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Abortifacient Medicinal Plants: A Review of Toxic Herbs During Pregnancy

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A B S T R A C T

Objective: Miscarriage, or spontaneous abortion, remains a significant challenge in women's reproductive health. Traditional Iranian Medicine (TIM) possesses a rich history of pharmacognosy, identifying numerous medicinal plants with potential toxicological effects on pregnancy. While some agents were historically employed to manage fertility, their inadvertent consumption poses risks. This study aims to systematically identify and categorize abortifacient plants documented in classical Iranian medical texts.

Methods: A systematic review of traditional medical literature was conducted. Data regarding medicinal plants associated with the induction of miscarriage were extracted from authoritative classical TIM references (e.g., *The Canon of Medicine*, *Makhzan-al-Advia*), contemporary herbal texts, and validated online botanical databases. Plants were categorized by scientific name, family, and the specific plant part used.

Results: The review identified a diverse range of plants with potential abortifacient properties as cited in traditional sources. Key species include *Cinnamomum verum* J. Presl, *Petroselinum crispum* (Mill.) Fuss, *Sesamum indicum* L., *Crocus sativus* L., *Matricaria chamomilla* L., *Ananas comosus* (L.) Merr., *Zingiber officinale* Roscoe, *Mentha piperita* L., *Foeniculum vulgare* Mill., *Ferula assa-foetida* L., *Drimys winteri* J.R. Forst. & G. Forst., *Berberis vulgaris* L., *Angelica archangelica* L., *Anethum graveolens* L., *Apium graveolens* L., *Viola odorata* L., *Althaea officinalis* L., *Thymus vulgaris* L., *Aloe vera* (L.) Burm.f. (syn. *Aloe barbadensis*), *Lawsonia inermis* L., *Equisetum arvense* L., *Syzygium aromaticum* (L.) Merr. & L.M. Perry, *Citrullus colocynthis* (L.) Schrad., *Terminalia chebula* Retz., *Saccharum officinarum* L., and *Glycine max* (L.) Merr. Analysis revealed that leaves (28%) and seeds (23%) were the most frequently implicated plant parts. Taxonomically, the majority of these abortifacient plants belonged to the Apiaceae and Lamiaceae families.

Conclusion: A significant number of medicinal plants commonly used in traditional practices exhibit potential abortifacient effects. Inadvertent consumption of these agents during pregnancy presents a tangible hazard to maternal and fetal safety. Comprehensive knowledge of these botanical risks is essential for healthcare providers to offer accurate prenatal counseling. Furthermore, these historical data provide a valuable foundation for future pharmacological research into the mechanisms of action and safety profiles of these herbal agents.

Keywords: Fetus, Toxicity, Miscarriage, Pregnancy, Traditional Medicine, Iran

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Introduction

Women's reproductive health is a complex field characterized by ongoing clinical and diagnostic debates. For instance, while the diagnostic accuracy of various modalities for detecting malignant and premalignant cervical lesions remains a subject of significant research and controversy [1], miscarriage stands as another profound challenge globally. Spontaneous abortion carries substantial physical, psychological, and socioeconomic consequences [2], and the high prevalence of both spontaneous and induced miscarriages in specific communities underscores the urgent need to elucidate the multifactorial determinants of pregnancy outcomes [3].

Historically, fertility regulation and the management of pregnancy complications have been focal points for physicians across various cultures, particularly within the rich heritage of Iranian medicine [4]. Spanning over a millennium, Traditional Iranian Medicine (TIM) has cataloged a vast array of medicinal plants through rigorous clinical observation, identifying numerous species capable of influencing the gestational process [5]. Specifically, certain flora possessing uterotonic properties were documented in classical texts for their utility in regulating fertility or inducing abortion [6]. However, a comprehensive understanding of the pharmacological profiles of these plants is imperative to mitigate the risks of inadvertent toxicity and irreversible health consequences [6].

Mechanistically, abortifacient medicinal plants often contain bioactive compounds that may stimulate myometrial contractions, compromise placental perfusion, or disrupt hormonal homeostasis [7]. The unintentional consumption of these agents can precipitate spontaneous abortion or other adverse obstetrical outcomes [7]. Given that many of these potent botanicals are frequently integrated into dietary staples and traditional remedies, the dissemination of scientifically grounded data regarding their potential abortifacient effects is critical for safeguarding maternal and fetal health [7].

Previous studies have largely focused either on the perspective of traditional medicine or on the limited biological effects of individual plants. There remains a lack of comprehensive and systematic reviews summarizing abortifacient plants and their mechanisms as documented in Iranian traditional medical sources [8]. This knowledge gap may lead to inadvertent use and serious health risks for pregnant women [9].

Beyond their physiological effects, many of these plants contain toxic chemical constituents that can threaten both maternal and fetal health [10]. Identifying these compounds and their association with abortifacient activity can lay the groundwork for future research on the safety and controlled applications of these plants [11].

Pregnancy induces complex physiological and immunological adaptations that, while essential for gestation, may heighten susceptibility to adverse maternal and neonatal outcomes, particularly in the context of viral infections [12]. Concurrently, miscarriage remains a profound burden on women's reproductive health, entailing significant physical, psychological, and socioeconomic sequelae [13]. In populations where Traditional Iranian Medicine (TIM) is widely practiced, the prevalence of both spontaneous and induced abortion necessitates a rigorous evaluation of indigenous medicinal flora [14]. Specifically, elucidating the abortifacient properties and mechanisms of action of these plants is imperative, as inadvertent ingestion poses severe risks to the maternal-fetal dyad [15]. Therefore, a systematic review of classical TIM literature is warranted not only to mitigate the hazards of unintended consumption but also to establish a theoretical framework for future pharmacological research regarding the safety and efficacy of these botanical agents [16].

The aim of this study is to systematically review traditional Iranian medical sources to identify medicinal plants with abortifacient properties and to examine their potential mechanisms of action.

Methods

Study Design

This study was conducted as a systematic review of Iranian traditional medicine sources and medicinal plants associated with miscarriage and toxic effects during pregnancy. The primary aim was to identify

and compile information on native Iranian medicinal plants used in traditional medicine that may stimulate uterine contractions and induce miscarriage, as well as to examine their potential mechanisms of action [11–20].

Data Sources

Relevant data were collected from the following sources:

Reference books on Iranian traditional medicine: Classical texts authored by Iranian physicians and other canonical works of traditional and herbal medicine discussing the effects of medicinal plants on pregnancy and maternal health.

Online databases and scientific articles: Credible digital sources addressing Iranian traditional medicine, medicinal plants, and their abortifacient effects, particularly studies focusing on maternal and fetal safety.

Search Terms

A combination of the following terms was used for the search:

miscarriage, “” pregnancy, “” medicinal plant, “” traditional medicine, “” abortifacient plants), “” (toxic effects of plants).

Inclusion Criteria

Sources were included if they explicitly addressed the uterotonic or abortifacient effects of medicinal plants, were relevant to Iranian traditional medicine, and originated from Iranian physicians. Eligible materials comprised books, classical texts, and articles published in Persian or English. Additionally, scientific studies investigating the effects of medicinal plants mentioned in Iranian traditional medicine sources on pregnancy or fetal health were considered.

Exclusion Criteria

Sources were excluded if they contained irrelevant information regarding pregnancy or plant toxicity, were incomplete, failed to specify plant names or modes of administration, were duplicates, lacked new data, had low scientific quality, were from non-credible websites, or concerned medicinal plants from other countries without a connection to Iranian traditional medicine unless compared with Iranian sources.

Data Collection Process

An initial list of native Iranian medicinal plants with uterotonic or abortifacient effects was compiled. For each plant, information on its common and scientific names, plant part used, and method of administration (e.g., infusion, extract, topical application, or other methods) was recorded.

Data Analysis

Collected data were presented in tables and descriptive text. Medicinal plants were categorized according to their type of effect and the available scientific evidence, providing a clear overview of their potential to induce miscarriage or pose risks to the fetus within the context of Iranian traditional medicine.

Results

Traditional Iranian medical sources indicate that a variety of plants may induce or trigger miscarriage. These include Cinnamomum verum L., Petroselinum crispum L., Sesamum indicum L., Crocus sativus L., Matricaria chamomilla L., Ananas comosus L., Zingiber officinale Roscoe, Mentha piperita L., Foeniculum vulgare Mill., Ferula assa-foetida L., Drimys winteri J.R. et G. Forster, Berberis vulgaris L., Angelica archangelica L., Anethum graveolens L., Apium graveolens L., Viola odorata L., Althaea officinalis L., Thymus vulgaris L., Aloe barbadensis Mill., Lawsonia inermis L., Equisetum arvense L., Syzygium aromaticum L., Citrullus colocynthis L., Terminalia chebula Retz., Saccharum officinarum L., Glycine max (L.) Merr.. A detailed list of these abortifacient medicinal plants, including their botanical information and relevant characteristics, is presented in Table

Table 1: Abortifacient Medicinal Plants [11-20]

English Name	Scientific Name	Plant Family	Toxic Plant Part	Mechanism of Abortifacient Effect
Cinnamon	Cinnamomum verum L.	Lauraceae	Bark and seeds	Stimulates uterine contractions and may increase bleeding
Parsley	Petroselinum crispum L.	Apiaceae	Leaf and seeds	Uterine stimulant; enhances uterine muscle activity
Sesame	Sesamum indicum L.	Pedaliaceae	Seed	Stimulates uterus and increases prostaglandin secretion
Saffron	Crocus sativus L.	Iridaceae	Stigma, corm	Increases uterine contractions and reduces fetal blood flow
Chamomile	Matricaria chamomilla L.	Asteraceae	Flower	Stimulates uterus and may induce bleeding
Pineapple	Ananas comosus L.	Bromeliaceae	Fruit and stem	Uterine stimulant; increases prostaglandin activity
Ginger	Zingiber officinale Roscoe	Zingiberaceae	Rhizome	Stimulates uterus and enhances uterine motility
Peppermint	Mentha piperita L.	Lamiaceae	Leaf	Stimulates uterine muscles and may increase risk of miscarriage
Fennel	Foeniculum vulgare Mill.	Apiaceae	Seed, leaf	Increases uterine contractions and stimulates prostaglandin secretion
Ferula	Ferula assa-foetida L.	Apiaceae	Root	Stimulates uterus and has direct toxic effects on the fetus
Drimys	Drimys winteri J.R. et G. Forster	Winteraceae	Stem and leaf	Uterine stimulant; may reduce fetal blood supply
Barberry	Berberis vulgaris L.	Berberidaceae	Root and fruit	Stimulates uterus and has direct toxic effects on the fetus
Angelica	Angelica archangelica L.	Apiaceae	Root, seed	Uterine stimulant; increases uterine contractions

Dill	Anethum graveolens L.	Apiaceae	Leaf and seed	Stimulates uterus and increases prostaglandin secretion
Celery	Apium graveolens L.	Apiaceae	Leaf and seed	Uterine stimulant; enhances uterine motility
Violet	Viola odorata L.	Violaceae	Flower and leaf	Direct toxic effect on fetus; stimulates uterus
Hollyhock	Althaea officinalis L.	Malvaceae	Flower and root	Stimulates uterus and may increase bleeding
Thyme	Thymus vulgaris L.	Lamiaceae	Leaf and stem	Stimulates uterine muscles and may increase miscarriage risk
Aloe vera	Aloe barbadensis Mill.	Asphodelaceae	Gel and leaf	Direct cytotoxic/toxic effect; stimulates uterine contractions
Henna	Lawsonia inermis L.	Lythraceae	Leaf	Stimulates uterus and has direct toxic effects
Equisetum	Equisetum arvense L.	Equisetaceae	Stem and leaf	Uterine stimulant; enhances uterine motility
Clove	Syzygium aromaticum L.	Myrtaceae	Flower, leaf, seed	Stimulates uterus and increases uterine contractions
Watermelon Abojahal	Citrullus colocynthis L.	Cucurbitaceae	Fruit and seed	Direct toxic effect on uterus and fetus
Black Myrobalan	Terminalia chebula Retz.	Combretaceae	Fruit	Stimulates uterus and has toxic effects on the fetus
Sugarcane	Saccharum officinarum L.	Poaceae	Stem and sap	Stimulates uterus and may increase miscarriage risk
Soybean	Glycine max (L.) Merr.	Fabaceae	Seed	Hormonal effects; stimulates uterus

The highest number of abortifacient medicinal plants belonged to the Apiaceae and Lamiaceae families. Additional information regarding the prevalence of abortifacient medicinal plants is presented in Figure 1.

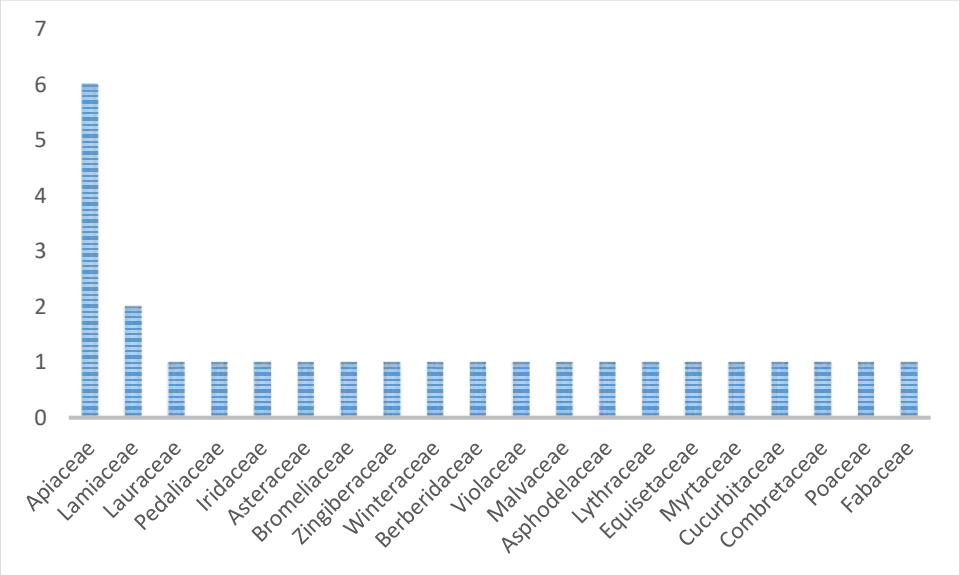

Figure 1: Frequency of abortifacient medicinal plants in Iranian traditional medicine

Leaves (28%) and seeds (23%) were the most commonly used plant parts with abortifacient properties. Additional information regarding the plant parts of abortifacient medicinal plants is presented in Figure 2.

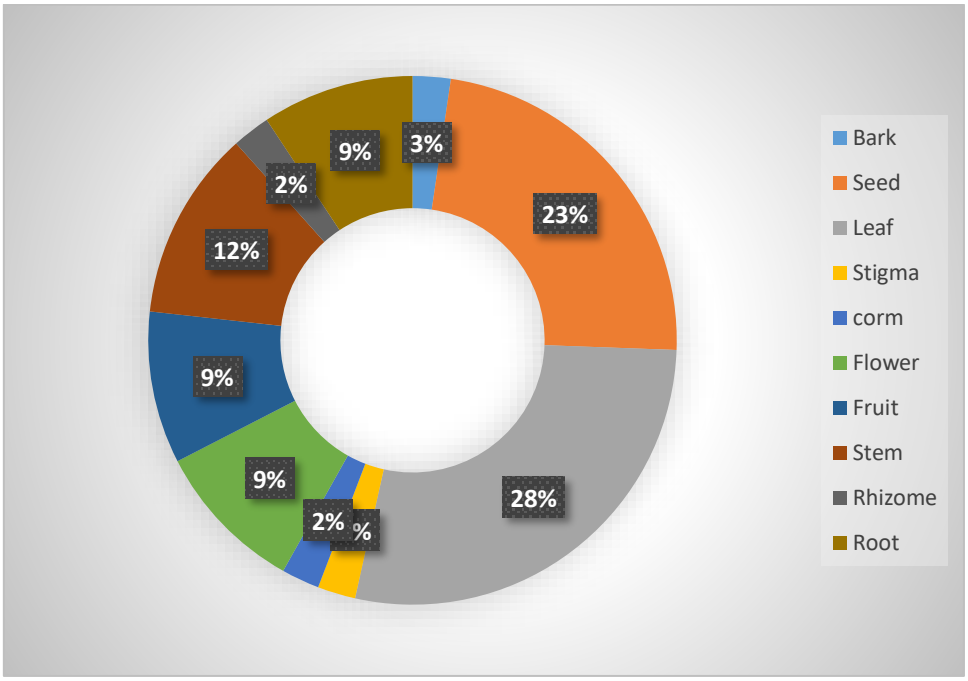

Figure 2: Percentage of plant parts of abortifacient medicinal plants

Based on the analysis of abortifacient mechanisms, the vast majority of these plants exert their effects by stimulating the uterus and enhancing uterine contractions. Some plants also act through direct embryotoxicity, elevated prostaglandin levels, an increased risk of bleeding or miscarriage, and reduced fetal blood supply, while only a few influence pregnancy through hormonal modulation. These findings indicate that physical stimulation of the uterus is the primary mechanism of action for

the studied abortifacient plants, with other effects serving a secondary role.

Discussion

A wide range of phytochemicals present in medicinal plants can influence pregnancy outcomes in diverse ways, from conferring organ protection to exerting potent abortifacient effects. These outcomes vary according to the plant species, dosage, preparation method, and timing of administration during gestation. For example, ethanolic extracts of *Petroselinum crispum* improved renal function in pregnant rats exposed to prostadin-induced abortion by decreasing serum creatinine, urea, and malondialdehyde (MDA) levels and enhancing total antioxidant capacity (TAS) [27]. Such findings underscore the potential of antioxidant-rich botanicals to mitigate oxidative stress in pregnancy.

Clinical observations similarly support therapeutic applications of certain plants. Administration of *Sesamum indicum* powder facilitated the expulsion of retained products of conception while reducing pain and vaginal bleeding in cases of incomplete abortion [28]. These effects may be associated with uterotonic and anti-inflammatory constituents that promote uterine clearance.

In contrast, several medicinal plants exhibit harmful reproductive effects. Sub-toxic aqueous doses of *Crocus sativus* significantly increased abortion rates in rodents, reduced fetal and placental size, and induced morphological abnormalities, particularly at concentrations around 0.8% [29]. These findings highlight the crucial role of dose and gestational timing in determining fetal risk.

Organ-specific interactions further illustrate the complexity of herbal influences during pregnancy. *Zingiber officinale* provided pronounced nephroprotection in dexamethasone-exposed fetal rats, whereas *Matricaria chamomilla* demonstrated superior placental protection [30]. Such tissue-specific outcomes may inform targeted therapeutic uses under controlled conditions.

Although *Ananas comosus* is culturally regarded as unsafe during pregnancy, animal studies indicate that its juice does not induce miscarriage in vivo despite demonstrating uterotonic activity in vitro [31]. This discrepancy suggests the presence of physiological compensatory mechanisms that may prevent uterine contractions from progressing to abortion in intact organisms.

Conversely, *Zingiber officinale* var. Amarum and *Mentha pulegium* exerted potent abortifacient effects, significantly reducing implantation rates, increasing fetal mortality and resorption, and impairing fetal development [32, 33]. These changes corresponded with marked histopathological injuries to uterine and placental tissues, hormonal dysregulation, and heightened inflammatory responses indicating disruption of critical metabolic and genetic pathways essential for fetal survival.

Notably, some botanicals may exhibit dual actions depending on dose. For instance, aqueous-alcoholic extracts of *Foeniculum vulgare* prevented misoprostol-induced abortion at 25 mg/kg [34], a benefit likely linked to its estrogenic and anti-inflammatory properties. Yet high doses of other commonly used herbs, such as *Berberis vulgaris* and *Thymus vulgaris*, suppressed fetal growth and increased resorption rates in animal models [35, 36], reinforcing the toxicological principle that "the dose makes the poison."

Molecular studies add an additional layer of insight, demonstrating that botanical effects extend beyond gestation to early reproductive biology. Callose deficiency in male celery led to abnormal microspore development and complete pollen abortion [30], while in *Syzygium cuminii*, only a single ovule progresses to completion as others undergo genetically regulated abortion [37]. These mechanisms reveal intrinsic plant-mediated control of reproductive success.

Given the physiological, psychological, and social complexities of pregnancy [38–44], awareness of the potential risks associated with consuming medicinal plants particularly those with demonstrated teratogenic or abortifacient effects is imperative for safeguarding fetal and maternal health [45].

Collectively, the available evidence demonstrates that medicinal plants may exert either protective or harmful influences during pregnancy. Outcomes are dictated by species-specific phytochemistry, administration route, dose, and gestational exposure window. Therefore, comprehensive characterization of molecular, hormonal, and histopathological mechanisms is essential to define safe therapeutic thresholds and responsibly integrate herbal medicine into prenatal care without compromising fetal development.

Limitations of this study include a reliance on animal models and the variability inherent in herbal dosages and preparations, which restricts direct result comparison. Despite these constraints, the study's multidisciplinary approach, integrating molecular, hormonal, and histopathological findings to characterize organ-specific and dose-dependent effects, represents a key innovation in understanding herbal medicine use during pregnancy. To fully ascertain safety and efficacy, future investigations must focus on standardized clinical trials, the evaluation of long-term neonatal health, and the characterization of potential interactions between medicinal plants, pharmaceuticals, and gestational hormones.

Conclusion

This comprehensive review of Traditional Iranian Medicine (TIM) literature delineates the broad spectrum of medicinal plants exhibiting abortifacient or fetotoxic properties. Mechanistically, these botanical agents may precipitate pregnancy loss through uterotonic stimulation, endocrine modulation, upregulation of prostaglandin synthesis, or direct cytotoxicity to the fetus. While distinct therapeutic benefits were noted for specific species such as *Petroselinum crispum* and *Sesamum indicum*, others, including *Zingiber officinale*, *Mentha piperita*, and *Crocus sativus*, displayed pronounced abortifacient potential. The toxicological profile of these agents is highly contingent upon dosage, administration route, and gestational age. Consequently, a profound understanding of their physiological interactions is imperative to prevent inadvertent exposure and mitigate irreversible sequelae. These findings underscore the urgent need for rigorous empirical research to define safety profiles and therapeutic windows, thereby facilitating the development of evidence-based guidelines for the safe application of medicinal plants during pregnancy.

Statements and Declarations

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Competing interests

The authors have no competing interests to declare that are relevant to the content of this article.

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

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