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Efficiency of Herbal Galactogogues in Galactopoiesis- A Literature Review

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Abstract:

Breast-feeding is essential for both new-born and nursing mothers. Breast milk provides optimal nutrition as well as immunity to new-born and lifelong health benefits to both mothers and children. But conditions like insufficient milk production or agalactia due to various barriers may cause inadequate nourishment of their babies, weight-loss for neonates, prompting for supplementation with formula feeding. Multiple plants are used as galactogogues worldwide during lactation period. Herbal galactogogues are naturally-derived plant products or herbs that help to augment, maintain and stimulate milk production in lactating mothers e.g cumin, fenugreek, shatavari, moringa, garlic, anise, sesame seeds, fennel seeds, milk thistle ,amaranth etc. The mechanisms of action of herbal galactogogues are different from each other. Some herbs like cumin, moringa, garlic act by stimulating prolactin hormone secretion, increasing mammary gland development and thus enhancing milk ejection reflex. Some of herbs like fenugreek and shatavari exhibit their lactogenic effects by influencing hormonal pathways. Despite of widespread use of traditional herbs there is limited and inconsistent scientific research and evidence on safety, usage, doses and efficacy of these herbs. Some clinical trials show positive impacts e.g increased milk production, weight gain in neonates while others show no significant improvement compared to placebo. By combining traditional knowledge and scientific research and approaches, the therapeutic uses of herbal galactogogues can be increased, thus supporting better and successful lactation results.

Keywords- Breast-feeding, Herbs, Galactogogues, Galactopoiesis.

Introduction:

The word “Galactogogue” was originated from a Greek word “Galacta”which means “milk”and “agogos”, meaning leading or promoting. It is a substance that stimulate, maintain and amplify breast milk production. They can be nature-derived (like foods or herbs) or pharmaceutical (drugs prescribed in certain cases under strict medical supervision)[5,8].

The term “Galactogogue” means any substance that initiate, maintain and augment adequate milk production, whereas the term “Galactopoietic” refers to hormone preparation to induce or increase milk production in an animal already in lactation. Galactogogues produce pharmacological effects by interactions with dopamine receptors and increasing prolactin concentration, thereby augmenting milk production[1,2].

Synthetic drugs include adverse effects on neuro-endocrine axis of lactation physiology and hence their prolonged use may cause toxicity. So researchers have developed their interest in

traditional herbs that are easily available, cheap and with hope that traditional herbs may have less toxic residues in milk[3,5].

Women suffering from insufficient milk production as well as adoptive parents are seeking for therapy with herbal and pharmaceutical galactogogues. Although available information suggests the increasing demand for herbal galactogogues , still there is no available guidance regarding their usage procedure. Even according to the Academy of Breast-feeding Medicine, there is lack of proper evidence to recommend any specific herbal galactogogues[4].

Breast-feeding is essential for newborn and infants, providing all essential nutrients, immune support. Breast feeding has long-term benefits for mothers also. Women who breast-feed their children have lower risk of breast and reproductive cancer. Chances of post-partum weight retention is also lowered in women who breast-feed their children. The WHO (2011) recommended the Exclusive Breast Feeding for up to 6 months[7].

For many new moms, one of the top concerns is milk production. Is the milk production enough? Is the baby getting adequate amount of milk? These questions make the new mothers anxious and restless. After endless Google search, they might know the term Galactogogue - foods, herbs or food supplements that are beneficial for boosting breast milk production. With these natural remedies one have to understand that breast milk production is all about the demand - the more often and effectively a baby sucks breasts , the more milk is produced by the mammary glands in breasts[13,7].

Galactogogues may be little helpful but there is no substitute for effective nursing and pumping routines.

Objectives-

- In this study we will explore about different nature-derived galactogogues, their way of action. We will also seek for popular natural options for increasing milk production.
- We will focus on natural galactogogues that have been used for ages across different cultures to promote lactation. This paper aims to report the possible side effects of natural galactogogues.

Methodology-

- A systematic and depth search was conducted for published papers on the use of galactogogues for breast feeding mothers.
- A comprehensive literature review was performed by using the terms- Galatogogue, Lactogogue, Herbal, Lactation, Breast milk in Pubmed, Scorpus, Google scholar, EMBASE, EBSCO, Science Direct, Web of Science and Data was collected.
- General searches in Google were executed in order to seek for general information on the topic. There was no restriction on publication dates. The reference lists of some peer-reviewed journals were also searched by hand.

Role of galactogogues-

Lactogenesis is a complex neuro-physiological event which is triggered by many hormones, physical and emotional factors. After child birth, the dramatic drop in progesterone and

estrogen and high levels of prolactin stimulate the mammary glands to produce milk. Suckling stimulates oxytocin releaseand causes ejection of breast milk, a process known as "Let-down reflex"[6,13].

Prolactin secretion is regulated both positively and negatively by a hypothalamic inhibitory factor i.e dopamine. When a baby sucks nipple, a neural pathway is triggered that reduces dopamine release from hypothalamus, resulting in prolactin from anterior pituitary and this stimulates milk production. Low dopamine level is linked with the breast milk ejection process[3,11].

Proper and effective nutritional regimen along with the use of herbal galactogogues can augment milk yield synergistically. Herbal galactogogues act by interacting through adreno-hypothalamo-hypophyseal-gonadal axis and augment the milk production by improving prolactin concentration. Some herbal sources like alfa alfa, aniseeds, raspberry act synergistically by promoting appetite, increasing productivity, reducing stress since they are rich in vitamins, minerals and anti-oxidants. Oats, lemon balm, pot marigold,chamomile, marshmallow act as galactogogues as well as carminativesby stimulating the efficiency of food utilization, alleviating adverse effects of environmental stress and thus improving overall animal health. These herbs improve the reproductive health also[5,9].

A) *Naturally Derived Active Compounds from Herbal Galactogogues-*

Phytochemical analysis of many medicinal herbs with organic or aqueous solvents have revealed the presence of many active compounds like – ascorbic acid, risperdal, curcumin, alpha-linoleic acidstearidonic acid, domperidone, glycosides, isoflavones, limonene, bisabolol, essential oils like thymol, asparagamine, eugenol, vanillin etc. These actives contribute to galactopoietics effects. Apart from this, these herbal extracts contain polyphenols which have anti-oxidative, anti-allergic, anti-microbial, anti-cancer, anti-mutagenic, liver-protective, immunity boosting, cardio-protective, hypo-lipidaemic effects[12,13,3].

Phytochemicals present in herbal extracts have been proved to combat oxidative stress by scavenging free radicals and thus play a vital role in augmenting milk production.

A) Herbal Galactogogues found in commercial products-

The mostly used herbs which are commercially used as galactogogues are fenugreek, fennel, milk thistle, goat's rue, moringa, blessed thistle, asparagus. These are widely available in the forms of capsules, teas, powders and tinctures for commercial use[12,6].

Examples of commercial products-

Teas- Various brands like Pink Stork, Organic Mother's Milk Tea, Traditional Medicinals, Earth Mama Organics sell lactational teas consisting of herbs like fenugreek, fennel, blessed thistle.

Capsules and Powders- Products like " Lactare Granules", "More Milk" (Motherlove), "Shatavari Bar" (made with Shatavari and Oats) are available as powders or capsules[14,11].

Commercially herbal galactogogues are available, but still there is lack of clinical trials regarding dosage safety and efficiency in lactating women. Sometimes to maximize the efficiency of galactogogues, herbs are blended with commercial products and sold in market[6,10].

But care must be taken for right dosage and safety of the products since it is concerned with the potency, unregistered ingredients, standardization- some remarkable aspects in herbal marketplace[12,8].

Some Traditional and Scientific Evidence regarding Herbal Galactogogue:

Herbal galactogogues are nature-derived components having the quality of increasing breast milk production. According to WHO around 80% of the populace in developing countries depend on plant based medicines. The role of some herbs as galactogogues are documented below-

1) Amaranth- Amaranth belongs to the Amaranthaceae family. Amaranth is packed with nutrients that are beneficial for nursing mothers such as iron, calcium, protein, vitamins and minerals[3].

According to a study on Amaranthus spinosus, it was found that it contains steroids and polyphenols that increase prolactin levels and stimulate milk production. Leaf extract of A. spinosus when administered to lactating mothers for 14 days, there is an increase in prolactin level in blood, thus stimulating milk production[7].

2) Fennel Seeds-Fennel is a herb that belongs to the family of Apiaceae. The main two essential oils extracted from fennel are Anethole (50-60%) and Fenchone (15-20%).

Studies revealed that consumption of 10% fennel seeds for a period of 20 days helps to stimulate breast milk production by increasing prolactin level[5,9].

The consumption of fennel seeds also antagonize the dopamine action and thereby stimulate prolactin secretion and augment breast milk production.

Although traditionally fennel seeds are used as galactogogues, but they also exhibit estrogenic properties. The clinical evidence of lactogenic effects of fennel seeds is not fully satisfactory[5,7].

3) Milk Thistle- It belongs to the family of Asteraceae. The bioactive compounds i.e. silymarin has significant biological role in promoting breast milk production. The mechanism of its lactogenic action is not yet well-established[7,4].

Various studies showed that the bioactive compound silymarin increases the activity of mammary glands and thereby milk production. Silymarin has been found to increase prolactin levels[9].

Studies have claimed that silymarin has no adverse or toxic effects but its dosage as galactogogue is unclear. It was found to increase prolactin levels when different dosage of the extract as 3,6,9 ml/kg diet was provided for testing. Silymarin is considered to be the safe and effective lactogogue for improving milk production in women during their postpartum period[3,10].

4) Asparagus/ Shatavari- It is a reviewed herb for female reproductive health and it belongs to the Liliaceae family. It contains steroidal saponins that act as phytoestrogens. The phytoestrogens work in the similar way as the estrogen in our body. They increase the growth of prolactin producing cells, also suppress the dopamine secretion and stimulating prolactin synthesis[6,9].

Asparagus also contains tryptophan essential amino acid that stimulate prolactin production, leading to increased milk production.

In Studies, it was found that shatavari shortens the duration of breast refilling process and helps to start breastfeeding early. The safety doses of asparagus are not yet reported. In Ayurveda literature, asparagus has been described as safe when used for long-term lactation[11,15]

5) Fenugreek Seeds- This belongs to Leguminosae family. It contains several coumarin compounds and a few alkaloids. It has been found to stimulate production of sweat and modifies the activity of sweat glands like the breasts.

In various animal studies, fenugreek has shown it's efficiency of 16% higher milk production and increased lactose concentration in milk. Additionally, the role of fenugreek seeds in expressing pituitary-oxytocin axis demonstrates its role in expression of genes involved in milk flow and production[6].

Various studies have confirmed the galactopoietic role of fenugreek on mammals which is helpful in clinical trials in humans. But there is lack of sufficient research on safe dosage and toxicity of fenugreek during lactation[7].

6) Anise- Aniseed or anise popularly known as star anise belongs to the Illiciaceae family. It contains volatile essential oils like trans-anithole and shikimic acid. Star anise have been found to exhibit estrogenic activities in rats study. Estrogen in anise stimulate the growth of milk ducts and increase breast milk production by augmenting prolactin level. Further studies are necessary to study the safe dosage, toixicity of anise as galactogogues[4].
7) Black Cumin- It belongs to the family of Ranunculaceae. The volatile oil of black cumin carries many saturated fatty acids among which thymoquinone is responsible for its galactogogue action. Thymoquinone has been found to stimulate prolactin production[5]. A systematic review of 110 articles revealed the black cumin as milk booster herb since its effects were determined by serum levels of prolactin, changes in mammary gland tissues, milk production and composition. However, further studies are needed to ensure the safe dosage of this plant[7].
8) Sesame seeds- Belonging to the Pedaliaceae family, sesame seeds have shown galactopoietics properties in many animal studies. Many animal studies showed that administration of sesame seeds have been found to improve the size of lobulesb in mammary glands during pregnancy and lactation. Sesame seeds induce mamogenesis in mammary glands by increasing estrogen, progesterone and prolactin hormones[9].

The presence of different vitamins and minerals improve the milk production. Further studies are needed to be executed to research the effects and safe dosage of sesame seeds[11,14].

The galactopoietic effects of some herbs are summarized in the following table.

Table 1: Herbs having Galactopoietic properties

Common name	Botanical name	Parts used	Effects	Reference
Alfalfa	Medicago sativa	Leaves	Estrogenic and lactogenic stimulant, stimulates prolactin release.	[2,8]
Black cumin	Nigella sativa	Seeds	Analgesic, anti-inflammatory, galactopoetic	[4]

Anise	Pimpinella anisum	Seeds	Anti-spasmodic, shows mild estrogenic effects.	[8.11]
Fennel	Foeniculum volgare	Seed	Promote milk ejection, stimulates milk flow, and increases udder milk production.	[[3,7]
Fenugreek	Trigonella foenumgraecum	Seed	Promote milk ejection, stimulates milk flow, and increases udder milk production.	[4,9]
Milk thistle	Silybum marianum	Leaves and seeds	Galactogogue, cholagogue, increase milk supply	[9]
Shatavari	Asparagus racemosus	Root	Increase milk supply and weight of the mammary glands, inhibits involution of lobulo-alveolar tissue and induce milk secretion.	[14,15]
Borage	Borago officinalis	Leaf and flower	Increases blood flow to mammary glands and increase milk production	[9]
Goat's Rue	Galegas officinalis	Dried aerial parts	Stimulate breast growth, improve milk production	[1,6]
Caraway	Carum carvi	Seeds	Galactogogues during post-partum lactational period	[13]

Result and Discussion-

Herbal galactogogues , since used as traditionally validated products, therefore there is lack of adequate clinical trials on herbal galactogogues. Based on the findings presented in the study, the herbs such as fenugreek, milk thistle, black cumin, fennel seeds have been found to have potential benefits in improving breast milk production. However the exact mechanism through which the herbs act still remain unexplored[2]. While many studies proves the positive outcomes of herbal galactogogues in improving prolactin levels and milk production, but the evidences are not still consistent for all studies. Adverse effects of certain herbs have been also found in some studies[7,9].

In the present study, although the positive effects of some herbs e.g fenugreek, cumin, milk-thistle, anise, fennel, asparagus, amaranth on breast milk production have been demonstrated, but their mechanism of action are not known exactly. The knowledge of dieticians, lactation consultants, midwifes should be updated in order to prevent breast milk malnutrition. Further, large-scale research must be conducted to analyze the mechanism of action and fully elucidate the safety and potency of these herbal galactogogues[5].

Galactogogues, which are positively related with increased milk production, their controlled use should be expanded. The knowledge of responsible health personnels should be increased and more rigorous research are required to unclear the points, still unexplored[12,14].

Conclusion-

Lactation failure or agalactia is the physiological condition where there is complete failure or absence of milk secretion after child birth. It occurs due to hormonal deficiency, lack of

protein intake, issues with Let-down Reflex etc. But agalactia must be cured since it disrupts the delivery of basic and essential nutrients to new-born baby. Further, WHO has strictly suggested for Exclusive Breast Feeding for the first six months after the baby is born[3,7].

Lower cost and fewer adverse effects are some of important convenient aspects of using herbal galactogogues. But their use is dependent on traditional knowledge with little or no scientific research data. Standardization of bioactive composition and nutritional data is also required. Although some brands have launched commercial products in the market, but more scientific trials are necessary to evaluate the efficiency and safety of these herbs[6,9].

Limited scientific data are available on the usage of herbal medicines in comparison to synthetic galactogogues. Therefore, further research area for manufacturing herbal formulation for increasing breast milk production need to be projected. Thus herbs mat be utilized as galactopoietics substances and can be made commercially available in the form of supplements[6].

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