Leguminosae	Oxytocic	Reimers et al. (2019)
Euphorbia pulcherrima Willd. ex Klotzsch	Christmas-flower	Euphorbiaceae	Contraceptive	Ortiz and Browner (1985)
Euphorbia tithymaloides L.	Red bird flower	Euphorbiaceae	Uterine prolapse	Smith-Oka (2008)
Eysenhardtia polystachya (Ortega) Sarg	Kidney-wood	Leguminosae	Contraceptive	Ortiz and Browner (1985)
Fleischmannia pycnocephala (Less.) R.M.King & H.Rob	Flor de octubre	Compositae	Postpartum care	Cervantes and Valdes (1990)
Foeniculum vulgare Mill.	Fern	Apiaceae	Breast feeding, menopause	Vargas (2021)
Gaultheria acuminata Schltdl. & Cham	Wintergreen	Ericaceae	Postpartum care; treats infertility; prevents miscarriage	Ortiz and Browner (1985); Browner (1985)
Guazuma ulmifolia Lam.	West Indian Elm	Malvaceae	Expel placenta	Cervantes and Valdes (1990)
Helianthemum glomeratum (Lag.) Lag. ex Dunal	Damiana	Cistaceae	Osteoporosis	Cruz et al. (2021)
Heliocarpus glanduliferus B.L. Rob. Ex Rose	-	Malvaceae	Oxytocic and induces labour or speeds delivery	-
Heliocarpus mexicanus (Turcz.) Sprague	Majaguillo	Malvaceae	Oxytocic and induces labour or speeds delivery	Smith-Oka (2008)
Hibiscus rosa-sinensis L.	Chinese hibiscus	Malvaceae	Menopause	Smith-Oka (2008)
Hybanthus attenuatus (Humb. & Bonpl. ex Schult.) Schulze-Menz	Western Green violet	Violaceae	Steriliser	Smith-Oka (2008)

Table 2 continues on the next page →

TABLE 2 (Continues...): Medicinal plants used in female fertility practices.

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Hydrocotyle mexicana Schltdl. & Cham	Native pennywort	Araliaceae	Postpartum care	Ortiz and Browner (1985); Browner (1985)
Hylocereus undatus (Haw.) Britton & Rose	Night-blooming ceresus	Cactaceae	Postpartum care	Smith-Oka (2008)
Iostephane trilobata Hemsl.	Hierba del manso	Compositae	Postpartum care; treats infertility; speeds birth	Ortiz and Browner (1985); Browner (1985)
Lippia alba (Mill.) N.E.Br. ex Britton & P.Wilson	Bushy Matgrass	Verbenaceae	Postpartum care	Cruz et al. (2021); Ortiz and Browner (1985); Browner (1985)
Liquidambar styraciflua L.	Sweet gum	Altingiaceae	Obstetric problems	Perez, Vibrans and Romero-Manzanares (2017)
Litsea glaucescens Kunth	Mexican bay leaf	Lauraceae	Postpartum care; treats infertility	Browner (1985)
Loeselia mexicana (Lam.) Brand	Mexican false calico	Polemoniaceae	Postpartum care	Cervantes and Valdes (1990); Vargas (2021)
Matricaria chamomilla L.	Chamomile	Compositae	Oxytocic and induces labour or speeds birth; insomnia; reduces stress	Cruz et al. (2021); Leonti et al. (2001); Ortiz and Browner (1985); Browner (1985
Melia azedarach L.	Chinaberry	Meliaceae	Venereal diseases	Umar et al. (2012); Martinez (1984)
Mentzelia aspera L.	Tropical stickleaf	Loasaceae	Uterine prolapse	Smith-Oka (2008)
Miconia argentea (Sw.) DC.	Capirote	Melastomataceae	Oxytocic and induces labour or speeds birth	Leonti et al. (2001)
Mimosa albida Willd.	Mimosa	Leguminosae	Oxytocic and induces labour or speeds birth; treats infertility	Ortiz and Browner (1985); Browner (1985); Cervantes and Valdes (1990)
Montanoa tomentosa Cerv.	Zoapatle	Compositae	Oxytocic and induces labour or speeds birth	Ortiz and Browner (1985); Browner (1985)
Musa sp	Plantain and Banana	Musaceae	Postpartum care	Smith-Oka (2008)
Nectandra sp.	-	Lauraceae	Oxytocic and induces labour or speeds delivery	Smith-Oka (2008)
Nopalea cochenillifera (L.) Salm-Dyck	Cochineal cactus	Cactaceae	Postpartum care	Smith-Oka (2008)
Ocimum basilicum L.	Sweet basil	Lamiaceae	Labour pains; uterine prolapse	Alonso et al. (2017); Smith-Oka (2008)
Peperomia granulosa Trel.	Baby rubber plant	Piperaceae	Breastfeeding	Reimers et al. (2019)
Phragmites australis (Cav.) Trin. ex Steud	Phragmites communis	Poaceae	Postpartum care	Browner (1985)
Pimenta dioica (L.) Merr.	Allspice	Murtaceae	Inflamed uterus	Leonti et al. (2001)
Piper sanctum (Miq.) Schltdl. ex C.DC.	Hierba santa	Piperaceae	Postpartum care	Reimers et al. (2019)
Piper auritum Kunth	Hoja Santa	Piperaceae	Oxytocic and induces labour or speeds birth	Ortiz and Browner (1985); Browner (1985)
Piper umbellatum L.	Cordoncillo	Piperaceae	Oxytocic and induces labour or speeds birth; uterine prolapse	Browner (1985); Smith-Oka (2008); Smith-Oka (2012)
Pleurothallis cardiothallis Rchb.f	The Heart Shaped Growth Pleurothallis	Orchidaceae	Treats infertility	Browner (1985)
Pluchea odorata (L.) Cass	Marsh Fleabane	Compositae	Postpartum care	Ortiz and Browner (1985); Browner (1985); Cervantes and Valdes (1990)
Podocarpus matudae Lundell	Palmilla	Podocarpaceae	Contraceptive	Ortiz and Browner (1985); Browner (1985)
Pouteria sapota (Jacq.) H. E. Moore et Stearn	Mamey Sapote	Sapotaceae	Uterine prolapse	Leonti et al. (2001)
Priva lappulacea (L.) Pers.	Mozote	Verbenaceae	Prevents miscarriage	Smith-Oka (2008)
Pseudobombax ellipticum (Kunth) Dugand	Xiloxochitl	Malvaceae	Induces sterilisation	Kumar, Kumar and Prakash (2012); Smith-Oka (2008)
Psittacanthus calyculatus (DC.) G. Don	Injerto de huizache	Loranthaceae	Treats infertility; prevents miscarriage	Ortiz and Browner (1985); Browner (1985)
Punica granatum L.	Pomegranate	Lythraceae	Stops haemorrhage during labour	Cervantes and Valdes (1990)
Quercus elliptica Née	Encino blanco	Fagaceae	Postpartum care	Ortiz and Browner (1985); Browner (1985)
Quercus oleoides Schltdl. & Cham	Encino	Fagaceae	Inflamed uterus	Leonti et al. (2001)
Rhynchosia pyramidalis (Lam.) Urb.	Virility-vine	Fabaceae	Contraceptive	Leonti et al. (2001)
Ricinus communis L.	Castor oil plant	Euphorbiaceae	Treats infertility	Ortiz and Browner (1985); Browner (1985)
Rosa chinensis Jacq.	China rose	Rosaceae	Menopause	Vargas (2021)
Rosmarinus officinalis L.	Rosemary	Lamiaceae	Postpartum care; treats vaginal infections	Leonti et al. (2001); Alonso et al. (2017); Cervantes and Valdes (1990); Vargas (2021)
Russelia sarmentosa Jacq.	Russelia sarmentosa	Plantaginaceae	Contraceptive	Ortiz and Browner (1985); Browner (1985)

Table 2 continues on the next page →

TABLE 2 (Continues...): Medicinal plants used in female fertility practices.

Scientific name	Common name	Family	Uses	References
Ruta chalepensis L.	Rue	Rutaceae	Oxytocic and induces labour or speeds birth	Ortiz and Browner (1985); Browner (1985); Cervantes and Valdes (1990); Cetto (2009); Bernstein et al. (2021)
Ruellia sp.	Cuaimate	Acanthaceae	Postpartum care	Kumar et al. (2012); Martinez (1984)
Salix bonplandiana Kunth	Bonpland willow	Salicaceae	Postpartum care	Cervantes and Valdes (1990)
Salix humboldtiana Willd	Humboldt's willow	Salicaceae	Postpartum care	Cervantes and Valdes (1990)
Sambucus nigra L.	Eldelberry	Adoxaceae	Obstetric problems	Perez et al. (2017)
Selaginella pallescens (C. Presl) Spring	Moss fern	Selaginellaceae	Postpartum care	Ortiz and Browner (1985)
Sesamum indicum L.	Sesame	Pedaliaceae	Breastfeeding	Reimers et al. (2019)
Solanum nudum Dunal	Forest nightshade	Solanaceae	Not stated	Smith-Oka (2008)
Styrax argenteus C. Presl	Styrax	Styracaceae	Contraceptive: oxytocic and induces labour or speeds birth	Ortiz and Browner (1985)
Tagetes erecta L.	Amapola	Compositae	Postpartum care	Smith-Oka (2008)
Tagetes lucida Cav.	Dayflower	Compositae	Oxytocic and induces labour or speeds birth	Ortiz and Browner (1985); Browner (1985)
Tecoma stans (L.) Juss. ex Kunth	Trumpet bush	Bignoniaceae	Postpartum care	Cruz et al. (2021)
Tectaria sp	-	Tectariaceae	Postpartum care	Smith-Oka (2008)
Thelypteris kunthii (Desv.) C.V. Morton	Fern (Helecho macho)	Thelypteridaceae	Contraceptive	Umar et al. (2012); Martinez (1984)
Thelypteris tetragona (Sw.) Small	Freetip maiden fern	Thelypteridaceae	Postpartum care	Smith-Oka (2008)
Tonduzia longifolia (A.DC.) Markgr.	Palo blanco	Apocynaceae	Postpartum care	Cervantes and Valdes (1990)
Turbina corymbosa (L.) Raf.	Ololiuhqui	Convolvulaceae	Oxytocic and induces labour or speeds birth	Ortiz and Browner (1985); Browner (1985)
Vanilla planifolia Jacks. ex Andrews	Vanilla	Orchidaceae	Menopause	Reimers et al. (2019)
Zea mays L.	Corn	Poaceae	Postpartum care; treats infertility	Ortiz and Browner (1985); Browner (1985)
Zingiber officinale Roscoe	Ginger	Zingiberaceae	Nausea and vomiting; obstetric problems	Alonso et al. (2017)

Note: Please see the full reference list of the article, Singh, K., Coopoosamy, R., David, A. & Naidoo, K., 2024, 'Unlocking nature's secrets: Medicinal plants for enhanced female fertility', *Journal of Medicinal Plants for Economic Development* 8(1), a258. https://doi.org/10.4102/jomped.v8i1.258, for more information.

Bangladesh, and various regions across the globe. These plants have therapeutic or curative functions which have helped them attain a commanding role in health systems all over the world (Akkol et al. 2021; Sánchez-Fernández et al. 2021). *Syzygium spp*. has a wide geographic range that stretches from Africa and Madagascar to Asia and the Pacific (Perrie et al. 2013), with the highest levels of diversity occurring from Malaysia to Australia, where many species are poorly understood, and countless others have not been taxonomically depicted. These species are common elements in the upper and middle strata of eastern Australian rainforests (Hyland 1983). *Syzygium spp*. are useful for treating illnesses and may be used as ingredients to preserve health and conditions. These plants are culturally acceptable, compatible, and adapted to the human body with fewer negative side effects. Many nations across the globe rely on these plants as a major form of healthcare (Bari et al. 2021; Hoque et al. 2021). According to Dharani (2016), *Syzygium cordatum* Hochst ex C Krauss. leaf, root, and bark were found effective in curing stomachaches, abdominal pains, indigestion, diarrhoea, diabetes, venereal diseases, and infirmity. Pomegranate is high in vitamin C, water, and polyphenols such as anthocyanins, punicalagins, ellagic acids, and gallic acids.

A study conducted on Nahua women in Northern Veracruz, Mexico found that around 80 different medicinal plant species were used, with married women and mothers being particularly knowledgeable about most of these plants. Twenty-six of the plant species were used to treat conditions relating to reproductive health, including conception, menstruation, pregnancy, and the postpartum period. A herb called *Priva lappulacea* (L.) Pers. was utilised to stop miscarriages (Cabada et al. 2023; Castillo-Juárez 2009; Maduro 1983). To completely sterilise females, a tea made from *Hamelia patens* Jacq. [syn. *Hamelia erecta*] and *Bombax ellipticum* Kunth (Malvaceae) was consumed. A tea made from a different plant, *Cydista potosina*, was used for the same reason, and *Hybanthus attenuatus* (Humb. & Bonpl. ex Schult.) Schulze-Menz (Malpighiales) was said to make conception easier. The Natau women employed *Tillandsia recurvata* (Bromeliaceae), *H. patens, Manilkara zapota* (L.) P. Royen (Sapotaceae), *Solanum nudum*, and *Persea americana* as remedies for heavy menstruation (Cabada et al. 2023; Castillo-Juárez 2009; Maduro 1983).

It is worth noting that several of the therapeutic herbs used by women were recorded in pre-Columbian codices, indicating that they have been utilised in Mexico for more than 500 years. It was more widespread across a significant number of regions (Castillo-Juárez 2009). However, most of these plants lack any evidence supporting their usage during pregnancy in terms of safety or efficacy. Most of these herbs lack safety or effectiveness evidence for consumption through pregnancy or their delivery, with the exemption of ginger root and chrysanthemum. Besides, it was discovered in findings by Uganda and Yineger et al.

(2007) in Ethiopia that many of the wild habitats are influenced by anthropogenic impacts and, as a result, shrink in size because of ever-increasing population pressure, resulting in the extinction of many medicinal species.

Conclusion

Infertility is a complex and multifaceted condition that can significantly impact the lives of individuals and couples trying to conceive and is prevalent in many parts of the world. Poor food, illness, curses, and unprotected sexual intercourse during periods were recognised as causes of infertility. The usage of current treatment was discovered to be expensive in most locations. The government offers little or no help for fertility care, necessitating victims' visits to local practitioners. Traditional herbs are utilised as a treatment in many cultures around the world to treat a wide range of ailments, including infertility. Different cultures employ various extraction methods and procedures. These herbs' bioactive ingredients aid in disease treatment. In other words, the bioactive element in plant species may be insufficient because of the increasing prevalence of industrial development and anthropogenic activities.

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Competing interests

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Authors' contributions

K.S., R.C., A.D. and K.N. contributed equally to this work. K.S. and A.D. conceptualised and wrote the manuscript. R.C. and K.N edited the manuscript and provided additional information where needed.

Ethical considerations

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Data availability

The authors confirm that the data supporting the findings of this study are available within the article.

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