



Pushkarmoola (*Inula racemosa* Hook. F.): A Healing Legacy Unveiled - Exploring its Potent Anti-Pyretic and Medicinal Significance

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Authors' contributions

This work was carried out in collaboration among all authors. Author AKL analysis of the study and literature searches, Author VJ deigned the study. All authors read and approved the final manuscript.

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ABSTRACT

Pushkarmoola, scientifically known as *Inula racemosa* Hook. F., is a robust herb belonging to the Asteraceae family. It is renowned for its potent medicinal properties, particularly in the realm of cardio-pulmonary health. In contemporary times, it enjoys significant recognition and popularity in both folk and traditional medicinal practices. Its versatility in addressing various health conditions

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such as fever (Jwara), cardiac diseases (Hridroga), wasting (Kshaya), cough (Kasa), respiratory diseases (Svasa), and tuberculosis (Rajayakshma) has been firmly established over the years through a combination of traditional wisdom and scientific investigation.

Objective: This article provides a concise overview of the historical significance of Inula in medicine. Inula is a valuable source of natural compounds, and this article covers their pharmacological, biochemical, and clinical studies conducted in both in-vitro and in-vivo settings. Furthermore, it places particular emphasis on Inula's widespread use in Ayurvedic literature particularly as a remedy for fever (Jwara).

Data Source: The available literature on Pushkarmoola from original Ayurvedic scriptures, classical Ayurvedic texts from different periods, Indian Ayurvedic Pharmacopoeia, and scientific databases such as ScienceDirect, PubMed, and Google Scholar.

Review Methods: Numerous references to Pushkarmoola, found in Ayurvedic classics, journals, and traditional knowledge sources, were thoroughly compiled, and analyzed. The extensive data revealed its potential as a potent antipyretic, as it is prominently featured in formulations designed to alleviate fever. Additionally, both in vivo and in vitro studies have provided evidence of its antibacterial, anti-inflammatory, antioxidant and antifungal properties.

Conclusion: This article encourages future researchers to delve deeper into the anti-pyretic properties of Pushkarmoola, as it has been extensively documented in ancient texts for its effectiveness in treating various types of fever (jwara). This historical evidence serves as a compelling reason for scholars to explore and expand upon the potential anti-fever benefits of Pushkarmoola.

Keywords: *Inula; Pushkarmoola; Ayurveda; Alantolactone; Isoalantolactone.*

ABBREVIATIONS

1. A.H. : *Ashtanga Hridaya;*
2. BP : *Bhava Prakash;*
3. Ch. : *Charaka Samhita;*
4. Chi. : *Chikitsa Sthana;*
5. Ha. Sa. : *Harita Samhita;*
6. Ka. : *Kashyap Samhita;*
7. Khi. : *Khila Sthana;*
8. Ma.Ni. : *Madhav Nidan;*
9. Ni. : *Nidana Sthana;*
10. Sh. : *Sharir Sthana;*
11. Su.Su. : *Sushruta Samhita Sutra Sthana;*
12. Su. : *Sutra Sthana;*
13. Su. Ut. : *Sushruta Samhita Uttara Tantra;*
14. Ut. : *Uttarasthana;*
15. B.Sm. : *Bhela Samhitha;*
16. CK.D : *Chakradatta;*
17. A.S. : *Ashtanga Sangraha;*
18. BP : *Bhava Prakash;*
19. Ca.Su. : *Caraka Samhita Sutra Sthana.*

1. INTRODUCTION

A *bheshaja* is a substance through which we can overcome the fear of disease it can also called as *ausadha*. According to *Acharya Charaka* the following are the four indispensable for treatment of diseases, namely *Bhisaka* (Physician), *Dravya* (Medicament), *Upasthata* (attendant / nursing personal), *Rogi* (patient). These are the *Cikitsa Catuspada* (analogous to four legs) that support a table. Applicability, richness of quality,

abundance, and utility in multipurpose are said to be the best qualities of a drug. Hence *Bhesaj* is kept in second position among the *pada catustaya* because of its great role in treatment grounds.

A substance which is the constituent cause of its action and properties residing in it is known as a *dravya*. *Acharya Charaka* had told that with proper (right method of) preparation a poison can act as an excellent medicine. Medicine if improperly used becomes a severe poison. As per this advice, in this world, there are many objects with medicinal properties, which ever substances (drugs) are available, use them judiciously, for serving the purpose in hand. Drugs are of three types: *Shamana* (producing subsidence), *Kopana* (producing aggravation) and *Swasthahitam* (maintaining health). A drug not perfectly understood is (fatal) like poison, weapon, fire and thunderbolt; a perfectly understood drug is (life saver) like ambrosia.

Acharya Charaka in *Sutra Sthana* has told that a drug whose name and form and properties are not known, and when known, if improperly used can produce disaster. One who knows uses, names and form is known as *Tatvavita* (knowledgeable), then what would be a *Bhisaka* (physician) called, who knows everything about medicine. Specific knowledge about *ausadhi* (drugs) is obtained through scientifically based discussions.

Knowledge of drug is important before its usage, otherwise it can give a negative impact on our body. Knowledge of a drug includes its botanical name, family, Habit, Habitat and its *Rasa pancaka* etc.

2. PUSHKARAMOOLA (*Inula racemosa* Hook.f.) (Asteraceae)

2.1 Vernacular Names [1]

- English – Indian elecampane, sun spear
- Hindi – Pokharmul
- Sanskrit – Puskara mula, kasmira, Padma.
- Gujarati – Pokharmul
- Telugu – Pushkara mulamu
- Kannada – Puskarmul
- Kashmiri – Poshkar
- Marathi – Pushkarmul
- Malayalam – Pushkarmulam
- Tamil – Puskarmulam

2.2 Basonym of Drug

पुष्पातीति पुष्करं । पुष पुष्टौ । पोषयति
उदकादानाद्युपकरणे च ॥ [1]

Pushkaramoola (*Inula racemosa* Hook.f.)
nourishes the person who uses it.

2.3 Synonyms

Habitat:

1. काश्मीरा-काश्मीरेषु भवम् । [2]

Pushkaramoola grows in Kashmir region.

Morphology:

2. पद्मपत्र- मुकुलित पद्म सदृश पत्राणि अस्य ।

पद्मदल सदृश पत्राणि सन्त्यस्य ॥ [2]

Leaves of *Pushkaramoola* resemble floral bud of lotus flower or shape of petals of lotus flower.

Properties and Actions

3. कुष्ठ भेदः - कुष्ठस्य भेदः, कुष्ठ समानगुण धर्मिणी वा । [2]
Properties and actions of *Pushkaramoola* is similar to Kustha

Synonyms *Pushkaramoola* in Different Nighantus:

Kasmira, Padmapatra, Puskara, Kustha, Bheda, Ciram, Jiham, Tirtha, Dhira, Padma, Puskarahava, Brahmatirtha, Mulam, Vatahva,

Phala Patra, Viram, Swasari, Sugandhikam, Mula, Pushkarjata

2.4 Taxonomic Classification of Pushkaramoola [1]

- Kingdom : Plantae
- Class : Dicotyledons
- Subclass : Gamopetalae
- Series : Inferrae
- Order : Asterales
- Family : Asteraceae
- Species : *Racemosa*
- Botanical Name : *Inula racemosa* Hook.f
- Kula : Bhringaraja Kula

2.5 Morphological Characters [3]

The plant is a sturdy shrub with broad leaves that are placed racemosely. All vegetative parts are scabrid tomentose and the stem is grooved. Lower leaves thin to form a leaf stack with wings. Upper leaves are stem-clasping and lanceolate. The face of the abaxial lamina is heavily tomentose. Radical leaves have long petioles and are elliptic-lanceolate in shape. The cauline leaves are smaller, semi-aplexicaule, and oblong. Large, shaded yellow daisies that bloom in the middle to end of summer make up the bottoms. They are born in a cluster resembling an apical spike. The fruits, slender achenes, 0.4 cm long, bearded with 0.75 cm long pappus hairs. Root stock branched; fresh roots are irregularly fusiform. Sometimes a number of roots are found in the collar zone, though usually few occur in each clump. These roots have a dull brownish skin with yellowish colour inside. They possess a sweet and somewhat camphoraceous odour and have a bitter taste.

2.6 Geographical Source [4]

The plant is found in the Himalayas at elevations between 1500 and 4200 metres above sea level, from Kashmir to Kumaon, Afghanistan, and Central Nepal. It grows naturally in dense alpine scrub between 2700 and 3500 metres in the cold, dry environment of the northwestern Himalayas in Kashmir's Laddakh (Leh) area. Both in Kashmir and the Lahaul valley of Himachal Pradesh, domesticated varieties of the incipient cultigens are grown along the edges of wheat, barley, and buckwheat fields.

2.7 Phytoconstituents [5]

The roots contain Alantolactone, Isoalantolactone, Alloalantolactone, Inunal,

Isoallantolacton, Inunolide, Dihydroinunolide, Isoimunal, Alantodiene, Isoulantodiene: - Sitosterol, Aplotaxene, Phenylacetonitrile, P-Cymene, 2-Furfural, Norbornyl Acetate, Benzaldehyde A-Pinene Oxide, A-Humulene, O-Farnesene, ArCurcumene, A-Ionone, Fionone And Other Aldehydes and Alcohols are reported from the essential oil of the root.

2.8 Gana Vargikarana (Classical Categorization)

Pushkarmoola is given as a drug of choice in different varga by different acharyas. Both Charaka samhitha and Ashtanga Hridaya included Pushkarmoola in swasahara varga an hikka nighrahana varga. Sushruta include Pushkarmoola in the phala varga. Nighantu of

the different eras included Pushkarmoola in different varga such as haritakyadi varga, guduchyadi varga, aushadi varga, pippalyadi varga and satapushpadi varga (Table 1).

2.9 Pharmacological Properties with their Therapeutic Use of *Pushkarmoola* (*Inula racemosa* Hook.f.)

The Pharmacological Properties with their Therapeutic Use of *Pushkarmoola* (*Inula racemosa* Hook.f.) are mentioned as per Rasa Panchaka, which consists of Rasa, Guna, Virya, Vipaka and Prabhava in Ayurveda. According to different texts Rasapanchaka and Karma (actions) of Pushkarmoola mentioned [Table 2].

Table 1. Gana vargikarana

Nighantu	Varga
Charaka Samhitha	Swasahara varga, Hikkanigrahana Varga
Sushruta Samhitha	Phala Varga
Vagbhata Samhitha	Hidhma Nigrahana, Swasa Shamaka
Bhavaprakasha Nighantu	Haritakyadi Varga
Dhanwantari Nighantu	Guduchyadi Varga
Kaiydeva Nighantu	Aushadi Varga
Raj Nighantu	Pippalyadi Varga
Priya Nighantu	Satapushpadi Varga

Table 2. Pharmacological properties of *Pushkarmoola* (*Inula racemosa* Hook.f.)

Samhitha/Nighantus	Rasa	Guna	Virya	Vipaka	Doshic property	Use/Action
Dhanwantari Nighantu (Guduchyadi Varga)	Tikta	Laghu	Ushna	Katu	Kapha-Vataghna	Jwara, Arochaka Kasa, Shopha, Adhmana, Swasa, Hikka
Kaideva Nighantu (Aushadhi Varga)	Katu, Tikta		Ushna		Kapha Vataghna	Kasa, Jwara, Shopha Aruchi, Swasa, Hikka Parswaruja
Bhavaprakasha (Haritakyadi Varga)	Katu, Tikta	Tikshna Laghu		Katu	Vata-Kaphaghna	Shotha, Aruchi Swasa, Parswasoola
Raj Nighantu (Pippalyadi Varga)	Katu, Tikta		Ushna		Kapha Vataghna	Jwara, Swasa, Arochaka Kasa, Shopha, Pandu
Priya Nighantu (Satapushpadi Varga)	Katu, Tikta		Ushna			Madavaham, Hridya, Kasa, Swasa, Parswa, Shoola

3. PUSHKARAMOOLA IN VARIOUS SAMHITHAS

3.1 Brihatrayi

The "Brihatrayi," also known as the "Three Great Classics of Ayurveda," refers to a trio of ancient Indian texts that are foundational to the practice of Ayurvedic medicine. These texts are considered the most authoritative and comprehensive sources of Ayurvedic knowledge and are highly respected in the field. Charaka Samhitha Attribute the sage Charaka, covers a wide range of topics, *including fundamental principles of Ayurveda, diagnostics, classifications of diseases, and* detailed descriptions of herbal medicines and treatments. The Charaka Samhita (1000B.C-4A.D.) places a strong emphasis on preventive medicine and holistic health. Sushruta Samhita(1000 B.C-

2A.D.), attributed to the sage Sushruta, primarily focuses on the field of surgery. It is one of the earliest texts to provide detailed information on surgical techniques, instruments, and anatomy. Ashtanga Hridaya, Written by Vagbhata is a more concise and simplified compilation of the teachings found in the Charaka and Sushruta Samhitas.

In Charaka Samhita, Pushkaramoola is given under hikka nighrahana dasaimani, swasahara daisaimani. Its also given in different formulations to treat a wild variety of ailments such as jwara, swasa, kasa, rajyakshma, kushta etc (Table 3). Susrutha in addition to the aforesaid indicated for udavarta and vata vikara.(Table 4). Vagbhata has mentioned many formulations with Pushkaramoola as a key ingredient in many formulations which are arsas, gulma, grahani, shopha, soolahara etc (Table 5).

Table 3. Pushkaramoola in Charaka Samhitha [6]

Sl. No.	Preparation /Yoga	Indication	Reference
1.	Hikka Nighrahana	Dasaimani	C Su. 4/30
2.	Swasahara	Dasaimani	C.Su. 4/37
3.	Agrya Ausadha	Swasa, Kasa Parsvashoolahara	C.Su. 25/39
4.	Satyadi Varga	Sannipataja Jwara	C.Su. 3/211
5.	Baladi Ghrita	Jwara	C.Ci. 3/225
6.	Agaruadi Taila	Jwara	C.Ci. 3/266
7.	Lodrasava	Kushta	C.Ci. 6/41
8.	Duralabadi Ghrita	Jwara	C.Ci. 8/108
9.	Jeevantyadi Ghrita	Eakadasha Lakshana Rajayakshma	C.Ci. 8/111
10.	Marichyadi Choorna	Grahani	C.Ci. 15/109
11.	Satyadi Choorna	Swasa, Kasa	C.Ci. 17/123
12.	Chitrakadi Lehya	Swasa, Kasa, Gulma, Hridya	C.Ci. 18/56
13.	Agastya Haritaki	Vishama Jwara, Kasa, Swasa, Hikka	C.Ci. 18/58
14.	Hingu ugragandhadi Choorna	Pleeha, Udara, Ajeerna	C.Ci. 26/22
15.	Katphaladi Kwatha	Kaphaja Hridroga	C.Ci. 26/97

Table 4. Pushkaramoola in Sushruta Samhitha [7]

Sl. No.	Preparation /Yoga	Indication	Reference
1.	Hinguvadi Choorna	Vata Vikara	S.U. 5/28
2.	Pushkaramooladi Choorna	Parsvashoola, Hridaya shoola	S.U. 42/120
3.	Agastyaavaleha	Vishama Jwara, Swasa, Kasa	S.U. 52/43
4.	Devadarvadi Kwatha	Udavarta	S.U. 55/45
5.	Panchagavya Ghrita	ChaturthakaJwara, Swasa	S.U. 61/35

Table 5. Pushkaramoola in Ashtanga Hridaya [8]

Sl. No.	Preparation /Yoga	Indication	Reference
1.	Nagaradi Kashayam	Sannipatika Jwara	Ah.Chi. 1/65-69
2.	Yavanyadi Peya	Kasa Chikitsa	Ah.Chi. 3/20-21
3.	Twakadi Lehya	Hridroga, Kasa	Ah.Chi. 3/32
4.	Dipyakadi Kashayam	Kaphaja Kasa	Ah.Chi. 3/54

Sl. No.	Preparation /Yoga	Indication	Reference
5.	Dasamuladi Ghrita	Vatakaphaja Kasa	Ah.Chi. 3/56-57
6.	Kantakari Ghrita	Kasa,Swasa,Hikka	Ah.Chi. 3/59-63
7.	Agastya Rasayana	Kasa,Swasa,Hikka,Vishama Jwara	Ah.Chi. 3/127-132
8.	Chavikadi Ghrita	Kshayaja Kasa	Ah.Chi. 3/159-161
9.	Tejovatyadi Ghrita	Swasa,Hidma Chikitsa	Ah.Chi. 4/52-55
10.	Jivantyadi Ghrita	Rajayakshma	Ah.Chi. 5/16-17
11.	Sunthyadi Ghrita	Chardi, Hridroga ,Trisna Chikitsa	Ah.Chi. 6/28-29
12.	Pushkaradi Kalka	Vikartika Shoola	Ah.Chi. 6/31-33
13.	Pushkaradi Kashaya	Kaphaja Hridroga	Ah.Chi. 6/49-52
14.	Pippalyadi Anuvasanam	Arsha Chikitsa	Ah.Chi. 8/89-93
15.	Putikaranja Cukra	Arsha,Panduroga,Udara,Gulma	Ah.Chi. 8/145-148
16.	Dhanwantara Ghrita	Prameha Chikitsa	Ah.Chi. 12/19-24
17.	Rodhrasava	Prameha Chikitsa	Ah.Chi. 12/25-28
18.	Hinguvadi Ghrita	Gulma Chikitsa	Ah.Chi. 14/9-10
19.	Dadhika Ghrita	Gulma Chikitsa	Ah.Chi. 14/13-21
20.	Hingvadi Choorna	Gulma Chikitsa	Ah.Chi. 14/31-32
21.	Pushkaradi Kashayam	Gulma Chikitsa	Ah.Chi. 14/49
22.	Narayana Choorna	Udara Chikitsa	Ah.Chi. 15/14-21
23.	Ajaji Peya	Svayathu Chikitsa	Ah.Chi. 17/20-21
24.	Rasnadi Ghrita	Vata Vyadhi Chikitsa	Ah.Chi. 21/57

3.2 Laghutrayi

Laghutrayi, also known as the "Three Minor Classics of Ayurveda," is a collection of three important classical texts in Ayurvedic medicine. These texts are considered fundamental in understanding and practicing Ayurveda, the traditional system of medicine that originated in India. The Laghutrayi texts are shorter in comparison to the Brihatrayi (the three major Ayurvedic classics), which include the Madhava Nidanam, an Ayurvedic diagnostic text written by Madhavakara. It primarily focuses on the diagnosis of diseases and provides insights into the causes, symptoms, and prognoses of various ailments.

Sharangadhara Samhita is an essential text in Ayurvedic pharmacology and therapeutics. It was written by Acharya Sharangadhara, and it elaborates on various aspects of preparing Ayurvedic medicines, their properties, and their clinical applications. This text serves as a valuable guide for Ayurvedic practitioners in formulating and administering herbal remedies. Bhava Prakasha Nighantu is a classical Ayurvedic materia medica, or a compilation of medicinal plants and their properties. It was authored by Bhavamishra and provides detailed information about the therapeutic properties, indications, and uses of various herbs and substances commonly used in Ayurvedic medicine. Together, these three texts form the Laghutrayi, and they are considered foundational texts of Ayurveda.

Table 6. Pushkaramoola Sharangadhara Samhitha [9]

Sl.no	Preparation	Indication	References
1.	Sudarshana churna	Sarvajwara nashaka	Sa.S.M 6/34-35
2.	Kshudradi kwatha	Swasa,kasa	Sa.S.M.2/83
3.	Brhat kshudradi kwatha	Vishama Jwara	Sa.S.M.2/52
4.	Gridrasi nasak kwatha	Gridrasi	Sa.S.M.2/86
5.	Katphaladi churna	Jwara,Swasa,kasa	Sa.S.M.6/39
6.	brhat katphaladi churna	Jwara,swasa	Sa.S.M.6/41
7.	Dvitya katphaladi churna	Jwara	Sa.S.M.6/43
8.	Narayana churna	Jwara,kasa	Sa.S.M.6/83-91
9.	Lavangtriyadya churna	Yakrit,pliha	Sa.S.M.6/101
10.	Tumbroyadi churna	shula	Sa.S.M.6/107
11.	Hinguwadi churna	Udara sula,Vata roga	Sa.S.M.76/121
12.	Yavaksharayadi churna	Pancha Kasa	Sa.S.M.6/45

Table 7. Pushkaramoola in Bhavaprakasha [10]

Sl. No.	Preparation /Yoga	Indication	Reference
1.	Sudarshana churna	Vishama Jwara	B.P.Chi.1/26
2.	Chaturbadraka avaleha	Jwarajanya kasa,swasa	B.P.Chi.1/379
3.	Ashtanga avaleha	Kaphaja jwara	B.P.Chi.1/380
4.	Brhat pippalyadi kwatha	Pittaja jwara	B.P.Chi.1/408
5.	Astanga avaleha	Sannipataja jwara	B.P.Chi.1/559
6.	Astadasangha kwatha	Sannipataja jwara	B.P.Chi.1/576
7.	Padmakadi taila	Jwara	B.P.Chi.1/761
8.	Dasanga taila	Jwara,swasa	B.P.Chi.1/844
9.	Swasa roga nasaka yoga	Swasa	B.P.Chi.14/36-38
10.	Tandra nasaka yoga	Murchha	B.P.Chi.19/45
11.	Hinguvadi churna	Vatavyadhi	B.P.Chi.24/111
12.	Maha saindhavadi taila	Pakshaghata,urustambha	B.P.Chi.257/47
13.	Hinguvadi churna	Aamavata	B.P.Chi.26/31
14.	Brhat saindhavadi churna	Aamvata	B.P.Chi.26/117
15.	Tumbaruadi churna	Shula,gulma	B.P.Chi.30/45
16.	Hinguvadi churna	Gulma	B.P.Chi.32/30
17.	Hridaya roga nashaka	Hridaya roga	B.P.Chi.34/12
18.	Punarnavadhya taila	Ashmari cikitsa	B.P.Chi.37/95
19.	Narayana churna	Mandagni	B.P.Chi.41/50

3.3 Other Classical Textbooks

In addition to the Brihatrayi (Great Triad) and the Laghutrayi (Smaller Triad) in Ayurveda, there are several other important Ayurvedic texts that provide valuable insights into various aspects of

this traditional system of medicine. Some of these texts include: Bhela Samhita, Harita Samhita, Chakradatta, Kashyapa Samhita, Sahasra yogam have given various formulations with Pushkaramoola as an ingredient.

Table 8. Pushkaramoola in Chakradatta [11]

Sl. No.	Preparation /Yoga	Indication	Reference
1.	Chaturbadravaleha	Jwara	CK.d. 1/102
2.	Nimbadi Kashaya	Jwara	CK.d. 1/97
3.	Pancha Tiktaka Kashaya	Jwara	CK.d. 1/123
4.	Kshudradi Kashayam	Jwara	CK.d. 1/132
5.	Ashtangawa Avaleha	Jwara	CK.d. 1/149
6.	Bharangyadi Kwatha	Jwara	CK.d. 1/169
7.	Paushkaradi Kashaya	Kasa	CK.d. 11/18
8.	Dasamoola Ghritam	Kasa	CK.d. 1/44
9.	Saptasatika Prasarani Tailam	Vatavyadhi	CK.d. 22/188-204
10.	Hingwadi Choorna	Shoola	CK.d. 25/50
11.	Kankayana Gutika	Gulma	CK.d. 30/52-57
12.	Pushkaramoola Choorna	Hridroga	CK.d. 31/12
13.	Hingwadi Choorna	Hridroga	CK.d. 31/17
14.	Padadi Choorna	Hridroga	CK.d. 31/19-21
15.	Dhanwantara Ghrita	Prameha	CK.d. 35/28-35
16.	Narayana Choorna	Udara	CK.d. 37/31-38
17.	Maharohita Ghrita	Shophya	CK.d. 39/32-38
18.	Saindhawadi Taila	Vridhi, Bhaghna	CK.d. 40/25-28
19.	Saptavinshati Guggulu	Bagandhara	CK.d. 46/13-18
20.	Trikatwadikwatha Nasyam	Siroroga	CK.d. 60/21
21.	Sahacharadi Kwatha	Stree Roga	CK.d. 63/38
22.	Pushkaradi Choorna	Balaroga Kasa	CK.d. 64/58
23.	Kumarakalyana Ghrita	Sarvabalaamaya, Dantodbeda	CK.d. 64/70-74
24.	Siva Gutika	Rasayana	CK.d. 65/161-173

Table 9. Pushkaramoola in Haritha Samhitha [12]

SI. No.	Preparation /Yoga	Indication	Reference
1	Mulakadya Taila	Vata Vyadhi	Ha.Sa. 20
2	Narayana Taila	Pangu,Vandhya,Sukrakshaya	Ha.Sa. 20
3	Rasnadi Kwatha	Amavata	Ha.Sa. 20
4	Ajamodadi Choorna	Amavata	Ha.Sa. 20
5	Satavaryadi Choorna	Grdhrasi	Ha.Sa. 21
6	Satyadi Choorna	Gulma	Ha.Sa. 4
7	Ajamodadi Choorna	Vataja Gulma	Ha.Sa. 4
8	Hingvadi Choorna	Vataja Gulma	Ha.Sa. 4
9	Hingu Sauvarcaladya Ghrita	Vataja Gulma	Ha.Sa. 4
10	Kulathadi Kwatha	Prameha	Ha.Sa. 28
11	Candanadi Kwatha	Danta Roga	Ha.Sa. 46
12	Devadarvadi Ghrita	Sira Shoola	Ha.Sa. 7
13	Katphaladi Yoga	Pinasa	Ha.Sa. 42
14	Dashanga Kwatha	Sannipatika Jwara	Ha.Sa. 2
15	Brihatyadi Kwatha	Sannipatika Jwara	Ha.Sa. 2
16	Satyadi Kwatha	Jwara	Ha.Sa. 2
17	Laghu Rasnadi Kwatha	Jwara	Ha.Sa. 2
18	Hingvadi Kwatha	Shoola	Ha.Sa. 7
19	Tumburvadi Choorna	Vatika Shoola	Ha.Sa. 7
20	Chandanadi Choorna	Apasmara Unmada	Ha.Sa. 19
21	Maha Pancha Gavya Ghrita	Apasmara Unmada	Ha.Sa. 19

Table 10. Pushkaramoola in Bhela Samhitha [13]

SI.No	Formulation	Indication	Reference
1.	Dadhika Ghritam	Gulma	B.Chi. 5/20-28
2.	Haritakadi Choorna	Hridroga	B.Chi. 19/6
3.	Padadi Choorna	Hridroga	B.Chi. 19/7-9
4.	Agastya Rasayana	Kasa	B.Chi. 20/40
5.	Yavanyadi Choorna	Amatisara	B.Chi. 10/16
6.	Hinguvadi Choorna	Hridroga,Parsvashoola,Apatantraka	B.Chi. 26/12-13
7.	Aswathamooladi Modaka	Rajayakshma	B.Chi. 4/54-68

Table 11. Pushkaramoola in Sahasra Yogam [14]

SI No	Formulation	Indication
1.	Bharangyadi Kashayam	Sannipatika Jwara, Hridaya Shoola, Parsva Shoola
2.	Nimbadi Kashayam	Kaphaja Jwara
3.	Dashamooladi Kashayam	Sirashoola, Kshayam, Kasa
4.	Ashwagandhadi Kashayam	Kshayam
5.	Pushkarahwadi Kashayam	Hridroga
6.	Poushkaradi Kashayam	Kasa,Swasa
7.	Dashamoola Kashayam	Swasa, Parsvashoola, Hridaya Shoola
8.	Kulanthadi Kashayam	Hikka
9.	Kankayana Gutika	Rakta Gulma
10	Agasthyarasayana	Swasa, Kasa, Vishama Jwara, Hrdroga, Grahani
11	Jeevantiyadi Choorna	Kasa, Swasa, Hikka
12	Tegarajarasa Choorna	Kasa, Swasa
13	Trikatutripthaladi Choorna	Kasa, Swasa, Arsha, Bagandara, Gulma
14	Pushkaramoola Choorna	Hridroga, Kasa, Swasa, Hikka
15.	Brhatgnimukha Choorna	Ajeerna, Gulma, Pleeha, Arsha
16.	Sringhadi Choorna	Hikka, Kasa, Peenasa
17	Sudarshana Choorna	Jwara, Swasa, Kasa, Pandu, Hridroga,Kamala

18	Hinguvadi Choorna	Parswa Shoola,Udara Roga, Vridhi
19.	Chaturbadravalehika	Swasa, Jwara, Kasa
20	Chyavana Prasha	Hrdroga, Raktavata,Shukla Dosha
21	Dashamoolarishta	Kasa, Swasa, Vataroga, Kshayam, Pandu
22	Pushkaramoolasava	Kshayam, Apasmara, Kasa, Raktapitta
23	Haritakyasava	Shoola, Mutrakrichra, Asmari
24	Narayana Taila	Garbha Vikara, Vandya
25	Tejovatyabhringa Ghrita	Hikka, Swasa, Shopha,Vata,Arsas
26	Dashamoola Grita	Kasa, Swasa
27	Dhanwantara Ghrita	Arsha, Kshayam,Pandu, Chardi
28	Baladya Ghrita	Jwara, Kshayam, Kasa Sirashoola
29	Mahamayoor Ghrita	Vandyata,Sukraartava Roga, Yoni Roga
30	Mahatpanchagavya Ghrita	Jwara, Apasmara, Gulma, Grihapeda
31	Simhyamrta Ghrita	Arsha, Prameha

Table 12. Pushkaramoola in Kashyapa Samhitha [15]

SI.No	Formulation	Indication	Reference
1.	Satyadi Choorna	Kapha Vataja Jwara	Ks Khi. 19/44-45.1
2.	Vidangadi Kashaya	Sannipatika Jwara	Ks Khi. 19/45.2-46.1
3.	Brhatyadi Kashaya	Sannipatika Jwara	Ks Khi. 19/49.2-49.1
4.	Duralabadi Kashaya	Sannipatika Jwara	Ks Khi. 19/46.2-48.1
5.	Brihatyadi Kashaya	Kapha Vataja Jwara	Ks Khi. 19/20
6.	Dashamooladi Kashaya	Vata Jwara	Ks Khi. 19/18-19
7.	Jeevantiyadi Yoga	Sannipatika Jwara	Ks Khi. 19/48.2-49.1
8.	Kushtadi Anuvasana Yoga	Shoola	Ks Khi. 18/58-61
9.	Pippalyadi Choorna	Shoola,Udavarta	Ks Khi. 18/55-57
10.	Hingwadi Choorna	Shoola	Ks Khi. 18/18-21
11.	Devadaruadi Kashaya	Shopha	Ks Khi. 17/70.2-71.1
12.	Brihatyadi Kashaya	Sutika Kaphaja Jwara	Ks Khi. 11/128
13.	Dashamooladi Kashaya	Sutika Sannipatika Jwara	Ks Khi. 11/161.2-165.1
14.	Pancakolaka Yusa	Sangrahika,Deepaniya	Ks Khi. 4/402-42.1
15.	Satyadi Choorna	Shoola Anaha	Ks Ka. 8/114.2-115
16.	Pippalyadi Vati	Vata Gulma	Ks Chi. 8/32-35
17.	Katuka Sarpi	Sannipatika Jwara	Ks Ka. 8/144.1

3.4 Property of Pushkaramoola in Various Nighantus

Table 13. Pushkaramoola in Various Nighantus

SI No	Nighantu	Indicaton	Reference
1.	Dhanvantari Nighantu [16]	Jwara Arocaka	Guduchyadi Varga
2.	Madanapala Nighantu [17]	Vatakapha Jwara	
3.	Kaiyadeva Nighantu [18]	Jwara, Shopha, Aruci, Swasa	Ausadi Varga
4.	Raj Nighantu [19]	Kapha Vata Jwara	Pippalyadi Varga
5.	Bhavaprakasha Nighantu [20]	Kapha Vata Jwara	Haritakyadi Varga
6.	Priya Nighantu [21]	Madavaham	Satapushpadi Varga
7.	Sodhala Nighantu [22]	Parshva Ruka, Swasa, Kasa, Hikka, Jwara	

3.5 Description of Pushkaramoola in Various Books

3.5.1 Ayurvedic pharmacopoeia of India [23]

Pushkaramoola is mentioned in The Ayurvedic Pharmacopoeia of India Part-I & Volume IV.

Table 14. Identity, purity and strength

Foreign matter -	Not more than 2 percent
Total ash	Not more than 5 per cent.
Acid-insoluble ash	Not more than 0.6 per cent
Alcohol-soluble extractive	Not less than 10 percent
Water-soluble extractive	Not less than 20 per cent

T.L.C

T.L.C of alcoholic extract on Silica gel 'G' plate shows nine spots at Rf. 0.23, 0.28, 0.34, 0.39, 0.48, 0.51, 0.64, 0.73 and 0.94 (all yellow) on exposure to iodine vapor using Benzene: Ethylacetate.

At Rf. 0.11, 0.28, 0.34, 0.39, 0.48, 0.64, 0.73 and 0.94 (all violet) on spraying with Vanillin-Sulphuric acid reagent and heating the plate for about ten minutes at 105°C eight spots appear.

3.5.2 The wealth of India [24]

In Ayurvedic system of medicine,

- The roots were given in cough, dyspnoea, asthma, pleurisy, tuberculosis and chest pain, especially in precordial pain.
- The aqueous extract of dry or fresh roots is given orally in rheumatic pains and liver problems and it's used for external application for relieving pain.
- Anti-anginal, Hypolipidaemic properties were seen in the roots (powder)
- Pushkara-guggulu, which has been found effective in management of ischemic and coronary heart disease; the treatment with the drug has beneficial effect in restoration of normal ECG, and significant reduction in cholesterol, triglycerides and total lipid levels. .
- The essential oil obtained from roots exhibits Antibacterial activity against several Gram positive and Gram negative bacteria.

3.5.3 Quality standards of Indian medicinal Plants [25]

Chemical Constituents: Foreign organic matter: Not more than 1.0 per cent. Ash: Not more than 4.8 per cent. Acid insoluble ash: Not more than 0.57 per cent. Ethanol-soluble extractive: Not less than 25 per cent. Water soluble extractive: Not less than 15.0 per cent.

Adulterants/Substitutes: The roots of *Saussurea lappa* C. B. Clarke (Asteraceae), *Iris*

germanica Linn. (Iridaces) and *fuldroyleana* DC. are used as substitutes of *I. racemosa*.

Pharmacology:

- Administration of the *I. racemosa* root extract decreased the serum glucose level in dexamethasone induced hyperglycaemic mice and plasma glucose and insulin levels in adrenaline induced hyperglycaemia in rats.
- The alcoholic extract of root lowered blood glucose und enhanced liver glycogen without increasing plasma insulin in rats, suggesting that the actions might be at the peripheral level by potentiating the insulin sensitivity.
- The root powder also showed negative inotropic and chronotropic effects on frog heart, indicating that one of the constituents may have adrenergic beta-blocking activity.
- A human study showed the beneficial effect of root extract in cases of angina pectoris. The alcoholic extract of root exhibited antiallergic activity in rats it also showed marked protection against the bronchospasm in guinea pigs, which has been attributed anti-5-HT, antiallergic and antihistaminic properties.
- Alantolactone isolated from the root showed anti-inflammatory and hepatoprotective activities in albino rats.
- Alantolactone and isolantolactone exhibited anti dermatophytic activity against ringworm fungi while latter was also active against other human pathogenic fungi. The essential oil of root exhibited antifungal and antibacterial activity against gram-positive and gram-negative bacteria.

Major Therapeutic Claims: Antihyperglycemic, Antiasthmatic, Antidyspnoea.

Safety Aspects: The drug used traditionally in prescribed doses may be considered safe

Dosage: Powder: 1 to 3 Grams.

3.5.4 Encyclopaedia of world medicinal plants [26]

Erect herb, up to 1.8m tall, young parts densely hairy. Leaves elliptic-lanceolate or obovate, amplexicaul. Flowers in heads, yellow. Fruit achene.

It is a Erect herb, up to 1.8m tall, young parts densely hairy and the Leaves are elliptic-lanceolate or obovate, amplexicaul. The Flowers in heads are yellow and the Fruit is achene.

Flowering & Fruiting time: July-September.

Medicinal uses:

- It is used as an expectorant and resolvent.
- Roots contain Inuline (10%) and an essential oil containing alantolactone which is strongly anthelmintic, expectorant and diuretic.
- Seeds are aphrodisiac.
- It is also a good cure for rheumatism. Roots show hepatoprotective activity



Fig. 1. Plant Pushkaramoola (*Inula racemosa* Hook.f.)



Fig. 2. Dried root of Pushkaramoola (*Inula racemosa* Hook.f.)

3.6 Description of Pushkaramoola in Different Journal

Table 15. Pushkaramoola in Different Journal

Sl.No	Part used	Pharmacological Activity/ Clinical Activity	Model or Method	Solvent used	Reference
1.	Root	Cardio protective Activity	Rats	Petroleum extract	Chabukswar.et.al. [27]
2.	Root	Antiallergic Activity	Albino rats	Alcohol	Srivastava, S., Gupta, PP.et.al. [28]
3.	Root	Cytotoxic Activity	In vitro	n-hexane, chloroform, n-butanol and aqueous	Gnanasekaran, D.; et.al, [29]
4.	Root	Antimutagenic & Antiapoptotic Effects	Mice	Aqueous	Arumugam, P. and Murugan, M [30]
5.	Root	Hepatoprotective Activity	Rats	Hydroalcoholic extract	Rao K, Mishra S. [31]
6.	Root	Hypoglycemic Activity	Rats	Ethanol	S. Gholap, A. Kar, [32]
7.	Root	Anti-inflammatory & Analgesic Activity	Mice	Aqueous	Arumugam, P., Marudhamuthu.et.al [33].
8.	Root	Antifungal Activity	Human	Methanol	R.X. Tan et al. [34]
9.	Root	Adrenergic Beta Blocking Activity	Albino rat/frog	Petroleum ether	Tripathi YB et al. [35]
10.	Root	Antioxidant Activity	Albino rat	Ethanol extract	S. Srivastava, B. Anand, B. Ali, [36]
11.	Root	Antibacterial Activity	Agar plate	Ethanol and Aqueous	Y.Q. Yang, H.L. Ma, Z.X. Zhang, [37].
12.	Root	Mosquito Larvicidal Activity		Ethanol	H.E. Qing et.al. [38]
13.	Root	Adaptogenic Activity	Albino rat	Ethanol roots	D. Gnanasekaran et.al, [39]
14.	Root	Antiasthmatic Activity	Mice	Petroleum ether	Vadnere, G. P et.al. [40]
15.	Root	Phytoestrogenic effect	Rat Vitro Silico	Alcohol (IrA) and hexane (IrH)	Kalachaveedu, et.al [41]
16.	Root	Hepatic ischemia–reperfusion injury following orthotopic liver transplantation	Male albino rat	N Hexana	Wang, Zhuoyi; [42]

4. DISCUSSION

Ayurveda is an ancient practice of medicine, utilizing the various knowledge of the medicinal plants available in Indian subcontinent. A great percent of ayurvedic preparation is based on medicinal plants. The ayurvedic literature documentation can be catageriosed in 4 different

periods the vedic period, the Samhita period, the medieval period and the modern period .The medicinal plants documentation find a place in three of four Vedas. Samhitas describe different plants and its medicinal uses. The texts have description and therapeutical uses of medicine. We also have to mention Nigantus which are written based on the medicinal plants mentioned

in samhitas. Among thousands of medicinal plants mentioned in ayurvedic literature, here we are codifying one of the medicinal plant pushkaramoola (*Inula racemosa* Hook.F) mentioning in various ayurvedic literature.

The plant is pushkaramoola is a medicinal plant which grows in India, China, Nepal, Afganistan . Pushkaramoola has wide range of pharmacological actions such Antipyretic, Antiinflammatory, Hepatoprotective, Anthelmintic, Antiasthmatic and Antifungal properties. The root of the plant is mainly used for various medicinal purpose. Roots are bitter, acrid, thermogenic, cardiogenic, expectorant, alexipharmic, anodyne, antiinflammatory, digestive, carminative, aphrodisiac. The root has been traditionally used for the treatment of gonorrhoea; the flower is used in jaundice and ophthalmic afflictions in folklore. Leaves are extensively used for the affections of the respiratory tract such as chronic and acute bronchitis. The dried leaves are smoked as cigarettes in asthma and the juice of fresh leaves have been used for diarrhoea and dysentery and also used as valuable antiseptic, antiperiodic and anthelmintic.

Pushkaramoola is a drug that is widely used in the classic text books to treat different vyadhis. It is considered as Agrayaousadha in swasa kasa parswa soola hara rogas. A through study was done throughout the ayurvedic text books which shows that pushkaramoola is mostly administered as single drug or as compound preparation in Swasa (antiasthmatic), Kasa (cough), Jwara (antipyretic), Rajayakshma (tuberculosis), Gulma, Udara, Udavarta (G.I.T problems), Hrdroga (Cardiac protective), Hikka (hiccup), Ajeerna (Indigestion), Amavata, Vata vikara (Vitiation of vata), Soola (pain reliever), Chardi (emesis), Kushta (skindiseases), Arsas(piles), Bagandara(fistula), Sopha(anti-inflammatory), Pandu(Anemia) Kamala (jaundice), Apasmara ((convulsions), Mutrakrichra (urinarydiseases), Asmari (Antiurolithiasis), Vandyia (Aphrodisiac), Prameha (Antidiabetic), Dantaroga, Sirasoola, Pinasa (catarrh), Rasayana (rejuvenator). The Cardioprotective, antiallergic, cytotoxic, antimutagenic, antiapoptotic, hepatoprotective, hypoglycemic, antiinflammatory, analgesics, antifungal, adrenergic, beta blocking activity, antioxidant, antibacterial, mosquito larvicidal activity, adaptogenic activity and anti asthmatic activity were studied already. Still some of the properties which are indicated in the classical

textbook need to be explored especially the antipyretic.

Jwara is a prevalent problem in today's general practice, affecting both sexes at various stages of their life. Even in the Vedas, *Jwara* is mentioned. It is regarded as the earliest manifestation of an illness. *Jwara* was given a lot of focus by Acharya Charaka, who kept it ahead of all other diseases. *Jwara* is an illness that is quite common and is comparable to pyrexia. A wide range of modern drugs are used to treat inflammation and pyrexia, but their long-term use may have several harmful side effects. As a result, new anti-inflammatory drugs and antipyretic derived from plants must be established, and existing therapies must be utilized more effectively. Herbal antipyretic drugs are derived from plant sources and are often considered a more natural and holistic approach to managing fever. Many herbal antipyretic drugs have a long history of traditional use, which suggests their safety profile. They often have fewer side effects compared to synthetic drugs, making them suitable for a wide range of individuals, including those with allergies or sensitivities. Some herbal antipyretics possess antimicrobial properties, which can be beneficial when fever is caused by infections. These herbs can help address the underlying cause of fever while reducing the body's temperature. They can aid the body's natural defense mechanisms in fighting off infections. In an era where concerns about antibiotic resistance and overuse of pharmaceutical drugs exist, herbal antipyretics offer an alternative that can reduce the reliance on synthetic medications.

Pushkaramoola can be used as a single antipyretic herbal drug and as a formulation in different kind of jwara. The mostly used jwarahara formulations with pushkaramoola as a key ingredient in different samhithas include.

Baladighritha, Agaraditaila, Duralabhadighritha, Agastyaavaleha, Panchagavyaghrihitha, Nagaradikashayam, chaturbadravaleha, Nimbadi Kashaya, Panchatikta Kashaya, kshudradi Kashaya, Ashtangawaavaleha, Bharangyadi kwatha, Satyadikwatha, Laghurasnadikwatha, Sudarshanachoorana, satyadichoorna, Vidangadi Kashaya, Brhatyadi Kashaya, Duralabhadi Kashaya, Dashamooladi Kashaya, Jeevantiyadi yoga, Katuka sarpi.

There are numerous formulations regarding the jwarahara property of pushkaramoola. While there have been studies examining various

aspects of Pushkarmoola, such as its antibacterial, antifungal, and antioxidant properties, which could potentially contribute to its anti-pyretic effects, there is a noticeable lack of research specifically focused on its role as an anti-pyretic. This absence of comprehensive data to substantiate the classical references regarding Pushkarmoola's potential as a fever-reducing herb highlights the need for further investigation in the future.

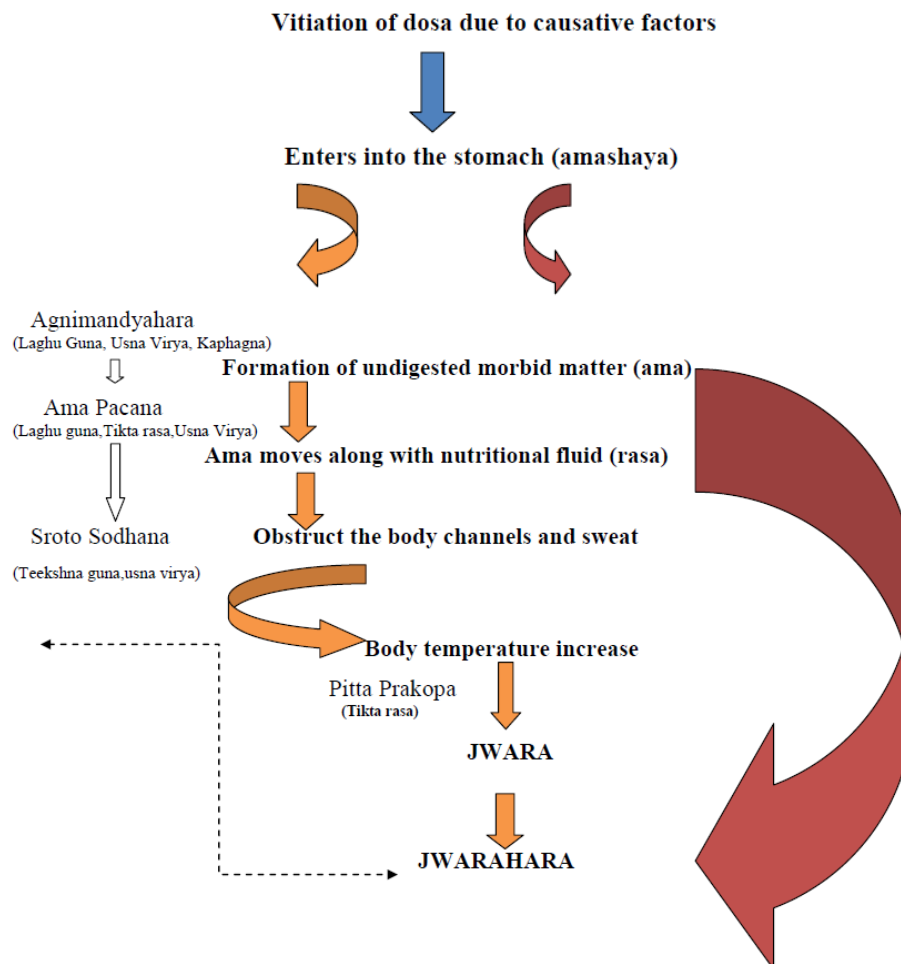
- Ushna Virya- helps in *ama pacana, kapha hara, srotosodhaka*
- Teekshna guna- *sroto sodhaka, kaphahara*
- Katu Vipaka- *sroto sodhaka, kapha hara*
- Kaphaghna Karma - *Ama pachana*

Ayurvedic treatment is widely acknowledged for its high effectiveness. However, there remains a significant gap in understanding the mode of action, pharmacology, pharmacokinetics, and pharmacovigilance of many essential Ayurvedic drugs. Additionally, the comprehensive knowledge of the fundamental principles of Ayurveda faces challenges in gaining scientific acceptance due to the lack of robust evidence. So, more research and clinical studies are needed to validate the efficacy and safety of Pushkarmoola as an antipyretic drug.

The probable action of the pushkarmoola as a jwarahara can be due to its (Flow Chart 1)

- Tikta Rasa – reduces *pitta*, relieves *daha* and *pippasa* and helps in *ama Pacana*, increases the appetite reduces *Trishna* and act as *vishaghna*
- Laghu guna – *ama pachana, kapha hara*, helps in *langana* which is the prime treatment of *jwara*

Samprapti Vighatana of the jwara by Rasa Panchaka of Pushkarmoola:



Flow Chart 1. Samprapti vighatana of the jwara by rasa panchaka of pushkarmoola

4. CONCLUSION

It is notable that although Pushkarmoola's antipyretic potential is well-described in ancient texts like the Samhitha, there is a surprising absence of relevant studies to validate these claims. This gap creates a significant opportunity for further exploration into Pushkarmoola's effectiveness as an antipyretic, especially in individuals with cardiac conditions and respiratory ailments. In an era where the demand for effective antipyretic drugs without adverse side effects is crucial, the need for extensive research on Pushkarmoola as an antipyretic cannot be overstated. This research could pave the way for its recognition as a prominent and safe antipyretic medication, offering potential benefits to a wide range of patients.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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