



## COMPARATIVE ANALYSIS OF THE PHARMACOLOGICAL POTENTIAL OF HINGU (FERULA FOETIDA REGEL) AND NADIHINGU (GARDENIA GUMMIFERA.L. F) – A – A LITERARY REVIEW

[Ankitha sudheendran<sup>1</sup>](#), [Krishna Priya A<sup>2</sup>](#), [Sethu R<sup>3</sup>](#)

<sup>1,2,3</sup> Assistant Professor, Department of Dravyaguna Vijnana, Ahalia Ayurveda Medical College, Palakkad.

**Corresponding Author:** [drsethu1989@gmail.com](mailto:drsethu1989@gmail.com)

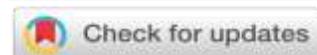
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## ABSTRACT

Ayurveda is a science that has been refined through centuries and decades of practice and research has proven to be a reliable source of information on the understanding of herbal drugs throughout the world. The use of plants for medicinal purposes has been in practice since time immemorial, but documentation including the usage and their application for combating problems associated with health started with the *vedic and Samhita kala*. Various ayurvedic texts like Samhita and Nighantu give us an idea of the synonyms along with their interpretations, properties, actions, pharmacological activity, and indication, in general, scientific texts give us the complete pharmacological profile of the plant. With the industrialization and globalization of ayurveda progressing day by day, the demand for ayurvedic herbs also increases and is forced to meet the demand of the public. With people turning towards herbal medicines for a safe and effective healthcare alternative, the increased demand and exploitation of drugs bring around the fear of various herbs becoming endangered. This led ayurvedic scholars and physicians to welcome and embrace the concept and usage of substitute drugs with similar pharmacological potential. The present study is an attempt to analyse and compare the pharmacological potential of *Hingu (Ferula foetida regel)* and *Nadihingu (Gardenia gummifera. l. f)* and establish the possibility of the usage of *Nadihingu* as an effective substitute.

**Keywords:** *Hingu*, *Nadihingu*, Pharmacological potential, literary review, substitute.

## INTRODUCTION

The plant kingdom has been the direct and indirect source for various human needs associated with life and health, whether it be food or medicine. Growing urbanization and industrialization in ancient times have made humans develop more interest in allopathic medication. The majority of allopathic medicines, being synthetic or semisynthetic, brought along with their medicinal action various harmful and life-threatening side effects. The health concern from these adverse side effects resulted in people choosing herbal medications over allopathic medications for primary healthcare. But this sudden shift in choosing herbal medicine as the primary health care system increased the demand for herbal drugs and in turn, disturbed the population equilibrium of the particular herb within the ecosystem. *Hingu*, commonly known as asafoetida, is an oleo gum resin that is produced by the incisions on the roots of the minimum five-year-old *Ferula foetida Regel* plant that belongs to the Apiaceae family. It has been used as an ayurveda medicine and food flavoring agent for many years. *Ferula* is an endangered medicinal plant species of conservation concern and has become very important in recent years due to its demand in the medicinal and food industry. Also, the plant is grown chiefly in Iran, and Afghanistan, not native to India. It is used to treat a variety of diseases, especially Gastrointestinal disorders. Nowadays *Hingu* is highly adulterated with physical and chemical adulterants which can be responsible for serious health issues. A thought for finding out a genuine substitute for *Hingu*, with simi-

lar pharmacological properties and action ended up in the drug called ‘*Nadihingu*.’ *Nadihingu* is the resinous exudate from the shoot tip of *Gardenia gummifera. l. f*, Rubiaceae family. *Gardenia gummifera.l. f* is a shrub that is distributed throughout India, abundantly available in the hilly region. The gum is having similar smell to that of *Hingu* and hence is called the name *Nadi hingu*. Which can be easily cultivated in our climatic conditions. This article is intended to explore the pharmacological potential of both these drugs, *Hingu* and *Nadihingu* in terms of their pharmacological properties, action, indications, and activity proved and thereby find out the similarity in the pharmacological potential of the two drugs checking the possibility of using the latter as an effective substitute in the absence of the former drug.

### Aim of the study

The aim of the study is mainly to assess, understand and compare the pharmacological potential of drugs *Hingu* (*Ferula foetida Regel*)<sup>(1)</sup> and *Nadihingu* (*Gardenia gummifera. L.f*)<sup>(2)</sup>

### Materials and Methods

Relevant sections of ayurvedic literature including the *Samhitas* and *Nighantus* were referred and all the information regarding the botanical name, family, taxonomical details, pharmacological actions, and properties of both drugs were collected from reliable authentic sources. Details regarding their pharmacological evaluation were also collected from research articles published.

**Table 1: Drugs with their Botanical Name, Family, and Part used.**

Drugs	Botanical name	Family	Part used
<i>Hingu</i>	<i>Ferula foetida Regel</i>	<u>Apiaceae</u>	Resinous exudate of the root <sup>(3)</sup>
<i>Nadi hingu</i>	<i>Gardenia gummifera. L.f</i>	Rubiaceae	Dried resinous exudation from the shoot tip <sup>(4)</sup>

### Synonyms of *Hingu* and *Nadihingu*

Synonyms help to understand the identity, morphological features, properties, pharmacological actions, etc. of the drug. In this study, the synonyms of *Hingu* and *Nadihingu* are studied in detail from various literature and the relevant synonyms which explain the pharmacological actions are filtered.

**Table 2: synonyms of Hingu and Nadihingu based on their pharmacological activity.**

<b>HINGU</b> <sup>(5)</sup>	<b>NADIHINGU</b> <sup>(6)</sup>
Rakshoghnam	
Janthughnam	Janthuka
Janthu nasanam	
Janthukam	
Bhoothanasanam	
Jaranam	
Supadhoopanam	
Sahasravedhi	
Sulari	
Athyugram	
Agoodagandham	
Ugra gandham	

**Method of collection of Hingu and Nadi hingu**

The proper way of collecting the useful part from a plant is very important to preserve the pharmacological action. The drugs being resinous exudate the correct method of collection remains an important point of discussion.

**Table 3: Method of collection of Hingu and Nadihingu**

<b>Hingu</b> <sup>(7)</sup>	<b>Nadihingiu</b> <sup>(8)</sup>
<ul style="list-style-type: none"> <li>• Select the plant before its flowering stage.</li> <li>• The root stock is exposed, and it is cut off as a slice from the top.</li> <li>• A milky juice starts exuding which is discarded.</li> <li>• The root is then covered by a dome structure called ‘Khora’ formed of twigs and covered with clay leaving an opening towards the north, to protect from direct sun.</li> <li>• After 6 weeks, a thick gummy reddish substance appeared as irregular lumps which were scraped off with an iron hoop.</li> </ul>	<ul style="list-style-type: none"> <li>• Resinous exudate appears at the shoot tip of the plant.</li> <li>• Globular(1-3mm), shiny smooth, translucent Sulphur yellow to golden yellow in colour</li> <li>• Which can be collected directly from the plant</li> </ul>

**Organoleptic evaluation of useful part**

Organoleptic evaluation helps to identify the genuine drug sample. The following table shows the comparison of the organoleptic features of both drugs.

**Figure 1 – Hingu**



**Figure 2 – Nadi hingu**



**Table 4: organoleptic evaluation of useful parts of *Hingu* and *Nadihingu***

	<i>Hingu</i> <sup>(9)</sup>	<i>Nadihingu</i> <sup>(10)</sup>
Shape	Rounded, flattened, or masses of agglutinated tears	Globular droplet
Size	12-25 mm	1-3 mm
Colour	Greyish white to dull yellow	Sulphur yellow to golden yellow in colour gradually turns to brown with age
texture	Gummy mass when fresh and later when dried become agglutinated mass <sup>(11)</sup>	Smooth
fracture	Brittle <sup>(12)</sup>	Brittle when dry, sticky when fresh
Smell	Strong, characteristic, and persistent	The characteristic smell of asafetida
Taste	Bitter and acrid	Slightly bitter

**Pharmacological properties of *Hingu* and *Nadihingu***

The pharmacological properties of the drugs are analyzed in terms of *Rasapanchaka*, which give us an insight into the mode of action of the drug on various disease. *Rasa panchaka* includes *Rasa* (Taste), *Guna* (Property), *Virya* (Potency), *Vipaka* (Post digestive effect), *Prabhava* (Specific action)

The following table includes the *Rasapanchaka* of *Hingu* and *Nadihingu* from literatures.

**Table 5: Pharmacological properties (*Rasa panchaka*) of *Hingu* and *Nadi hingu***

<i>Drug</i>	<i>Rasa</i>	<i>Guna</i>	<i>Virya</i>	<i>Vipaka</i>
<i>Hingu</i> <sup>(13)</sup>	<i>Katu</i>	<i>Tikshna</i> <i>Laghu</i> <i>Snigdha</i> <i>Sara</i> <sup>(14)</sup>	<i>Ushna</i>	<i>Katu</i>
<i>Nadi hingu</i> <sup>(15)</sup>	<i>Katu</i> ( <i>Katu thiktha</i> – <i>Kaiyyadeva Nighantu</i> ) <sup>(16)</sup>	<i>Thikshna</i>	<i>Ushna</i>	<i>Katu</i>

**Pharmacological action of the drugs *Hingu* and *Nadihingu***

*Karma* or the pharmacological action of a drug can be understood on multiple levels. The action of a dravya can be analysed at the level of *dosha*, *dhathu*, *mala*, *agni*, *ama*, *srothas*, *indriya*, *buddhi*, *sthana*, *avayava*, and *sarva sareera*. The following table helps to get a deeper understanding of the *Karma* of both drugs in a very deeper level.

**Table 6: Pharmacological action of *Hingu* and *Nadihingu***

<i>Actions</i>	<i>Hingu</i>	<i>Nadi hingu</i>
<i>Dosha</i>	<i>Vatavalasahrit</i> , <i>Pithavardhanam</i> <sup>(17)</sup> <i>Kaphavathajith</i> <sup>(18)</sup> <i>Pithalam</i> <sup>(19)</sup>	<i>Vathahara</i> <sup>(20)</sup> <i>Kaphahara</i>
<i>Dhatu</i>	-	-
<i>Mala</i>	<i>Vibandhaghnam</i> <i>Malasthambhakaram</i> <sup>(21)</sup> <i>Bhedanam</i> <sup>(22)</sup>	<i>Vathanulomaka</i> <i>Vibandhaghna</i> <i>Malasthambanasanam</i> <sup>(23)</sup>

<i>Agni</i>	<i>Deepanam</i>	<i>Deepanam</i>
<i>Ama</i>	<i>Pachanam,</i>	<i>Pachanam,</i>
<i>Srotas</i>	-	-
<i>Indriya</i>	<i>Ruchyam</i> <i>Chakshushyam</i> <sup>(25)</sup>	<i>Ruchyam</i> <sup>(24)</sup>
<i>Budhi</i>	-	<i>Manomoha nasana</i> <sup>(26)</sup>
<i>Sthanam</i>	-	-
<i>Avayavam</i>	<i>Sthreepushpajananam</i> <sup>(27)</sup> <i>Hridyam</i> <sup>(28)</sup>	<i>Hridyam</i> <sup>(29)</sup> <i>Hrid vasthi ruk</i> <sup>(30)</sup>
<i>Sarva Sareeram</i>	<i>Balyam</i> <i>Bhootaghnam</i> <i>Janthughnam</i>	<i>Janthughnam</i> <sup>(31)</sup>

**Therapeutic indication of drugs *Hingu* and *Nadi hingu*:** Based on the understanding of *Karma* of a particular drug, therapeutic indications are attributed to that drug. The following table lists the therapeutic indication of both *Hingu* and *Nadihingu* from the literature.

**Table 7: Therapeutic indication of drugs *Hingu* and *Nadihingu***

<i>Hingu</i> <sup>(32)</sup>	<i>Nadi hingu</i> <sup>(33)</sup>
<i>Agnimandyam</i>	<i>Vishtambam</i>
<i>Soola / Udaraarathi</i>	<i>Vibandham</i>
<i>Anaha</i>	<i>Arsas</i>
<i>Adhmanam</i>	<i>Gulma</i>
<i>Ajeernam</i>	<i>Kaphavathaarathi</i>
<i>Vibandham</i>	<i>Aruchi</i>
<i>Gulma</i>	<i>Meda</i>
<i>Udara</i>	<i>visha</i>
<i>Krimi</i>	<i>Krimi</i>
<i>Murcha</i>	
<i>Apasmara</i>	
<i>Swasa</i>	
<i>Kasa</i>	
<i>Hidroga</i>	

**Chemical constituents of *Hingu* and *Nadi hingu*:** Chemical constituents present in both drugs are listed in the following table.

**Table 8: chemical constituents of *Hingu* and *Nadihingu***

<i>Hingu</i> <sup>(34)</sup>	<i>Nadihingu</i> <sup>(35)</sup>
Resin – 40-65%	Resin – 89.9%
Gum – 20-25%	Volatile oil 0.1%
Volatile oil – 4-20%	Gardenin
Sesquiterpenecoumarins	Saponin
Di and tri sulphides	Iodine
Asaresinetol	Dikamaliartanes

Asafoetidin	
Alpha – pinene	
Phellandrene umbelliferone	
Undecyl sulphanyl acetic acid	
Asaresinotannol	
Ferulic acid	

### **Pharmacological evaluation of drugs based on the proven pharmacological activity.**

Various research has been carried out on both drugs to find out their pharmacological potential. Informations regarding the experiments carried out with both the drugs are collected and compared.

**Table 9: Proven pharmacological activities of Hingu and Nadihingu**

Pharmacological Activity	Hingu <sup>(36)</sup>	Nadi hingu <sup>(37)</sup>
Antioxidant activity	Yes	Yes
Analgesic activity		Yes (Acetic acid-induced writhing method)
Anti-inflammatory	Yes	Yes
Anti-pyretic activity		Yes
Anthelmintic	Yes	Yes
Anti-convulsant	Yes	Yes (Dikamaliartane -A)
Anti-cancer activity	Yes	Yes (Dikamaliartane -A) (17)
Action on intestinal motility	Yes	Yes <sup>(38)</sup>
Hypolipidemic activity	-	Yes <sup>(39)</sup>
Anti-spasmodic and hypotensive activity	Yes	-
Anti-viral	Yes	-
Anti-fungal	Yes	-
Hepatoprotective	Yes	-
Anti-ulcer activity	Yes	-
Memory enhancing activity	Yes	-
Anxiolytic activity	Yes	-
Neuroprotective effect	Yes	-
Digestive enzyme activity	Yes	-

## **DISCUSSION**

*Hingu* is a drug with high medicinal value, and it is an ingredient in many ayurvedic formulations. It has been used for treating gastric issues and various abdominal disorders. It is also popularly used as a spice as well as a flavoring agent. Due to this, the drug is having a high demand for production throughout the year. *Hingu* is the oleogum resin exudated from the root of different species of *Ferula*. The oleo gum resin contains sesqui – terpene coumarins, volatile disulphides, free ferulic acid, and

some ferulic acid esters. Many of the pharmacological studies conducted on the species *Ferula foetida* revealed that it has antioxidant, antiulcer, anticancer, antimicrobial, and antifungal activities. some recent studies have revealed that it also possesses antiviral activity which is active against influenza A (H1N1) virus.<sup>(40)</sup> These highlight the importance of drug *hingu* in the area of controlling multiple areas of the infection spectrum, which may consider most relevant in the present scenario. The plant *Ferula foetida Regel* is distributed wild in Punjab, Kashmir, Iran, and Afghanistan.<sup>(41)</sup> The resin is collected from a

plant when it is five-year-old, just before the flowering stage usually during March and April. The exudate takes a few weeks to harden and it is collected at that time. The plant needs specific climatic conditions to grow, which makes it hard to cultivate in our region. The unavailability of genuine drugs and the increase in demand from the market ended up in the injudicious exploitation of the drug and adulteration. Adulteration can be always prevented by finding out a substitute of similar therapeutic value.

*Nadi hingu* is such a drug collected as an exudate from the shrub *Gardenia gummifera* L. f, which is distributed throughout India, and abundantly available in the hilly region. The gum is having similar smell to that of *hingu* and hence is called the name *Nadi hingu*. Which can be easily cultivated in our climatic conditions. It contains various chemical compounds like alkaloids, flavonoids, steroids, proteins, tannins, and phenols. The plant has potential medicine values screened for several pharmacological activities like antimicrobial activity, Insecticidal activity, Antioxidant Activity, Antibacterial, Anti-cancer, cytotoxic activity, etc.<sup>(42)</sup>. Both drugs, on literary review revealed that they have *Katu rasa*, *Thikshna guna*, *Ushma virya*, and *Katu vipaka*. Both drugs are *Vatakaphahara*, *Deepana*, *Pachana*, *Vathanulomana*, *Ruchya*, *Hridya*, and *Krimighna* action in common. In 2015, one study was conducted at SDM college of Ayurveda on a comparative evaluation of *Hingu* and *Nadihingu* with special reference to their effect on gastrointestinal motility by charcoal meal test in Albino mice. The study revealed that *Nadi hingu*, exudate exerted remarkable intestinal transit (57.9%), which is near to that of *Hingu* (61%) which indicates the functional symmetry of both drugs.<sup>(43)</sup> Considering the above facts, *Nadihingu* can be the safest substitute for *Hingu*. Vast cultivation practice of *Nadihingu*, *Gardenia gummifera. l. f* can be done in order to avoid unnecessary adulteration in *Hingu*. Further scientific research for comparative pharmacological activities of the drug sample can be carried out for better understanding.

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