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A review on *Mundi* (*Sphaeranthus indicus* Linn) - Its medicinal value in Hypothyroidism

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ABSTRACT

Thyroid dysfunctions are the most common endocrine abnormalities of which major ones are hypothyroidism and hyperthyroidism. Hormone replacement therapy has been a standard approach to thyroid dysfunction. However, herbal approach to treatment of thyroid dysfunction is gaining popularity as it is said to be equally effective, safe and devoid of any side effects. The synthesis and transport of thyroid hormones play a vital role in the normal physiology and functioning of thyroid hormones. HPT axis with its negative feedback mechanism helps in maintaining normal hormone levels. The level of TSH is the primary indicator of hypothyroidism and a thorough evaluation is needed to know the pathology behind before starting hormone supplementation therapy. Hashimoto's Thyroiditis and Autoimmune Thyroiditis are the two main pathogenesis involved in the manifestation of hypothyroidism. While analysing the signs and symptoms of hypothyroidism in Ayurvedic view, It can be understand with the involvement of all *Srotas*. The *Kaphadosha* and *Vatadosha Vruddhi* is elicited and *Pitta Doshakshaya* is seen. Though some physicians consider it as a *Sthanikavyadhi* under *Galagandaroga*, it's *Dushti Lakshanas* are seen in whole body. Ayurvedic system of medicine has been very effective in maintenance and treatment of hypothyroiditis. *Mundi* (*Sphaeranthus indicus* Linn) is one such drug which is endowed with properties like *Gandanashini*, *Vatasleshmahara*, *Agnikruth* and *Rasayana*. This review aims at providing comprehensive information regarding *Mundi* (*Sphaeranthus indicus* Linn) used in Ayurveda acting towards correction of thyroid dysfunction.

Key words: *Hypothyroidism, Hashimoto's thyroiditis, Autoimmune thyroiditis, Galaganda.*

INTRODUCTION

Thyroid disorders are most common in all endocrine disorders. Prevalence about 42 million in the world have thyroid disease.[1] The function of thyroid gland under normal condition is to maintain body metabolism. The failure of these hormones to maintain normal metabolic rate in body produced two most common conditions either hypothyroid or hyperthyroid. Hypothyroid is a most common among thyroid disorders. The global incidence of hypothyroidism is increasing as the thyroid gland easily responds to stimuli like stress and anxiety. Recent statistical study reveals that the iodine deficiency is the most common cause of hypothyroidism. According to World Health Organisation, 2 billion people are iodine deficient worldwide, the relative iodine deficiency causes Goiter and severe deficiency causes Hypothyroidisim & Cretinism. On the other hand over supply of iodine results in autoimmune thyroid disease. Females are more affected than males. The incidence rate is more in women than men in the ratio of 6:1.

Hypothyroidism generally describes an under-active thyroid that does not produce enough thyroid

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hormones causing an overall decrease in physical and mental activity. The disease is more prevalent in females around 6-8 times, between 40-50 years. Hypothyroidism can result from a defect anywhere in the hypothalamic-pituitary-thyroid axis, either insufficient

TSH from the pituitary or insufficient TRH from the hypothalamus.[2] In the vastmajority of cases, it is primary hypothyroidism, which is decreased secretion of thyroxine (T4) and triiodothyronine (T3) by the gland itself, which results in a compensatory increase in TSH secretion. Thus, the combination of a low serum T4 and a high serum TSH concentration both confirm the diagnosis of hypothyroidism.

Mundi (*Sphaeranthus indicus* Linn) is herb used in traditional medicine in India for a long time to cure the *Galaganda, Apachiroga* and the disease which is originated in the neck region. According to *Bhavaprakasha Nighantu* it has the properties of *Laghu, Teekhna, Ushna* and *Tikata, Katu, Madurarasa, Ushna In Veerya*, and pacify the *Vatakapha Dosha,* It has *Katuvipaka* (undergoes pungent taste after digestion) and it is considered has a best *Dravya* for *Galaganda,*[3] *Apachi*, other *Gala Roga* (Diseases originates from the root of anterior aspect of neck region).

Distribution

Plant is found throughout India, at an altitude of 1500m, in the hills, especially as a weed in the rice fields. The species is occurring at a rate of Chindwara District M.P. It is also found in the moist damp places of tropical zones of Garhwal Himalayan region.

Botanical description

Mundi is locally known as *Bodukadale* and *Tarapu*. It is a glandular hairy herb with many branches, up to 30-75cm tall and it is belongs to the Asteraceae family.

Description

Macroscopic[4]

Root: Pieces 5 to 15cm long and 0.3 to 0.5cm thick, a few branching, smooth, slender, somewhat laterally flattened, greyish-brown, fracture, short, odour, not characteristic, taste, slightly bitter.

Stem: Pieces 10 to 30cm long, 0.2 to 0.4cm thick, branched, cylindrical or somewhat flattened with toothed wings, rough due to longitudinal wrinkles, externally brownish – black to brownish – green, internally creamish-grey, fracture, fibrous, odour nil, taste bitter.

Leaf: Sessile, recurrent, 2 to 7cm long, 1 – 1.5cm wide, obviate-oblong, narrowed at the base, dentate or serrate, hairy, greenish-brown, odourless, taste, and bitter.

Flower: Globosely, head about 1.5cm long and about one cm in diameter, purplish-brown with linear involucres bracts which are shorter than the head and ciliate at apex, peduncle with toothed rings, outer female flowers 12 - 16, inner bisexual 2 or 3, corolla female 2-toothed, ovary, inferior, carpel's 2, style arms connate.

Fruit: Achene, smooth, stalked.

Main causes of hypothyroidism[5]

The main causes of hypothyroidism can be classified into:

1. Primary hypothyroidism - The most common cause of primary hypothyroidism is Iodine deficiency, AITDs (Autoimmune thyroid diseases), Iatrogenic causes, drugs, congenital etc.
2. Secondary hypothyroidism (due to pituitary TSH deficit).
3. Tertiary hypothyroidism (due to hypothalamic deficiency of TRH).

Pathogenesis

Thyroid hormone is required for the normal functioning of each and every tissue of the body, hence deficiency manifest as multi system involvement. The daily requirement of iodine recommended is 150ug/day, when there is iodine deficiency. The thyroid compensates by increasing the iodine trapping mechanism and synthesis of hormone under the influence of TSH. This results in diffuse

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enlargement of the gland, which later on becomes multinodular. The onset and progression of disease is very gradual, the basal metabolic rate (B.M.R.) is decreased, deposition of haluronidase in dermis and all tissues and hence leading to non-pitting oedema i.e. myxoedema, which is the result of long lasting hypothyroiditis.

Classification of hypothyroidism

The criteria used to establish this classification are summarized in table.

Grade	Clinical features	Biochemical features
Overt Hypothyroidism	Obvious C/F	Major elevation of TSH & low T_4
Mild Hypothyroidism	Non-specific symptoms	Increased TSH, T_4 normal remit with thyroxin therapy.
Sub clinical	No symptoms	Elevated TSH, T_4 is normal.

Symptoms

Hypothyroidism is one of the most undiagnosed and misdiagnosed diseases, the symptoms of hypothyroidism are quite variable, depending on the severity of the hormone deficiency and of course one's constitutional make-up. Weakness, malaise, lethargy, and weight gain, periorbital puffiness are the early symptoms. It is followed by cold intolerance, loss of hair, dry and scaly skin, nails become brittle, and hoarseness of voice and slowness of speech, constipation, Irregular cycle, PCOD and infertility.

Ayurvedic perspective on hypothyroidism

There is no direct mention of the thyroid gland in Ayurveda, but a disease by the name *Galaganda*, characterized by neck swelling, is well known. The first description of neck swelling was mentioned in *Atharva Veda* by the name *Apachi*. *Charaka* mentioned the disease under 20 *Sleshma Vikaras*. *Sushruta* (renowned ancient Indian surgeon) in *Shareera Sthana* has mentioned that of the seven layers of the skin, the sixth layer *Rohini* is the seat of *Galaganda,* In *Nidana Sthana,* he described *Galaganda* as two encapsulated small or big swellings in the anterior angle of the neck, which hang like scrotum, where as *Charaka* mentioned *Galaganda* as a solitary swelling.[6]

The climatic conditions, water supply, dietary conditions, etc., are mentioned as the main aetiological factors. *Sushruta* stated that *Himvatprabhava* rivers might give rise to the occurrence of *Galaganda*. *Bhela* described that *Sleepda* and *Galaganda* are more common in *Prachyadesa* (eastern part) of the country, and that persons consuming predominantly fish are liable to develop *Galgaganda. Harita Samhitakara* described the role of *Dushtambu* (contaminated water) and *Krimidosha* (infection) in the precipitation of *Galaganda. Kashyapa Samhitakara* added that any part of the country that is cold, damp, with densely grown long trees, water stagnation and heavy rains may be prone for the development of *Galaganda.*

From the above descriptions it is attempting to associate *Galaganda* with hypothyroidism. Where thyroid functions may or may not be compromised. But hypothyroidism is not just a localized disease. It has many symptoms related to many systems of the body. Thus it is probably inaccurate to draw a parallel between hypothyroidism and *Galaganda*.

In Hypothyroidism production of thyroid hormones reduces which decrease body metabolism and rise to any sign and symptoms like, dry skin and hair, weight gain, constipation, joint and muscle pain, fatigue, depression, etc. Thyroid hormones maintain proper metabolismin the body, it can be correlated with the action of *Agni*. Normal *Agni* is maintaining the body metabolism. *Jatharangni* is maintaining digestion and absorption of food. *Bhutagni* is responsible for a transformation of heterogeneous substances and *Dhatwagni* located in the body tissue. Normalcy of body is depending upon proper metabolism of body.

Hypothyroidism significantly increases free radical production.These free radicals interact with body material and destruction occurs. In Hypothyroidism

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metabolic insufficiency occurs due to low thyroid hormone, so that excessive production of free radical occurs. *Rasayana* interact with these free radicals and oxidation decreases. *Rasayanas* like *Mundi* (*Sphaeranthus indicus* Linn)is effective against free radical and also increases *Agni* so that it can be useful in hypothyroidism.

Classical reference of *Mundi*

Nighantus	***Varga***
Charaka Samhitha[7]	*Rasayana, Madura Skanda*
Sushrutha Samhitha	*Surasadi Gana*
Astanga Hridayam	*Madhura Skanda, Surasadi Gana*
Bhavprakash Nighantu[8]	*Guduchyadi Varga*
Kaidev Nighantu	*Ausadhi Varga*
Madanpal Nighantu	*Abhayādi Varga*
Saligram Nighantu	*Guruchyadi Varga*
Raj Nighantu	*Parpatadi Varga*
Priya Nighantu	*Satapuśpadi Varga*
Nighantu Adarsha	*Sahadevyadi Varga*

Vernacular names[9]

Sanskrit	*Mundi, Shravani, Palankasha.*
Kannada	*Bodukadale*
Hindi	*Gorakmundi, Mundi*
English	East Indian globe-thistle
Tamil	*Kottakkarandai*
Telugu	*Bodasoram, Bodatarapu*
Gujarathi	*Bodiokalara, Gorakmundi*
Bengal	*Chagulnadi, Ghorakmundi.*
Punjabi	*Gorakmundi, Khamadrus, Ghundi*
Malayalam	*Adakkamanian, Attakkamanni*
Marathi	*Barasavodi,Mundari,*

Bheda/Varities

Mundi and *Mahamundi*	Bhavaprakasha Nighantu
Shravani and *Mahashravani*	Dhanvantari Nighantu[10]
Shravani and *Mahashravani*	Raja Nighantu[11]
Mundika and *Alambusha*	Chakrapani Datta

Properties and Action of *Mundi* according to different Ayurvedic Text

Bhavprakash Nighantu

Rasa - Madhura, Guna - Laghu, Virya - Usna, Vipaka - Katu.

Rogagna Karma - Gandagna, Sleepada, Mutrakriccha, Yoniroga, Pandu ,Pleeha, Krimi, Aruchi.

Dhanwantar Nighantu

Rasa - Katu, Tikta, Guna - Laghu, Ushna, Virya - Usna, Vipaka - Katu.

Rogagna Karma - Gandagna, Sleepada, Apasmara, Amadosha, Raktadoshahara

Kaiyadeva Nighantu[12]

Rasa - Madhura, Kasaya, Tikta, Katu. Guna - Laghu, Virya – Usna, Vipaka - Katu.

Rogagna Karma - Apachi, Gandagna, Sleepada, Apasmara, Mutrakriccha, Pandu, Pleehagna.

Madanpala Nighantu[13]

Rasa - Tikta, Guna - Laghu, Virya - Madhur, Vipaka - Katu.

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Rogagna Karma - Apachi, Gandagna, Krimi, Apasmara, Mutrakriccha, Pandu, Amavata.

Shaligram Nighantu

Rasa - Katu, Madhura, Virya - Usna,Vipaka - Katu.

Rogagna Karma - Apachi, Gandagna, Pleehagna, Apasmara, Mutrakriccha, Pandu, Yoniroga.

Raja Nighantu

Rasa - Kasaya, Guna - Ushna, Laghu, Virya - Ushna, Vipaka - Katu

Rogagna Karma - Apachi, Vishagna, Apasmara, Mutrakriccha, Yoniroga.

Priya Nighantu

Rasa - Tikta, Kashaya, Guna – Lagu, Virya – Usna, Vipaka - Katu,

Rogagna Karma - Apachi, Gandagna, Vrana, Vidradi, Amatisara, Pandu, Yoniroga.

Nighantu Adarsha

Rasa - Madhura, Katu, Tikta, Kasaya, Virya - Usna, Vipaka - Katu.

Rogagna Karma - Gandagna, Sleepada, Apachi, Apasmara, Mutrakriccha, Yoniroga.

Dosage

- **Swarasa:** 10-20ml
- **Choorna:** 10 -12gms
- **Kwatha:** 50-100ml

Parts used: *Panchanga* (whole plant)

Properties as mentioned in API[14]

- *Rasa : Katu, Tikta*
- *Guna : Laghu, Rukshya*
- *Virya : Uṣhna*
- *Vipaka : Katu*
- *Karma : Vatakaphahara, Gandagna, Medhya, Agnivardaka, Kaphapittanut, Rucya, Swarya, Hṛidya, Rasayana, Vishaghna.*

Plate 1: Images of *Mundi* (*Sphaeranthus indicus* Linn.)

Leaves and Flower

Whole Plant

Dry Plant

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Chemical constituents[15]

Leaves	Maltose, Carbohydrates, Ocimene, Monoterpene, Arabinose–D, Geraniol, Rhamnose, Flavanoid, 7- 0- Beta- D-Galactoside, Cadinene, Sesquiterpene, Frullanoide, Ilicicacid, Sphaeranthanolide.
Stem	Glucose, Fructose-D, Flavone, Diglucosides, Hydroxy Eudesmanolides,
Flowers	Sphaeranthene, Sesquiterpene, *Sphaeranthus* lactone 2, 3 *Sphaeranthus* Peptide alkaloid 1, *Sphaeranthus* sesquiterpene1, Frulanolide
Entire Plant	Eudesmonolide, Flavane, Flavanoid, Indicusene, Sesquiterpene, Sphaeranthene eudesmalide2, *Sphaeranthus* Lactone1, Terpinene Alpha, Monoterpene, Frullanolide, Estragole
Essential oil	Cholesta -5-22-Dien- 3 Beta sitosterol, Monoterpene, Eudesmolide, Sesquiterpene, Gerahiolacetate, Sphaeranthuse duesmanolide. Eudesm -4-En-6-12-olides.

Pharmacological action

Yoga	**Indication**	**Reference**
Mundi Swarasa [16]	*Galaganda, Apachi*	C.D Galagandaadikara
Munditaka Choorna	*Galaganda, Vatarakta*	C.D Vataraktaadikara
Shravanyadi Gritam	*Gandaapachi, Vatarakta*	A.H Chi 22/15
Alambusha Qwata	*Apachi, Gandamala*	Sha.m.Kh 17

CONCLUSION

Mundi is an abundantly available medicinal drug. Its utility is mentioned in the classics in the form of *Swarasa*, *Kashaya* and *Gritha* can be widely adopted in the treatment of hypothyroidism. As *Mundi* is attributed with *Agnideepana Karma* because of its *Ushna Guna*,[17] in turn corrects the *Dhatwagni* and regularize basal metabolic rate. It is having *Tikta, Katu, Kashaya Rasa* which will counteract *Pravrudda Kaphadosha. Laghu, Ruksha, Ushnaguna* reduces *Mamsa, Medodhatu, Ushna Veerya* and *Madura Rasa* will pacifies *Prakupita Vata* and *Pitta Dosha* and is considered to have *Rasayana Karma* which is effective against free radical and also increases *Agni* so that it may increases the basal metabolic rate. Due to the presence of flavonoids in *Mundi*, it will enhance thyroperoxidase enzyme activity and in turn increases the Ft3 and Ft4 hormones levels. As it has Tri terpinoids, there is 10.59 fold increases in plasma Ft3, 8.65 fold increases in Ft4 and 3.59 fold decreases in TSH. Beta sitosterols, glycosides, eugenol, lupeols are proven to be anti-hypothyroid agents, hence researches are to be carried out to test the efficacy of *Mundi* clinically and it is compatible to the body and more effective in treating the hypothyroidism.

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