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REVIEW ARTICLE

CLASSICAL AND CONTEMPORARY REVIEW ON *MARUBAK* (*OCIMUM BASILICUM* L.): AN UNEXPLORED POTENTIAL AYURVEDIC HERB

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ABSTRACT

Ocimum basilicum L. of family Lamiaceae is an aromatic plant native to tropical regions from Central Africa to Southeast Asia. In Ayurvedic classics the plant is appeared by the name of *Marubak* and *Phaninjak*. The plant is widely used for culinary purposes. Thus the plant is in use as medicine and functional food. Several dosage forms of the plant are ascribed in Ayurvedic classics for the management of various diseases such as *Jwara* (fever), *Kustha* (skin diseases), *Krimi* (worm infestation), *Apasmara* (epilepsy), *Kasa* (cough), *Swasa* (asthma), *Pratishyaya* (rhinitis), *Visha* (poison) etc. The drug is also mentioned as a leafy vegetable (*Shaka Varga*) in Ayurvedic treatise. The plant is reviewed many times for its contemporary aspect but the Ayurvedic aspect of the plant is still not reviewed systematically. Thus an attempt is made to identify and report the classical Ayurvedic aspect of *Marubak* from Veda, *Samhita*, *Chikitsa Granth* and Ayurvedic *Nighantus* (Ayurvedic lexicons) along with its contemporary reviews from various journals.

Keywords: *Ocimum basilicum*, *Marubak*, *Phaninjak*, *Ayurveda*, *Shaka Varga*.

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INTRODUCTION:

Medicinal plants are the backbone of traditional medicine. Plants have been used for medicinal purposes since prehistoric period. In Ayurveda classics, several medicinal plants and their indications in different diseases are mentioned. In herbal industry, plants are used for medicinal purposes as well as for food preservation, cosmetic science, pharmaceuticals etc. The plant *Marubak* is widely stated in ancient *Samhitas*. Botanically the plant was taken as *Ocimum basilicum* L. from Lamiaceae family. The plant is commonly known as "Sweet Basil". It is a perennial undershrub which is native to Indian subcontinent and cultivated throughout Southeast Asian tropics[1]. It is an aromatic shrub which is mainly cultivated for its culinary purposes. More than 150 species of *Ocimum* are currently available throughout the world and 6 species are available in India[2]. Several contemporary review articles of the plant are presently available. The plant is reported to possess various biological activities such as anti-depressant (*avasadhara*)[3], antimicrobial (*krimighna*)[4], anti-inflammatory (*sothahara*)[5], anti-oxidant[6], anti-ulcer (*vranahara*)[7], anti-fungal (*jantughna*)[8], anti-bacterial[9], anti-plasmodial[10]. Wound healing activity (*vranaropak*) of the plant has also been proved[11]. However the Ayurvedic aspects on the plant *Marubak* will not disclosed yet. Several activities mentioned in Ayurvedic classics had been proved. Additional properties and actions which are stated in Ayurvedic classics were still unexplored.

MATERIALS AND METHODS:

The literature review has been carried from Vedic era, all Ayurvedic classical text books including *Charak Samhita*, *Sushrut Samhita*, *Bhela Samhita*, *Kashyap Samhita*, *Ashtanga Samgraha*, *Ashtanga Hridaya*, *Chakradatta*, *Vangasena* and *Bhavaprakash Samhita*, *Ayurvedic lexicons* including *Amarkosha*, *Saushrut Nighantu*, *Ashtanga Nighantu*, *Dhanvantari Nighantu*, *Nighantu Sesha*, *Siddhamantra Nighantu*, *Madanpal Nighantu*, *Kaidev Nighantu*, *Bhavaprakash Nighantu*, *Raj Nighantu*, *Nighantu Adarsha* and *Priya Nighantu*. The contemporary review on the plant was done from indexed journals, books etc. The gathering information has been summarized and has critically reviewed.

OBSERVATIONS:

1.1. Vernacular Names

Sans.- *Marubak, Phaninjak, Jambeera, Prasthapushpa, Sameerana, Kharapushpa, Kharapatra*, Hindi- *Marua, Marwa*, Bengali- *Murru*, Telugu- *Marvamu*, Tamil- *Marru, Maruvu*, Gujarati- *Marvo,* Kannada- *Maruga*, Malayalam- *Maruvanu*, Kumaun- *Bantulsi*, Deccan- *Murwa*, Marathi- *Murwa* [12].

1.2. Taxonomical classification

Botanical name: *Ocimum basilicum* L.

Family : Lamiaceae

English name : Sweet basil

Kingdom – Plantae

Subkingdom – Tracheobionta

Superdivision – Spermatophyta

Division – Magnoliophyta

Class – Magnoliopsida

Subclass – Asteridae

Order – Lamiales

Family – Lamiaceae

Genus – *Ocimum* L.

Species – *Ocimum basilicum* L [13].

1.3. Botanical description

It is a perennial under-shrub of Lamiaceae family. Leaves are 1-2 inches long, 1-2 cm in width, simple, opposite, glabrous, ovate to oblong in shape. Both the sides of the leaf are pubescent. Upper part of the leaf is dark green and lower part of the leaves is light green. Leaves are petiolated. The margin of the leaf was dentate or serrate. Stem was reddish in color, hairy and multi-branched. Stems are quadrangular in shape, glabrous or pubescent. Root is woody, darkish brown in color, approx. 4-5cm in length with root hairs and fibrous on fracture. Flowers are purplish white in color. The no. of sepals and petals are five. Flowers are present in whorls on simple or branched racemes; bracts petiolated. This plant possesses verticillaster type of inflorescence. Fruits are Capsular, brown in color, 2-5mm in length. Seeds are black in color, Oval in shape, 3.1mm length and 1.8mm in width. It became mucilaginous when dipped in water[14],[15],[16].

Flowering and Fruiting: Almost throughout the year[17].

Edible plant parts: Leaves, inflorescence, fruits and seeds.

1.4. Distribution & Habitat

Sweet basil is indigenous to Persia and Sindh and lower hills of Punjab in India. It is cultivated throughout Southeast Asian tropics[18].

1.5. Classification according to Ayurvedic literature

Table 1: Showing classification of the plant *Marubak* [*Ocimum basilicum* Linn.] according to *Varga* in Ayurvedic Classics

Ayurvedic Classics / *Nighantu* (Ayurvedic lexicons)	***Varga***	**References**
Sushrut Samhita	*Surasadi Gana, Shaka Varga*	*SS.SU.* 38/18, 46,221
Ashtnga Samgraha	*Harit Varga, Surasadi Gana*	*AS.SU.*7/146, 16/133
Ashtanga Hridaya	*Surasadi Gana, Shaka Varga*	*A.H.SU.*6/106, 15/30

Amarakosha	*Vanaousadhi Varga*	*AK.*79
Saushruta Nighantu	*Surasadi Gana*	*SN.* 131
Ashtanga Nighantu	*Surasadi Gana*	*AN.* 129
Nighantu Sesha	*Gulma Kanda*	*NS.*225
Siddhamantra Nighantu	*Kaphavataghna Varga*	*SMN.*90-91
Dhanwantari Nighantu	*Karaveeradi Varga*	*DN.* 47-48, p139
Madanpal Nighantu	*Karpuradi Varga*	*MN.* 108, p340
Raj Nighantu	*Karaveeradi Varga*	*RN.* 152-155, p328
Kaidev Nighantu	*Ausadhi Varga*	*KN.*1561, p636
Bhavaprakash Nighantu	*Pushpa Varga*	*BhN.* 64-66, p497
Nighantu Adarsha	*Tulasyadi Varga*	*NA.* 274, p274
Priya Nighantu	*Sharadi Varga*	*PN.* 274, p133

Table 1, describes classification of the plant *Marubak* in different Ayurvedic texts. Mostly the plant is mentioned under *Surasadi Gana* and *Shaka Varga*.

1.6. *Paryaya* (Synonyms)

Table 2: Showing *Paryaya* (Synonyms) of *Marubak* [*Ocimum basilicum* Linn.] in different *Nighantus* (Ayurvedic lexicons)

Sl. No.	Synonyms	*Saushrut Nighantu*	*Ashtanga Nighantu*	*Paryaya Ratnamala*	*Dhanwantari Nighantu*	*Nighantu Sesha*	*Siddhamantra Nighantu*	*Madanpal Nighantu*	*Kaideva Nighantu*	*Bhavaprakash Nighantu*	*Raj Nighantu*	*Nighantu Adarsh*	*Priya Nighantu*
1.	*Ajanmasurabhi*											✓	
2.	*Ajanmasurabhi Patra*										✓		
3.	*Alpapatra*					✓							
4.	*Bahuvirya*										✓		
5.	*Gandhapatra*										✓		
6.	*Jambeera*			✓	✓	✓					✓		
7.	*Kharapatra*	✓	✓	✓	✓	✓			✓		✓		
8.	*Kharabusa*		✓						✓				

9.	*Kharapushpa*	✓						✓					
10.	*Manjareeka*											✓	
11.	*Mareech*										✓		
12.	*Mareechaka*					✓							
13.	*Maaruta*					✓				✓			
14.	*Maru*				✓			✓		✓			
15.	*Maruba*		✓								✓		
16.	*Marubak*	✓			✓	✓		✓	✓	✓	✓	✓	
17.	*Marut*									✓			✓
18.	*Maruttaka*				✓				✓				
19.	*Patrapushpa*			✓									
20.	*Phanee*				✓	✓				✓			
21.	*Phaneenjaka*				✓	✓	✓	✓		✓	✓	✓	
22.	*Prasthakusuma*										✓		✓
23.	*Prasthapushpa*								✓	✓		✓	
24.	*Sameerana*									✓	✓		
25.	*Seetalaka*										✓		
26.	*Sookshmaheena*	✓							✓				
27.	*Sugandha*	✓		✓					✓				
28.	*Sukhatmaka*	✓	✓						✓				
29.	*Sura*										✓		
30.	*Surabhichadanah*												✓
31.	*Tikshna*							✓					
32.	*Tikshnagandha*			✓									
	TOTAL	6	4	5	7	8	1	5	8	8	13	05	03

Table 2, denotes the synonyms of the plant in various *Nighantus*. Maximum synonyms have been mentioned by *Raj Nighantu*. The synonym *Phaninjaka* is stated by almost all the *Nighantus* followed by *Kharapatra*.

1.7. *Rasapanchak* (Pharmacodynamic attributes)

Table 3: Showing *Rasapanchak* (Pharmacodynamic attributes) of *Marubak* [*Ocimum basilicum* Linn.] in *Samhitas and in Nighantus*

Nighantu	***Rasa*** **(Taste)**	***Guna*** **(Property)**	***Veerya*** **(Potency)**	***Vipak*** **(Biotransformation of Taste)**
Charak Samhita	-------	-------	*Ushna*(hot)	-------
Astanga Samgraha	*Katu*(pungent)	*Laghu*(light), *Rukshya*(dry), *Tikshna*(sharp)	*Ushna*(hot)	*Katu*(pungent)
Bhela Samhita	*Katu*(pungent)	--------	------	*Madhura*(Sweet)
Dhanwantari Nighantu	*Tikta*(bitter)	*Rukshya*(dry),	*Seeta*(cold)	-------
Madanpal Nighantu	------	*Laghu*(light), *Tikshna*(sharp)	*Ushna*(hot)	-------
Kaidev Nighantu	*Katu*(pungent), *Tikta*(bitter)	------	*Seeta*(cold)	-------
Bhavaprakash Nighantu	*Katu*(pungent), *Ti*	*Laghu*(light), *Tikshna*(sharp)	*Ushna*(hot)	*Katu* (pungent)
Raj Nighantu	*Katu*(pungent), *Tikta*(bitter)	--------	*Ushna*(hot)	-------
Priya Nighantu	*Katu*(pungent), *Tikta*(bitter)	*Rukshya*(dry), *Tikshna*(sharp)	*Ushna*(hot)	-------

Table 3, represents the *Rasapanchak* of the plant. The plant was said to be *Katu, Tikta* in *Rasa*, *Laghu*, *Rukshya*, *Tikshna* in *Guna*, *Ushna* in *Virya* and *Katu* in *Vipak*. *Acharya Dhanwantari* and *Kaideva* denotes *Seeta Virya* of the plant.

1.8. Dosage/Usage forms

Table 4: Showing various dosages form/Usage forms of *Marubak* (*Ocimum basilicum* L.) according to *Samhitas* and *Chikitsa Granthas*

S. NO.	DOSAGE/USAGE FORM	KARMA/PRAYOG	REFERENCE

1.	*Pradeha Churna* (Thick anointment)	*Kustha* (Skin diseases), *Kilasa,Indralupta* (Aloepecia), *Kitibha, Dadru* (Ringworm)	*C. Su.* 3/4-7
2.	*Asthapana Vasti* (Medicated Enema)	*Krimi* (Worm infestation)	*C. Vi*. 7/17
3.	*Swarasa* (Juice)	*Krimi* (Worm infestation)	*C. Vi*. 7/21
4	*Vasti*(Medicated Enema)	*Kaphaj vikara* (Diseases due to Kapha)	*C. Vi. 8/142*
5.	*Nasya* (Nasal drop)	*Kustha* (Skin diseases), *Krimi*(Worm), *Kapha* (Diseases due to Kapha)	*C. Ch*. 7/48
6.	*Pradhamana Nasya* (Nasal drop)	*Trimarma chikitsa* (Diseases of heart, brain and Urinary bladder)	*C. Ch*. 26/185
7.	*Kwatha* (Decoction)	*Vamana* Karma (Therapeutic emesis)	*C. Ka.* 1/25
8.	*Churna* (Powder)	*Krimij Shiraroga* (Diseases of head due to worm)	*C. Si.* 9/17
9.	*Swedana* (Fomentation)	*Sleshmaja Abhishyanda* (Conjuctivitis due to *Kapha*)	*Su. U.* 11/5
10.	*Pichu, Abhyanjana, Pana, Vasti*	*Karnasula* (Earache), *Shiroroga* (Diseases of head), *Karnasrava* (Ear discharge), *Urdhwajatrugata* (Diseases of ear, nose and throat)	*Bh. Ci.* 21/59
11.	*Ashchotana* (Eye drop)	*Kukkunaka* (opthalmia neonatarum)	*Ka.Khi*. 3/17
12.	*Parisechana* (Irrigation)	*Kaphaj Visarpa* (Erysipelas)	*Ka.Khi*.14/72
13.	*Shirovirechana* (Errhine Therapy), *Asthapana Vasti* (Medicated enema)	*Kustha*(Leprosy)	*A.S. Ch*.21/12
14.	*Pradeha* (Thick anointment)	*Kustha* (Leprosy), *Kilasa, Indralupta* (Aloepecia), *Kitibha* (Blackish discolouration of skin),	*A.S. Ch.*21/54

		Dadru (Itching)	
15.	*Rasakriya* (Medicated thick syrup used as Collyrium)	*Balasagrathita, Pistaka* (Lymphangioma)	*A.S.U.*14/7
16.	*Sirovirechana* (Errhine Therapy)	*Sushkakshipaka* (Dry eye)	*A.S.U*. 20/3
17.	*Dhoomavarti* (Medicated fumes)	*Drushtapratishyaya* (Chronic Rhinitis)	*A.S.U*.24/26
18.	*Nasya* (Nasal drop)	*Putinasa* (Ozaena)	*A.S.U*.24/33
19.	*Nasya* (Nasal drop)	*Krimija Sirobhitapa*	*A.S.U*.28/9
20.	*Nasya* (Nasal drop)*, Abhyanga* (Massage)	*Khalitya* (Baldness)	*A.S.U*.28/16
21.	*Agada* (Anti-toxic)	*Varati Visha* (Insect sting)	*A.S.U*.43/40
22.	*Nasya* (Nasal drop)	*Luta Visha Chkitsa* (Spider bite)	*A.S.U*.44/32
23.	*Anjana* (Collyrium) *(Vachadi anajanam)*	*Netra roga* (Eye diseases)	*A.S.U*.44/34
24**.**	*Prayogika Dhooma*	*Shodhana* (For purification)	*A.S. SU.*14/7
25.	*Nasya* (Nasal drop)	*Apasmara* (Epilepsy)	*A.H.UT*.7/32
26.	*Varti* (therapeutic wick)	*Vartmaroga* (Diseases of eyelid)	*A.H.UT.* 9/33
27.	*Anjana* (Collyrium)	*Sandhi, Sitasitaroga* (Diseases of Palpebral region)	*A.H. UT.* 11/45
28.	*Pralepa* (thin anointment)	*Kustha* (Skin diseases)	*C.D*. 50/9
29.	*Swedana* (Sudation)	*Netraroga* (Eye diseases)	*C.D*. 59/272
30.	*Aaschyotana* (Eye drop)	*Pothaki* (Trachoma)	*C.D*. 59/306
31.	*Pralepa* (Thin anointment)	*Vatapida* (Pain)	*V.S.S*. 60/36
32.	*Anjana* (Corrylium)	*Netraroga* (Eye diseases)	*V.S.S.* 36/466
33.	*Lepana* (External application)	*Varati Visha* (Insect poison)	*V.S.S.* 75/215
34.	Nasya(Marichyadi *Nashyam*)	*Apatantraka* (Convulsive fit)	BP.S.MK. 24/195
35.	*Kwatha* (Decoction)	*Amavata* (Rheumatoid arthritis)	BP.S.MK. 26/27

(Abbreviations: C. Su.- Charak Samhita Sutrasthana, Vi.- Vimansthana, Ch.- Chikitsa Sthana, Ka.- Kalpasthana, Si. – Siddhisthana, Su. U.- Sushruta Samhita UttaraTantra, Bh. Ci.- Bhela Samhita Chikitsa Sthana, Ka.Khi.- Kashyap Khilasthana, A.S. Ch.- Ashtanga Samgraha Chikitsa Sthana, A.S.U.- Ashtanga Samgraha UttaraTantra, A.S. SU.- Ashtanga Samgraha Sutrasthana ,A.H.UT.- Ashtanga Hridaya UttaraTantra. C.D.- Chakradatta, V.S.S.- Vangasena Samhita, BP.S.MK. Bhavaprakasha Samhita Madhyam Khanda)

Table 4, explains about various dosage forms and the indications of the plant. Out of 35 references, most are in *Nasya* or *Shirovirechana* form. The review suggests that, the plant is frequently used in the aspect of *Krimi* followed by *Kustha*.

1.9. Formulations

Table 5: Showing Various formulations of *Marubak* (*Ocimum basilicum* L.) according to *Samhitas* and *Chikitsa Granthas*

Sl. No.	Name of formulation	Indication	References
1.	*Agurvadya taila*	*Jwara* (Fever)	*C. Ch*. 3/267
2.	*Triphaladya taila*	*Apasmara* (Epilepsy)	*C. Ch*. 10/44
3.	*Shiva Varti*	*Visuchika* (Cholera)	*Bh. Ci*. 10/70-71
4.	*Rasna tailam*	*Vatavyadhi* (Nervous disorders)	*Bh. Ci*.24/25
5.	*Shirishadi Varti*	*Visuchika* (Cholera)	*A.S. Su*. 11/45
6.	*Triphaladya Nasya*	*Apasmara* (Epilepsy)	*A.S.U*.10/21
7.	*Punarnavadi Ghrita*	*Kasa* (Cough)	*A.H*. SU. 3/58
8.	*Ashtadashshatik Prasaranee taila*	*Vatavyadhi* (Nervous disorders)	*C.D.* 22/256
9.	*Maharaj Prasaranee Taila*	*Vatavyadhi* (Nervous disorders)	*C.D.* 22/272
10.	*Mahasugandhi Taila*	*Vatavyadhi* (Nervous disorders)	*C.D.* 22/306

(Abbreviations: C.Ch.- Charak Samhita Chikitsa Sthana, Bh. Ci.- Bhela Chikitsa Sthana, A.S. Su.- Ashtanga Samgraha Sutrasthana, A.S.U.- Ashtanga Samgraha Uttaratantra, A.H. SU.- Ashtanga Hridaya Sutrasthana, C.D.- Chakradatta)

Table 5, defines the formulations of the plant. A least number of formulation of the plant has been mentioned in Ayurveda. More of them are in *Taila* form which are said to be used externally.

1.10. *Doshakarma* (Effect on *Dosha*)

Table 6: Showing *Doshakarma* of *Marubak* [*Ocimum basilicum* Linn.] in different *Nighantus*

Doshakarma	***Dh. Ni.***	***SM.N***	***MP. Ni.***	***Kai. Ni.***	***BP. Ni.***	***Raj Ni.***	***P.NI***
Kaphahara (relieves Kaphaj disoders)	+	-	-	-	-	-	+

Kaphapittahara (relieves Kaphapaitik disoders)	-	-	-	+	-	-	-
Kaphavatahara (relieves Kaphavatik disoders)	-	+	+	-	+	-	-

(Abbreviations: Dh. Ni. – Dhanvantari Nighantu, SM.N. – Siddhamantra Nighantu, MP. Ni.- Madanpal Nighantu, Kai. Ni.- Kaideva Nighantu, BP. Ni.- Bhavaprakash Nighantu, Raj Ni.- Raj Nighantu, P.NI. – Priya Nighantu.)

Table 6, describes about the *Doshakarma* of the plant. Most of them are *Kapha-vatahara.*

1.11. *Karma* (Action)

Table 7: Showing various *karma* (action) of *Marubak* [*Ocimum basilicum* Linn.] in different *Nighantus*

Karma (action)	***Dh. Ni.***	***MP. Ni.***	***Kai. Ni.***	***BP. Ni.***	***Raj Ni.***
Agniprada (Improves digestive fire)	-	+	-	+	-
Hridya (Gopd for heart)	-	+	-	+	-
Soolaghna (Pain killer)	-	-	-	-	+
Sothahara (Anti-inflammatory)	-	+	-	-	-
Ruchya (Digestive)	+	-	-	+	-
Mukhasugandhikrit (Mouth freshner)	+	-	-	-	-
Twakdoshanashan (Relieves skin diseases)	-	-	-	-	+
Pachana (Improves digestion)	-	-	+	-	-

(Abbreviations: Dh. Ni. – Dhanvantari Nighantu, MP. Ni.- Madanpal Nighantu, Kai. Ni.- Kaideva Nighantu, BP. Ni.- Bhavaprakash Nighantu, Raj Ni.- Raj Nighantu)

Table 7, showing various action of the plant in *Nighantus.* Most of the indications are in Gastrointestinal diseases.

1.12. Therapeutic indication

Table 8: Showing various indications of *Marubak* [*Ocimum basilicum* Linn.] in different *Nighantus*

Karma (action)	***Dh. Ni.***	***Mad. Ni.***	***Kai. Ni.***	***BP. Ni.***	***Raj Ni.***
Vrischikadi Visha (Scorpio poison)	-	+	-	+	-
Kustha (Skin diseases)	-	+	+	+	+
Krimi (Worm infestation)	-	+	-	+	+
Kandu (Itching)	-	-	+	-	-
Vishamajwara (Maleria)	-	-	+	-	-
Vivandha (Constipation)	-	-	-	-	+
Agnimandya (Dyspepsia)	-	-	-	-	+
Adhmana (Abdominal distension)	-	-	-	-	+
Kritima Visha (Artificial poison)	+	-	-	-	-

Table 8, describes the indications of the plant by different *Nighantukaras*.

1.13. Chemical constituents

The essential oil of *Ocimum basilicum* L. contains two main chemicals i.e. Methyl chavicol and eugenol. Other phytochemical constituents are Methyl cinnamate, 1,8 -cineole, ocimene, borneol, eucalyptol, linalool acetate, eugenol, menthol, menthone, myrcenol, Flavonoids: Salvigenin and nevadensin, sirseleol, eupatorin etc[19].

1.14. Pharmacological actions

Anti-depressant activity:

The petroleum ether, ethanol and water extracts obtained from of the seeds of *Ocimum basilicum* L. have shown anti-depressant activity in Albino-wistar rats. The test was performed by Forced swim test (FST) and tail suspension test (TST) in 11 groups. Group 1(control group): normal saline (1 ml/100 g). Group 2: Fluoxetine (20 mg/kg, i.p.). Group 3, 4, 5: water extracts (100mg/kg, 200mg/kg, 400mg/kg, respectively). Group 6, 7, 8: ethanol extracts (100mg/kg, 200mg/kg, 400mg/kg, respectively). Group 9, 10, 11: petroleum ether extracts (100mg/kg, 200mg/kg, 400mg/kg, respectively). The petroleum ether extract at the doses at 200 mg/kg and 400 mg/kg showed antidepressant activity. But petroleum ether extract at 100 mg/kg, water and ethanol extracts (100, 200 and 400 mg/kg) have similar results like control (Normal saline) group.

Anti-inflammatory activity:

The methanolic and aqueous extracts of the aerial part of *Ocimum basilicum* L. have shown anti-inflammatory activity against macrophage (RAW264.7) and human chondrosarcoma (SW1353) cell lines, and human primary chondrocytes. It was correlated to test the efficacy in terms of management of osteoarthritis (OA). The aqueous extract of *O. basilicum* has shown significant activity in the management of inflammatory conditions associated with OA as compared to Methanolic extract.

Anti-oxidant activity:

In-vitro antioxidant activity was performed for the methanolic and petroleum ether extract by DPPH scavenging assay. As compared with methanolic extract, petroleum ether extract of seed of *Ocimum basilicum* L. has shown higher anti-oxidant activity.

Anti-fungal activity:

in-vitro, the essential oil of leaves of *Ocimum basilicum* L. was tested in *A. flavus* strain (ATCC 16872), for the evaluation of anti-fungal activity. Both fungal growth and aflatoxin biosynthesis were significantly suppressed by *O. basilicum* essential oil compared to control. The complete inhibition of *A. flavus* growth was observed at 1000 ppm oil concentration, while marked inhibition of aflatoxin B1 production was observed at all oil concentrations tested (500, 750 and 1000 ppm).

Anti-bacterial activity:

Ethanolic extracts of *Ocimum basilicum* L. leaves were tested for 100 bacterial test strains by agar disc diffusion method. The Standardized discs of ciprofloxacin (5µg), erythromycin (15µg), norfloxacin (10µg), cotrimoxazole (25µg), ceftriaxone (30µg), and gentamycin (10µg) were tested for antibacterial effect of synthetic antibiotics. Highest antibacterial activity was detected against Escherichia coli and Pseudomonas aeruginosa (7.8 mm inhibition zone); and lowest antibacterial activity was detected against Staphylococcus aureus (4.4 mm inhibition zone). Against Klebsiella pneumoniae there was significant difference of antimicrobial activity of leaf extract at concentration of 50µg/disc when compared with the antibiotics ciprofloxacin, erythromycin and gentamicin ($p = 0.001$, 0.006 and 0.009) respectively.

Anti-plasmodial activity:

In-vitro the ethanolic extract of *Ocimum basilicum* L. were subjected for the evaluation of anti-plasmodial activity against *P.falcifarum.*. The leaf extract showed higher activity against P. falciparum as compared to chloroquine

Wound healing activity:

Wound healing activity of ethanolic extracts of leaves of *Ocimum basilicum* L. was performed in Adult albino rats (wistar strain) of either sex weighing 180-200 g. This test was conducted in 3 groups (Group I control group, group II standard group, was treated with market formulation (Povidone Iodine ointment), group III test group, was treated with ointment of ethanolic leaves extract of *Ocimum basilicum* L. by Excision wound model. wound healing activity of *Ocimum basilicum* L. was assessed on topical route of administration in a form of a 5%w/w extract in simple ointment base for 15 days. In the topical route, test group III i.e ointment of

ethanolic leaves extract of *Ocimum basilicum* l. shows faster wound closure and wound contraction with Significant difference when compared to control group at $p<0.01$.

Table 9: Showing Reported Pharmacological activities of *Ocimum basilicum* L.

Sl. No.	Pharmacological activity	Part used	Extract type	Organisms
1.	Anti-depressant	Seed	Petroleum ether, Ethanol, Water extract.	Albino Wistar rats.
2.	Antimicrobial	Seed	Petroleum ether and Methanolic extract	Pseudomonas aeruginosa, E.coli, Shigela dysenteriae and Klebsiala pneumonia.
3.	Anti-inflammatory	Aeriel part	Aqueous and Methanolic extract	RAW264.7, SW1353 and human primary chondrocytes.
4.	Anti-oxidant	Seed	Petroleum ether and Methanolic extract.	Pseudomonas aeruginosa, E.coli, Shigela dysenteriae and Klebsiala pneumonia.
5.	Gastric ulcer		Hexane extract	Mice.
6.	Anti-fungal	Leaf	Essential oil	*Aspergillus flavus* (*A. flavus*) mycelial growth and aflatoxin B1 production in Yeast Extract Sucrose (YES)
7.	Anti-bacterial	Leaf	Ethanolic extract	Escherichia coli and Pseudomonas aeruginosa.
8.	Anti-plasmodial	Leaf	Ethanolic extract	Plasmodium

				falcifarum
9.	Wound healing activity	Leaf	Ethanolic extract	Male albino rats.
10.	Anticancer	Seed	Petroleum ether and Methanolic extract	Human osteosarcoma cell line (MG63).

Table 9, discusses pharmacological action of the plant. in-vitro and in-vivo studies were perfomed by using different extracts of the plant.

DISCUSSION:

Classical texts of Ayurveda i.e. available six *Samhitas* (*Charaka Samhita, Sushruta Samhita, Astanga sangraha, Astanga hridaya, Bhela Samhita, Kashyap Samhita*), three *Chikitsa granthas* (*Chakradatt, Vangasena*, *Bhavaprakash Samhita*) and 14 *Nighantus* along with the available published literatures has been reviewed to study the properties, actions and different indications of the plant *Marubak* (*Ocimum basilicum* L.). Total 12 references from *Charak Samhita*, 3 references from *Sushrut Samhita*, 5 references from *Bhela Samhita*, 2 references from *Kashyap Samhita*, 19 references from *Astanga Samgraha* and 6 references from *Ashtanga Hridaya* are found. The plant is not mentioned in Vedic era and Pauranas. However it is first stated in *Charak Samhita* by the name of '*Phaninjak*' which denotes the structure of the plant that it looks like hood of a snake. The plant is firstly appeared by the name of '*Marubak*' in *Ashtanga Samgraha*. The name may be coined to the plant due to its dry habitat. The classical review suggests numerous dosage forms of the plant. The dosages forms are *Churna*, *Kwath*, *taila*, *Anjana, Rasakriya, Abhyanga, Lepa, Aschotana* etc. This indicates both external as well as internal administration of the plant. The plant is mainly indicated for the treatment of *Krimi* followed by *Kustha*. Viewing the classification, the plant is enumerated both in *Ausadha* and *Ahaara* by different Ayurvedic literature. *Acharya Vagbhatta*, *Sushrut* mentioned the plant under *Shaka Varga* i.e. one of the leafy vegetable. The plant is ascribed in *Surasadi Gana* by *Achayas* for the treatment of *Kasa, Swasa* and *Pratishyaya*. The plant is also described by different *Acharyas* for the treatment of *Luta Visha*, *Varati Visha* in the form of *Lepana*, *Nasya* etc. Coming to the synonyms of the plant, the plant is mentioned in *Samhitas* by the name of '*phaninjak'* or '*Marubak*'. Total 32 synonyms have been ascribed in the *Nighantus*. Out of which, maximum number of synonyms are stated by *Raj Nighantu*. Most common synonyms which came many times in

all the *Nighantus* are *Phaninjak* and *Kharapatra* followed by *Jambeera*. The name '*Kharapatra*' coined to the plant due to roughness of the leaves. *Jambeera* is stated as a most common synonym because the plant is used for culinary purposes. The synonyms *Ajanmasurabhi*, *Surabhichandana*, *Sugandha* indicate towards a specific pleasant fragrance of the plant. *Ajanmasrabhiptra*, *Gandhapatra*, *Kharapatra* are the synonyms indicates towards the characteristics of the leaves which are rough and having a long lasting fragrance. The synonyms *Tikshna*, *Mareecha* indicates the punjent property of the drug. Most of the *Samhitas* and *Nighantus* accepted its *Katu* or *Katu*, *tikta Rasa* while *Dhanwantari Nighatu* mentioned it as *Tikta rasa*. The *Gunas* (properties) of the drug are *Laghu, Ruksha* and *Tikshna*. There is difference of opinion regarding the *Virya* (Potency) of the drug. However most of the classics are towards the opinion of *Ushna Virya*. The *Vipak* is *Katu* but *Bhela Samhita* mentioned it with *Madhura Vipak*. Overall considering all the views, the pharamacodynamic attributes of the drug is *Katu, tikta* in *Rasa*, *Laghu, Rukshya, Tikshna* in *Guna, Ushna* in *Virya* and *Katu* in *Vipak*. The *doshakarma* of the drug is *Kaphavataghna*. It may be due to the *Raspanchak* of the plant.

CONCLUSION:

Since times immoral, medicinal Plants have been used for the treatment of several diseases throughout the world. The survey of literature showed that *Marubak* has a wide spectrum of pharmacological activities. Most of the literature suggests that the plant *Marubak* (*Ocimum basilicum* L.) is frequently used in the treatment of *Krimi*, *Kustha*, *Kasa*, *swasa*. It is most commonly used for *Sirovirechana* and *Nasya* Karma. This is a plant which has medicinal value as well as used as a functional food. The detail literature study reveals the plant as a wonderful drug. Till date, several research works has been conducted in animals and cell-lines to know the efficacy of the drug. However further studies will be required to prove the additional properties and actions mentioned in the literature.

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