Review Article

The Potential Impact of Herbal Galactagogue in India: A Review from Medical Perspective

Shristi Kumari[1], Agatha Silvia Khalkho[1], Annie Jessica Toppo[2,3], Anant Kumar Mehta[1,3], Prachi Sinha[1,3], Aditi Kumari[1,3], Mukesh Nitin[3]

[1]Department of Biotechnology, Marwari College, Ranchi-834001, Jharkhand, India, [2]Department of Biotechnology, Birla Institute of Technology, Mesra, Jharkhand, India, [3]Department of Tech. Biosciences, Digianalix, South Samaj Street, Tharpakhna, Ranchi, Jharkhand, India.

How to cite this article: Shristi Kumari, Agatha Silvia Khalkho, Annie Jessica Toppo et. al. The Potential Impact of Herbal Galactagogue in India: A Review from Medical Perspective. Indian Journal of Public Health Research & Development 2023;14(4).

Abstract

The herbal galactagogues is well-known and acknowledged as substitute approach to boost breast milk production by the general population and medical professionals under insufficient milk lactation case in postpartum women. In order to improve breastfeeding performance, this study examines breastfeeding women's viewpoints and attitudes on using herbal galactagogues while nursing and methods of decision-making. Herbs have been used as galactagogues for a very long time, and many commercial formulations have been created employing herbs. The herbal formulations contain a number of active ingredients, including polyphenols, flavonoids, isoflavones, and terpenes, which give the items a disagreeable taste and reduce consumption. Additionally, a few of these active chemicals become unstable in the presence of the environment. In this regard, many strategies can be used to cover the flavour and improve the stability. Both mother and child benefit physiologically and healthily from breastfeeding. However, issues like insufficient milk ejection can interfere with a mother's ability to breastfeed and may lead her to think about opting for galactagogues.

Keywords: Herbal, Galactagogues, Lactation, Postpartum, Pharmacological, Endangered Species

Introduction

Prolactin (PRL) is well known pituitary hormone. It is of 23-kDa. Its requires for beginning and continuation of lactation. It is important in reproduction, growth, osmoregulation, metabolism, immunological processes, brain behaviour. Drug consumption during pregnancy has side effects which affects mother and foetus, results in congenital malformations. As they can trigger uterine contractions that result in miscarriage, an early birth, or harm to the foetus[1]. Herbal medicines are put through various regulations than prescribed drugs under the Dietary Supplement Health and Education Act of 1994. Exclusive nursing requires a minimum of 480 kcal of energy per day, placing metabolic stress on the mother's physiology. The production of breastfeeding to be increased in order for moms to fulfill their responsibility to breastfeed [2]. The galactagogues + as examples include increased breastfeeding rates include fennel, papaya, green bean juice, and katuk leaf. One of the galactagogues is papaya leaf contain quercetin, which can stimulate prolactin [3]. A group of researchers from Indonesia

Corresponding Author: Mukesh Nitin, Ph.D, Department of Tech. Biosciences, Digianalix, South Samaj Street, Tharpakhna, Ranchi-834001, Jharkhand, India.

E-mail: digianalix@gmail.com

and Malaysia has investigated the administration of papaya leaf to increment the volume of breast milk [4].

Previous evidences says consumption of plants helps infants and mothers beyond milk quality. More than 35,000 plant species and in rural population of our nation uses more than 8,000 herbs, mostly for medicinal purposes. The innate understanding that nature and man are partners in an unbreakable alliance and coexist in the foundation of ancient wisdom [5].

The importance of lactation and its general physiology

Infant and early child nutrition is a key element in improving child survival and development. Lactation promotes development in the first two years of life, lowers mortality and chronic disease. In reality, effective nursing and supplemental feeding could prevent the loss of 220,000 lives each year. The human breast is developed in maturity, to allow milk release to occur after just a short period of hormone stimulation. Oestrogen and progesterone both influence the growth of the tubes and secretory alveoli during pregnancy [6].

Rare medicinal plants as potential galactagogue

***Euphorbia fusiformis* Buch. -Ham.Ex.D.Don**

Euphorbia fusiformis Buch.-Ham. Ex. D. Don- a endangered species found in India. Its available in the areas of Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Telangana, Nagar Haveli, Andhra Pradesh and West Bengal. In Karnataka state, Ramanagara district region's Vaidyas use aqueous solution of tuberous root of *E. fusiformis* can help lactating moms produce more milk. The pups' body weight (or growth) was measured and compared to pups who weren't treated, it was discovered that this plant's ethanolic extract had substantial galactagogue activity. Protein and glycogen concentrations in the tissues of the mammary gland was found to be increased as compared to control. Study by Manna et al., observed treatment with ethanolic extract of root showed a significant enhancement of milk secretion. The abundance of phyochemicals like steroids, terpenoids, glycosides and alkaloids are found in plants [7].

***Leptadenis reticulata* (Retz) Wight & Arn**

L. reticulata is distributed in the areas of Gujrat, Punjab, the Himalayan ranges, Rajasthan. In India, it grows in Rajasthan, Gujarat, Punjab, the Himalayan ranges, Deccan Plateau, Karnataka, Kerala, Sikkim in India. Figure 1 illustrates its distinctive characteristics, which include revitalising, rejuvenating, and lactogenic effects [8].

Due to excessive exploitation of this herb, it came to brink of extinction. The presence of bioactive compounds like α-amyrin, ferric acid, luteolin, diosmetin, rutin, β-sitasterol, sigmasterol, hetricontanol, simiarenol, apigenin, reticulum, deniculatin and leptaculin are responsible for therapeutic properties.Increased prostaglandin levels increase the likelihood of miscarriage, but taking this herbal medicine, leptaden, prevents the disease. The amalgamate treatment with progesterone shows lesser benefits as compared to leptaden therapy. It can also be administered if uterine symptoms lead to abortion [8].

***Alstoniaschlorasis* Linn.**

Alstoniascholaris Linn R. Br., (Apocynaceae) is native tropical tree of Indian subcontinent, Australasia and Malay Peninsula [9]. The bark of this plant is employed as bitter astringent and lactogenic component shown in figure 1. The secondary metabolites found are alkaloids, steroids and triterpenoids. Isolated alkaloids includes nareline methyl ether, nareline ethyl ether, 5-epi-nareline ethyl ether, picrinine, scholaricine and scholarine-N(4)oxide, 12- methoxyechitamidine, 19-hyroxytubotaiwine, 19-epischolarine, and 6,7-seco-angustilobine [10]. *A. scholaris*seeds contains hallucinogenic properties, are induced by the presence of alkaloid like alstovenine, venenatine, chlorogenine, reserpine, ditamine and echitamine[10].

***Euphorbia hirta* Linn.**

In Western, Mid-Western, and Eastern parts of Nigeria; Ghana in West Africa, and India, reported the use of *E. hirta* to treat jaundice, hypertension, anaemia and malaria, cough, asthma, and anti-fertility. The plant has been reported to be used in aphrodisiac, to facilitate childbirth by traditional birth attendants, and induce lactation as a galactagogue [11]. Studies

done by Koko et al., 2019 found that dosage of 200 mg/kg in animal model produced 39.38±1.5g of milk as compared to control which was 28.05±0.57 g.

Enhancement of the lobuloalveolar system is another way to see the galactagogue activity. These rats received different doses of *E.hirta* aqueous extract (EHae). The rat's lobualveolar system developed as a result of the administration of 200 mg/kg of EHae[12].

***Fritillaria cirrhosa* D. Don**

F. cirrhosa D. Don is a perennial herb belongs to the group Astavarga[13]. Astavarga is a collection of 8 therapeutic plants that are used in Himalayan traditional medicine (TMK). It belongs from the family of Liliaceae and critically endangered species [14]. It has ability to cure haematemesis, tuberculosis and rheumatism and to decrease pain in pregnant woman. It also has unique properties like refrigerant, diuretic, galactagogue, and aphrodisiac shown in figure 1 [15].

Some medicinal plants as potential galactagogue

***Trigonella foenum graecum* Linn.**

Fenugreek is a typical leguminous herb cultivated in India (Trigonella foenum-graecum). Fenugreek seeds are a great supply of galactamannan. The following bioactive substances are present: diosgenin, trigonellin, and galactomannan [16]. Pharmacological characteristics include galactagogic, antidiabetic, hypolipidemic, carminative, and gastric stimulant action [17].

In previous studies, observed that production of breast milk within first two weeks of postpartum [18]. An experimentation done by El Sakka et al., provided tea with fenugreek to 66 women, apple tea or no supplement to placebo or control. In result they found mean volume of milk got doubled (73 ml) in fenugreek group than placebo (39 ml) and control (31 ml) [19].

***Gossypium haebaceum* Linn.**

Gossypium is one of the significant member of Malveaceae family. It is used to make food and medication. As effective painkillers and cotton are both used. The feeding of cotton seeds to buffaloes increases milk output compared to commercial mixtures (significance P <0.01)[20].

***Moringa oleifera* Lam.**

M. oleifera Lam. is a deciduous tree with sparse foliage [21]. In the experimentation of Raguindinet al., found significant increment in milk production in 6 randomised controlled trials induced by *M. oleifera*. This study inferences two things 1) increase in prolactin levels 2) improvement in infant's weights. Various studies found that *M.oleifera* has no toxicity or side effects over mother or infants. In previous studies it was noted that patients induced with *Moringa* has eminent level of prolactin 19.5 · 102 mIU/L. This experimentation hypothesised that *Moringa* induces production of prolactin in the anterior pituitary gland [22].

***Carica* papaya leaf**

Quercetin present is one of the bioactive compound in papaya leaves and results in increment of breast milk shown in figure 1. This characteristic makes its natural galactagogue [23]. According to Herawati et al., leaves have a significant impact on the expression of the prlr gene, which increases the number of breast alveoli. The ethanol extract of *C. papaya* leaves in this research affected 81.5% of the breast alveoli in mice, increasing milk production [24]. Other plants employed as natural galactagogue are shown in Table 2.

Table 1: Some common herbal galactagogue

Plants	Reference
Nigella sativa L.	[25]
*Asparagus racemous*Willd.	[26]
Ipomoea digilata Linn	[27]
Lipidium sativum L.	[28]
Foeniculum vulgare Mill	[29]
Silybum marianum(L.) Gaertn.	[30]
Rubus idaeus L.	[31]
*Cnicusbenedictus*L.	[31]

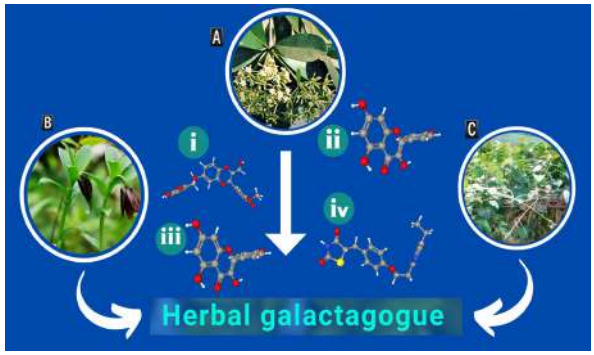

Figure 1: Herbal galactagogues (A) Flower of *Alstoniaschlorasis* (L.) (Bhandary et al., 2020) (B) *Fritillaria cirrhosa*D. Don (https://

eol.org/pages/1088491 national museum of natural history (Smithsonian) (C) Creepers of *Leptadenisreticulata*(Retz) Wight &Arn (Mohanty et al., 2017) Secondary metabolites as galactagogues (i) Silibinin (ii) Kaempherol (iii) Quercetin (iv) Taxifolin (PubMed)

Pharmacological galactagogues

In previous studies, during evaluation of galactagogue two major factors are highlighted. Firstly, principles of evidence-based medicine, which consist of blinding, randomisation and placebo control. Terms for selection of patients includes, mothers were feeding through breasts or pumps, infant's age, experience of feeding, etc[32]. Secondly, lactation management regulations should be followed.

Table 2: Commercial galactagogue and its side effects

Drug	Side Effects	References
Metoclopramide	anxiety, tiredness, nausea, vertigo, headache,hair loss	[33]
Domperidone	cardiac arrhythmia, cardiac arrest	[33]
Sulpiride	sedation, insomnia, restlessness, impaired concentration, weight gain, depression, xerostomia.	[34]

Things to ponder

Due to numerous side effects and low capability of synthetic drugs, people start seeking alternatives in nature.But many questions come up in people's minds throughout this procedure. These are: 1) the ability of phytochemicals and secondary metabolites, which are recognised as nutritional supplements in breast milk production, to close the knowledge gap. 2) Clinical trials should replace in vitro model testings as the next step in the study. 3) In addition to giving breastfed infants our undivided attention, immune and anti-inflammatory factors should be considered in study.4) The study of these galactagogues' toxicity and safety should be given top precedence. 5) Traditional knowledge and oral history should not be disregarded, despite current advances in scientific study.. This helps us to understand the plant usage to improve health especially mothers and our future generations.

Conclusion

The micro and macronutrients found in plant-based supplements can help lactating women and their babies' wellbeing. Future research should focus on the isolation and discovery of active metabolites to better understand the mechanism of these natural galactagogues. To ensure the administration of these bioactive compounds, the toxicity test of these galactagogues should be treated very seriously.

Ethical Clearance: No human or animal samples were taken for this research studies.

Conflict of Interest: There is no conflict of interest from the authors.

Source of Funding: No special funding was allocated for this article.

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