Breastfeeding: A Review of Its Physiology and Galactogogue Plants in View of Traditional Persian Medicine

Roghayeh Javan,1 Behjat Javadi,2 and Zohre Feyzabadi3

Abstract

Introduction: The beneficial effects of breastfeeding for the infant and mother are well recognized. Many natural products are reputed to be galactogogue agents in major Traditional Persian Medicine (TPM) textbooks. The aim of this study is to review those medicinal plants that are reported to be effective in increasing breast milk in TPM and to compare the data from TPM texts with the findings of modern pharmacological and clinical research.

Materials and Methods: Data on the medicinal plants used to increase breast milk were obtained from major TPM textbooks. A detailed search in PubMed, Science Direct, Scopus, Google Scholar, and Web of Science databases was performed to confirm the effects of medicinal plants mentioned in TPM on lactation in view of the identified pharmacological actions.

Results: Foeniculum vulgare, Anethum graveolens, Pimpinella anisum, Nigella sativa, and Vitex agnus-castus are among the most effective galactogogue TPM plants. Many pharmacologically relevant activities have been reported for these herbs.

Conclusion: The use of traditional knowledge can pave the way toward finding effective phytopharmaceuticals for increasing breast milk.

Keywords: milk production, breastfeeding, galactagogue plants, Traditional Persian Medicine

Introduction

Breastfeeding is considered the optimal infant feeding method. The World Health Organization (WHO) recommends that infants should be exclusively breastfed for 6 months, and breastfeeding should be continued in addition to complementary feeding up to 2 years.1,2 The beneficial effects of breastfeeding for the infant and mother are well recognized.3 Breastfeeding can be associated with better nutritional and non-nutritional outcomes in comparison with formula feeding.3 The nutritional needs of infants aged 0–6 months can be acquired through breast milk.4 Breast milk improves cognitive abilities, enhances neurological development, intelligence, and immunity, and reduces the incidence of allergic/hypersensitivity diseases, sudden infant death syndrome, obesity during adulthood, and development of type 1 and type 2 diabetes mellitus.5–10

The most common cause of breastfeeding failure is insufficient production of breast milk. Breast milk reduction can occur in many circumstances, such as illness of the mother or the child, mother–baby separation, preterm birth, anxiety, fatigue, and emotional stress. Although milk production can be increased by relaxation techniques and psychological support, many mothers tend to use medications or other products to increase their lactation. Galactagogue medicines, such as metoclopramide, oxytocin, domperidone, chlorpromazine, and sulpiride, are among the current therapeutic strategies in healthy mothers. However, these medications may cause adverse effects, such as extrapyramidal symptoms, arrhythmia, and iatrogenic hyperthyroidism in mother or infant.3

There is a long history of application of natural products to increase milk production.3 Although many studies have been conducted to investigate the galactogogue effects of medicinal plants, no scientific study has focused specifically on the instructions in Traditional Persian Medicine (TPM) for increasing the production of breast milk. The aim of this study is to review medicinal plants recommended by TPM for increasing breast milk and to search for modern pharmacological evidence supporting the traditional use of these plants.
Materials and Methods

In this review, we used a two-step search. The first search aimed at exploring major TPM textbooks to find physiology and etiology of insufficient lactation and medicinal plants recommended for enhancing milk production.

Among the most important TPM texts used in this review were Al-Hawi fi al-tibb (The Liber Continents) by Rhazes (865–925 A.D.), Kamel al-Sanaat al-Tibbiah (The Perfect Art of Medicine) by Majusi Ahwazi (Haly Abbas; 930–994 A.D.), Al-Qanun fi’l-Tibb (The Canon of Medicine) by Avicenna (980–1037 A.D.), Zakhiireh Khazrmshahi by Jorjani (1042–1136 A.D.), and Makhzan Al-Advie by Aghili Khorasani (18th century).

The second search was conducted using electronic databases, including PubMed, Scopus, Google Scholar, Science Direct, and Web of Science (from 1960 to 2016) to find the relevant pharmacological activities supporting the effectiveness of TPM-recommended plants in increasing breast milk. The scientific names or common names of these plants and the keywords—milk production or breastfeeding or lactagogue plants or milk increasing or milk enhancing—were used in this search strategy.

Only studies in the Persian or English language were considered in this study.

Results

Physiology of lactation

Lactogenesis (milk production) is a complex neurophysiological process that involves the interaction of multiple physical and emotional factors along with the action of a number of hormones, mainly prolactin. Prolactin is secreted by the anterior pituitary gland in response to nipple stimulation. It is under inhibitory control from the hypothalamus, which is mediated by dopamine. Dopamine, therefore, has inhibitory effects on prolactin secretion. Some experiments showed that chronic estrogen treatment similarly inhibited the dopamine receptor agonist.

During midpregnancy, a rise in mRNA for milk proteins and enzymes involved in milk formation and secretion occurs. At this stage, estrogen, progesterone, prolactin, growth hormone, and human placental lactogen (HPL) synergize to stimulate mammosgenesis. This secretory differentiation stage is classified as lactogenesis I. At birth, the expulsion of the placenta results in a sudden decrease in progesterone, estrogen, and HPL levels, which consequently causes lactogenesis II in the presence of high prolactin levels. Glucocorticoids also support lactogenesis. Other hormones, such as insulin and thyroxin, are also involved in lactogenesis, but their roles are poorly understood. When the milk supply is securely established, autocrine (local) control begins. In this phase, which is termed “galactopoiesis” or “lactogenesis III,” milk removal is the primary control mechanism for milk production. The lactation process can induce the release of prolactin, glucocorticoids, and oxytocin into the blood. It is established that oxytocin, opioids, serotonin, substance P, histamine, and arginine-leucine, which modulate prolactin, are released through an autocrine/paracrine mechanism, whereas estrogen and progesterone are involved in hypothalamic and adenohypophysial levels. Follicle stimulating hormone (FSH), human chorionic gonadotropin, and luteinizing hormone (LH) are also involved in lactogenesis through the control of estrogen and progesterone, prolactin, and growth hormone production. Oxytocin mainly acts as a powerful galactokinetic hormone by inducing contractions in the smooth muscle layer surrounding the alveoli.

TPM description and physiology of lactation

TPM is a comprehensive system of medicine, with a history of >2,000 years in the diagnosis and management of different illnesses. TPM is based on the concept of humors and temperament—which means the dominant quality of the composite object—results from the interactions between four elements, each of which have specific qualities: fire is hot and dry, air is hot and moist, water is cold and moist, and soil is cold and dry.

According to TPM, dis temperament (Su’e Mezaj) results from imbalances in a healthy temperament and may lead to organ dysfunction and disease. Humor is a fluid originating from the disposition of food in the stomach toward the liver and blood vessels. There are four natural humors in the body, and each of these is related to pairs of qualities: blood (dam) is hot and wet, yellow bile (safra) is hot and dry, phlegm (balgham) is cold and wet, and black bile (sauda) is cold and dry.

In his book Zakhiireh Khazrmshahi, Jorjani states that normal blood is the source of breast milk production. He believes that the blood, semen, and milk have the same source in the body, so medications with the ability to increase the quantity or quality of blood and semen can also increase milk production.

Avicenna believes that breast milk insufficiency has three main etiologies. First, lack of proper nutrients may result in a decline in the quantity or quality of milk. Second, a decrease in the blood volume as a result of bleeding, for example, postpartum hemorrhage, can cause a decrease in milk volume. Lastly, any change in the breast or body temperament may lead to changes in milk quality or quantity.

According to Rhazes, any food or plant that produces moderately hot and wet quality can be effective in the treatment of a decrease in breast milk. He assumes that the consumption of plants with dry and cold (e.g., Rhus coriaria) or excessive hot temperament (e.g., Ruta graveolens) can occasionally worsen the problem.

Medicinal plants used to enhance lactation in TPM

Ten plants from six families have been recommended by TPM to enhance lactation. Traditional information on these plants is given in Table 1.

Pharmacological activities of plants recommended in TPM

Lactation-enhancing effects of medicinal plants recommended in TPM have been studied by a large number of animal investigations as well as some clinical trials (Tables 2 and 3).

Foeniculum vulgare Mill. Fennel is a popular medicinal plant with various pharmacological activities mentioned in TPM and modern phytotherapy. According to TPM scholars, all parts of this plant are used as a galactagogue and diuretic. Pharmacological investigations support the galactagogue activity of fennel. Hydroalcoholic extract of fennel fruits could significantly increase the serum levels of prolactin,
Anethum graveolens L. Dill is a well-known vegetable and has been widely used as a galactogogue in TPM. Pharmacological research investigating the galactogogue activity of dill is scarce. However, in an unpublished investigation, dill alcoholic extract could slightly increase the mammary gland weight in lactating rats. Moreover, it significantly increased litter weight gain and litter stomach weight. Dill seed infusion could increase human uterus contractions in the active phase of labor, suggesting oxytocic-like activity. Taking into consideration the important role of oxytocin in the lactation process, mimicking oxytocin activity would be a possible mechanism for the galactogogue effects of dill. It is noteworthy that linoleic acid, a polyunsaturated omega-6 fatty acid found abundantly in dill, and some of its metabolites such as gamma-linolenic acid and conjugated linoleic acid are important components of breast milk.

Pimpinella anisum L. Anise is an annual plant with white flowers and small seeds, which is cultivated in Iraq, Turkey, Iran, and Egypt. Some of its therapeutic activities, including digestive, anticonvulsant, antiasthma, diuretic, and galactogogue effects, have been considered in TPM texts. Anise essential oil is known to enhance breast milk quantity, facilitating milk secretion and being a diuretic. Anise is a weak estrogenic agent. It also acts as a dopamine receptor antagonist, thereby acting through increasing prolactin secretion.

Nigella sativa L. This herb is commonly called “black cumin” in the West. Black cumin is an annual plant found in various countries bordering the Mediterranean Sea, Pakistan, India, and Iran. Black cumin seeds have long been used in TPM to treat asthma, cough, bronchitis, headache, rheumatism, influenza, and as a diuretic and galactagogue. In an animal study, aqueous (0.5 g/kg) and ethanolic (1 g/kg) extracts of black cumin significantly increased milk production, producing about 31.3% and 37.6%, respectively, more milk than control, in rats.

Vitex agnus-castus L. Vitex agnus-castus is a medicinal plant that has been used in TPM to increase lactation and decrease libido in men. Controversially, in some TPM textbooks, chaste-berry has also been recommended to increase sexual desire in women and suppress lactation. Interestingly, evidence on the effects of chaste-berry on the levels of hormones involved in lactation is also controversial. However, the results of a placebo-controlled clinical study of prolactin secretion in 20 healthy men during a period of 14 days suggest that effects of the chaste-berry extract on prolactin levels are dependent on the dose administered and the initial level of prolactin concentration. At low doses, as have been used in TPM and other traditional medicines,
### Table 2. In Vitro and Animal Studies on Milk-Enhancing Plants Reported from Traditional Persian Medicine

<table>
<thead>
<tr>
<th>Plant</th>
<th>Recommended dosage</th>
<th>Study design</th>
<th>Extract</th>
<th>Findings</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Foeniculum vulgare</em> Mill.</td>
<td>A total of 200 mg/g for 5 days, intraperitoneally</td>
<td>In vivo/mice</td>
<td>Seed/ethanol extract</td>
<td>Significant increase in serum prolactin levels 2.27±0.85 ng/mL compared with control group 1.36±0.51 ng/mL</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Increase the growth of the mammary glands in virgin rats, the composition of milk in pregnant rats, and the secretion of milk in lactating rats</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Seed</td>
<td>Increase nucleic acids and protein concentration as well as the organ weights in both the tissues especially more effective with medium and high doses.</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acetone extracts of seed</td>
<td>Increase in mammary gland weight, litter weight gain, and litter stomach weight in lactating rats</td>
<td>36</td>
</tr>
<tr>
<td><em>Anethum graveolens</em> L.</td>
<td>0.017 mg of alcoholic extract of dill from 15th day of gestation till 11th day of lactation</td>
<td>In vivo/mammary glands in rats</td>
<td>Seed/alcoholic extract</td>
<td>Increasing milk production in rats weight gain in rat pups</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Increasing milk production in rats weight gain in pups</td>
<td>41</td>
</tr>
<tr>
<td><em>Pimpinella anisum</em> L.</td>
<td>One gram per kilogram of aqueous and ethanolic intraperitoneally</td>
<td>In vivo/rat pups</td>
<td>Seed/aqueous and ethanolic extracts</td>
<td>A fractionation of chaste-berry extract resulted in the isolation of dopaminergic bicyclic diterpenes, which could inhibit cyclic adenosine monophosphate formation and prolactin release in rat pituitary cell cultures</td>
<td>42</td>
</tr>
<tr>
<td><em>Nigella sativa</em> L.</td>
<td>0.5 g/kg of aqueous and 1 g/kg of ethanolic extract intraperitoneally</td>
<td>In vivo/rat pups</td>
<td>Seed/aqueous and ethanolic extracts</td>
<td>Increasing milk production in rats weight gain in pups</td>
<td>44</td>
</tr>
<tr>
<td><em>Vitex agnus-castus</em> L.</td>
<td>Extracting 100 g ground <em>V. agnus-castus</em> with ethanol 70%</td>
<td>In vitro</td>
<td>Seed/aqueous ethanol 70% (v/v) extract</td>
<td>Twenty-four hours incubation of GH3/B6 cells in the presence of 50, 100, 200, and 300 μg/mL of β-glucan increase prolactin secretion in comparison with control. Forty-eight hours incubation of GH3/B6 cells in the presence of 100, 300, and 200 μg/mL of β-glucan increase prolactin secretion in comparison with the control.</td>
<td>51</td>
</tr>
<tr>
<td><em>Malva sylvestris</em> L.</td>
<td>A total of 50 to 300 μg/mL of β-glucan for a time period of 24 or 48 hours.</td>
<td>In vitro</td>
<td>GH3/B6 cells</td>
<td></td>
<td>51</td>
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</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Plant</th>
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<th>Study design</th>
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</tr>
</thead>
<tbody>
<tr>
<td><em>Medicago sativa</em> L.</td>
<td>A total of 60 mL of extract from <em>Carum carvi</em>, <em>Trigonella foenum-graecum</em> and <em>M. sativa</em> twice a day (morning and night) for 8 weeks</td>
<td>In vivo/cows</td>
<td>Extract from <em>C. carvi</em>, <em>T. foenum-graecum</em>, and <em>M. sativa</em></td>
<td>Increase of daily milk, prolactin, and insulin levels of control cows had a 20–40%, 12–25.2%, and 3–17% increase, respectively, in comparison with those of placebo</td>
<td>71</td>
</tr>
<tr>
<td><em>T. foenum-graecum</em> L.</td>
<td>A total of 20 to 320 µg/mL</td>
<td>In vitro/MCF-7 cells</td>
<td>Chloroform extracts of fenugreek seeds</td>
<td>Fenugreek seeds stimulated the proliferation of MCF-7 cells, and by binding to ER, acted as an agonist for ER</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>Two doses of genistein, 1 and 10 µg/100 µL/hour intracerebroventricularly from 12.00 to 16.00 hours</td>
<td>In vitro</td>
<td>Chickpeas meal</td>
<td>Plasma prolactin concentrations during and after genistein infusion were also significantly higher than the control</td>
<td>54</td>
</tr>
<tr>
<td><em>Cicer arietinum</em> L.</td>
<td>Intragastric gavage three different doses (20, 50, or 100 mg/kg/day) for 5 weeks.</td>
<td>In vivo/rats</td>
<td>Isoflavones extracted from chickpea sprouts</td>
<td>Estrogenic activities in ovariectomized rats</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>Chickpeas in the concentrate mixture 100–0, 50–120, and 0–240 kg/ton for 12 weeks in three group</td>
<td>In vivo/Chios ewes</td>
<td>Chickpeas meal</td>
<td>No differences in average milk yield, or milk composition in Chios ewes/no affect in growing lambs</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>Chickpeas at 0%, 50%, and 100% of concentrate dry matter from week 4 to week 16 postpartum for lactating Holstein cows</td>
<td>In vivo/cows</td>
<td>Dry chickpeas as a dietary supplement</td>
<td>Higher milk yield for cows fed 100% chickpeas than 0% chickpeas as dietary supplement</td>
<td>73</td>
</tr>
<tr>
<td><em>Hordeum vulgare</em> L.</td>
<td>A total of 50 and 500 µg/mL of barley leaf extract</td>
<td>In vitro</td>
<td>Green barley leaf extract</td>
<td>An analogue of α-tocopherol or vitamin E namely α-tocopherol succinate in green barley leaf extract enhancing the release of growth hormone and/or prolactin from rat anterior pituitary cells</td>
<td>62</td>
</tr>
</tbody>
</table>

ER, estrogen receptor; MCF-7, human mammary cancer.
### Table 3. Clinical Studies on Milk-Enhancing Plants Reported from Traditional Persian Medicine

<table>
<thead>
<tr>
<th>Plant</th>
<th>Recommended dosage</th>
<th>Study design</th>
<th>Extract</th>
<th>Findings</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Anethum graveolens</em> L.</td>
<td>One tablespoon whole dill seed three times a day</td>
<td>Double-blind randomized clinical trial</td>
<td>Ripe, dried fruits/boiling water &amp; alcohol extract</td>
<td>Increase in serum prolactin levels significantly in men and women compared to control group</td>
<td>46, 59</td>
</tr>
<tr>
<td><em>Foeniculum vulgare</em> Mill.</td>
<td>Herbal tea containing 7.5 g fennel seed powder in addition to 3 g of black tea</td>
<td>Double-blind randomized clinical trials</td>
<td>Seed/herbal tea</td>
<td>Improving breast milk sufficiency signs compared to control group</td>
<td>32</td>
</tr>
<tr>
<td><em>Fenugreek</em></td>
<td>One liter of commercial beer (6% alcohol)</td>
<td>Clinical trial</td>
<td>Beer</td>
<td>Increase in antioxidant capacity and coenzyme Q10 content in the breast milk of the study group</td>
<td>64</td>
</tr>
<tr>
<td><em>Hordeum vulgare</em> L.</td>
<td>A total of 800 mL of beer (4.5% ethanol)</td>
<td>Clinical study</td>
<td>Beer</td>
<td>Increase in prolactin levels significantly in men and women receiving a nonalcoholic beer</td>
<td>65</td>
</tr>
<tr>
<td><em>Medicago sativa</em> L.</td>
<td>A total of 660 mL of nonalcoholic beer</td>
<td>Prospective trial</td>
<td>Beer</td>
<td>No significant role in prolactin secretion</td>
<td>54</td>
</tr>
<tr>
<td><em>Malva sylvestris</em> L.</td>
<td>Marshmallow is a medicinal plant used orally as an expectorant and emollient in the treatment of common cold and topically to cure inflammation, abscesses, and breast engorgement. It is, moreover, prescribed to increase milk flow during breastfeeding.</td>
<td>Double-blind randomized clinical trial</td>
<td>Seed/herbal tea</td>
<td>Increase in prolactin secretion in patients receiving a herbal tea containing 3.5–4.2 mg dried extract of <em>V. agnus-castus</em> fruit</td>
<td>22, 25, 26</td>
</tr>
<tr>
<td><em>Trigonella foenum-graecum</em> L.</td>
<td>Alfalfa is a perennial flowering plant cultivated as an important forage crop in many countries around the world. It is used to increase sexual function and semen quantity, produce high-quality blood, and enhance lactation</td>
<td>Double-blind randomized clinical trial</td>
<td>Seed/herbal tea</td>
<td>Increase in prolactin secretion in patients receiving a herbal tea containing 3.5–4.2 mg dried extract of <em>V. agnus-castus</em> fruit</td>
<td>27, 28, 29</td>
</tr>
<tr>
<td><em>V. agnus-castus</em> L.</td>
<td>A total of 120, 240, and 480 mg/day</td>
<td>Placebo-controlled clinical trial</td>
<td>Ripe, dried fruits/boiling water &amp; alcohol extract</td>
<td>In a randomized double-blind study, the daily dose of 20 mg <em>V. agnus-castus</em> did not cause any adverse effects in women with luteal phase defects. In addition, no serious adverse event was observed after receiving two capsules per day containing 3.5–4.2 mg dried extract of <em>V. agnus-castus</em> fruit in women with premenstrual tension syndrome over a period of three treatment cycles. However, nausea and headache were observed after receiving 20–40 mg/day <em>V. agnus-castus</em> for 2 months for the treatment of premenstrual dysphoric disorder. In addition, case reports have documented ovarian hyperstimulation after the ingestion of <em>V. agnus-castus</em>.</td>
<td>40, 41, 42</td>
</tr>
</tbody>
</table>

**References**


**Notes**

- *Fenugreek* and *Trigonella foenum-graecum* are common in Traditional Persian Medicine (TPM) for milk production in mothers.
- *Malva sylvestris* is used in TPM to increase breast milk production.
- *V. agnus-castus* is used in TPM to increase breast milk production, and the results of the clinical trial did not show any adverse effects in women with luteal phase defects or in women with premenstrual tension syndrome.
- The use of *Malva sylvestris* in TPM is supported by historical and clinical evidence, but further research is needed to confirm its efficacy.
- *Fenugreek* is used in TPM to increase breast milk production, and its effect has been studied in clinical trials, showing its efficacy in increasing breast milk production.
- *Trigonella foenum-graecum* is used in TPM to increase breast milk production, and its effect has been studied in clinical trials, showing its efficacy in increasing breast milk production.
- The results of the clinical trial on *V. agnus-castus* did not show any adverse effects in women with luteal phase defects or in women with premenstrual tension syndrome.
- Further research is needed to confirm the efficacy and safety of *V. agnus-castus* in women with premenstrual tension syndrome.
T. foenum-graecum infusion (0.5 g of cut seed macerated in 150 mL cold water for 3 hours); 6 mL of fluid extract (1:1 g/mL) and 30 mL of T. foenum-graecum tincture (1:5 g/mL). But safety in adults does not guarantee safety in infants.

Cicer arietinum L. Chickpea is one of the oldest consumed legumes, grown all over the world, particularly in the Afro-Asian countries. In TPM, it is considered the best edible bean, inducing weight gain and appetite. It has been traditionally prescribed in cancer, liver, kidney, and lung diseases, and can boost libido and enhance milk production.

Oral administration of isoflavones extracted from chickpea sprouts has significant estrogenic effects in ovariectomized rats, as evidenced by increasing uterine weight, restoring the uterine structure, and circulating 17β-estradiol, FSH, and LH levels.

Hordeum vulgare L. Barley is the major cereal crop after wheat, maize, and rice in the world. Barley is widely used as a source of beer production and as a component of various health foods. In TPM, a drink named maolshaeer (nonalcoholic beer) is prescribed to produce high-quality blood and to treat many diseases such as liver and respiratory problems, diarrhea, scurvy, nephritis, bladder inflammation, and goit. In a clinical study, consuming equal amounts of beer and ethanol in normal women showed significant increases in serum prolactin (from 11.6 to 27.1 ng/mL) within 30 minutes of drinking 1 L of 6% ethanol-containing beer. Interestingly, no significant change after drinking 6% ethanol solution or sparkling water was observed. In another study, Carlson et al. gave 800 mL of beer that contained 4.5% ethanol to five men and seven women and an equal amount of nonalcoholic beer to one woman. The prolactin levels significantly increased in all men and women. The subject receiving nonalcoholic beer showed a similar response. Pretreatment of the studied women with naloxone had no effect on prolactin response. These results suggest that phytochemicals other than alcohol are responsible for the prolactin-increasing effects of beer. Badamchian et al. reported that green barley leaf extract contains an analogue of z-tocopherol or vitamin E—namely, z-tocopherol succinate—which has the ability to enhance the release of growth hormone and prolactin from rat anterior pituitary cells in vitro. Tocotrienols and tocopherols are also present in barley seeds and are possibly responsible for its galactagogue effects. Sitosterol, a phytoestrogen isolated from barley seeds, has also been shown to increase spontaneous uterine contractions in rats, suggesting the presence of oxytocic activities.  

β-glucan—a polysaccharide naturally occurring in the cell walls of barley—has been found to significantly increase prolactin secretion in GH3/B6 cells, which are known to secrete prolactin and growth hormone. In a prospective trial in mother–infant dyads, the effects of supplementing the diet of breastfeeding mothers with nonalcoholic beer (maolshaeer in TPM) on oxidative status and antioxidant content of their milk were evaluated. The results indicate an increase in antioxidant capacity and coenzyme Q10 content in the breast milk of the study group compared with the control group. Moreover, a positive effect of nonalcoholic beer supplementation on oxidative status of the mothers’ plasma was also observed.

Discussion

In this study, we explored the most useful galactagogue plants recommended by TPM. Some of these plants, such as anise, black cumin, dill, chaste-berry and marshmallow, are also traditionally used as diaphoretic agents. Prolactin is a peptide hormone synthesized by the anterior pituitary gland. It is secreted into the blood after stimulus on the maternal nipple by sucking.

Galactagogues may act by increasing the production and release of prolactin by direct stimulation of the adenohypophysis. Some galactagogues act either by inhibiting dopamine-producing neurons or by blocking hypothalamic dopaminergic receptors. Chemical components of some plants may act as a lactogenic in ingestion or oral administration. These components can be divided into two categories: pectins and β-glucans. Interestingly, these fragments of pectins and of β-glucans are well-known natural agents with hormonal activity in plants. So, like their role in carrying information for plants, they may be messengers in animal cells.

Plants introduced in TPM contain many chemical compounds, such as phytoestrogens, polysaccharides, flavonoids, tannins, alkaloids, and saponins. Pharmacological studies have shown that phytoestrogens may play a role in increasing the amount of prolactin.

According to TPM, the most significant factor in milk production is the ability to produce high-quality blood. Therefore, proper nutrition plays an essential role in the process of milk production. Using nutritious plants such as chickpea and barley might increase milk production in this way along with other hormonal mechanisms. The oxytocin hormone—which is secreted from the posterior pituitary after sucking—leads to the secretion and ejection of milk. According to TPM, mental stress and tension can quickly affect the amount of milk secretion. It is established that stress and anxiety contribute to decreased milk production by suppressing oxytocin release. Therefore, it is important to avoid maternal stress and negative emotions. As mentioned in the previous sections, according to TPM instructions, the dry temperament of the body and breasts can lead to a decrease in breast milk. Therefore, any factor inducing dryness—such as excessive fatigue, consumption of foods with dry nature and diuretic medications, intense exercise, and heavy massage—may decrease milk production.

Multiple case reports, case series, and pharmacokinetic trials have recently highlighted the possible interactions between herbal medicines and prescribed medicines. Although many of the herb–drug interactions are devoid of serious clinical consequences, some of them may require extreme vigilance. However, only a limited number of animal studies and clinical trials have addressed the herb–drug interactions. V. agnus-castus has been found to interact with prolactin synergistically. T. foenum-graecum has also synergistic effects with anti-diabetic agents and laxatives. It can increase anticoagulant and antiplatelet effects. Medicago sativa may interact with anticoagulant drugs. Therefore, future studies on the herb–drug interactions seem to be required to a great extent.

Conclusion

In light of the long historical usage of the mentioned plants as galactagogue agents and their documented pharmacological activities and lack of serious adverse effects, some of these herbs (especially fenugreek) are widely used as galactagogues. Furthermore, additional pharmacological and clinical studies will open new avenues toward the
understanding of the exact mechanisms through which these plants and their ingredients act.

**Disclosure Statement**

No competing financial interests exist.

**References**


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