"A DATABASE STUDY ON ARDRAKA (*Zingiber officinale*) USED FOR THE TREATMENT OF VARIOUS DISORDERS AS MENTIONED IN AYURVEDIC CLASSICS"

Abstract: ARDRAKA (Ginger) [ZINGIBER OFFICINALE Roxb., family ZINGIBERACEACE] is obtained from underground stem or rhizomes of, an herbaceous tropical perennial plant. Ginger described into two forms one is wet form (ARDRAKA) & another is dry form (SUNTHI). It used for the management of different diseases in classical text as well as modern sciences. ARDRAKA (ginger) is proved a non-toxic highly promising natural anti-oxidant compound having a wide spectrum of biological function (antimicrobial, antitumor, anti-diabetic, anti-inflammatory, immune-modulator etc.). which have been proved by various study and experiments. In **CHARAK SAMHITA**, ardraka is mention inShirovirechan, Dipaniya; Shitaprashamana Truptighna, Arshoghna,Trishnanigrahana, Shoolprashamana verga/gana. Mention in compound formulation like SHADANGA PANIYA used in Jwara (fever), MISRAKA SNEHAM used in gulma (gas trouble), PANCHKOL GHRITA used in rajayakshma (Tuberculosis), In **SUSRUTA SAMHITA**, ardraka is mention inPippalyadi Gana, Trikatu verga etc. Mention in compound formulation like NAVAYAS LOHA in prameha rog, SATHPAL GHRITA in udar rog etc.; in **ASTANGA HRYDAYA**; ardraka is mention inNasyapayogi Dravya, VachadiGana, mention in compound formulation like HINGWADI GHRITA in gulma chikitsa, TALISPATRA churn in rajayakshma etc. Likewise, plenty of references are available scattered in various ancient classics.

AIM: In this article, an attempt has been made to compile various information related to ginger from ayurvedic classics.

DISSCUSSION: It is hoped, this paper will provide many important information related to ardraka which will help further researchers to search data of ardraka and in the treatment purpose.

CONCLUSION: This work is going to give a complete information of zingiber all together by collecting all the scattered data from ayurvedic classics and will help to manage many different diseases.

Keywords: Ardraka, Sunthi, Ginger, ZINGIBER OFFICINALE, ayurvedic formulations.

ABBREVIATION

Ch/Su:	Charak Samhita Sutra Sthan
Ch/Chi:	Charak Samhita Chikitsa Sthan
Ch/Vi:	Charak Samhita Viman Sthan
Ch/Sa:	Charak Samhita Sasrir Sthan
Ch/Klp:	Charak Samhita Kalpa Sthan
Su/Su:	Susruta Samhita Sutra Sthan
Su/Sha:	Susruta Samhita Sharir Sthan
Su/Utt:	Susruta Samhita Uttar Tantra
Su/Chi:	Susruta Samhita Chikitsa Sthan
A.H/Su:	Astanga Hridaya Sutra Sthan
A.H/Sha:	Astanga Hridaya Sharir Sthan
A.H/Chi:	Astanga Hridaya Chikitsa Sthan
A.S/Su:	Astanga Samgraha Sutra Sthan
Sha/Pu:	Sharangadhar Purvakhanda
Sha/mdm.	Sharangadhar madhamkhan
Sha/utr.	Sharangadhar utarkhand
Chkrdt	Chakardutta
B.P.Madhyamkhanda.Chi:	Bhavaprakash Madhyam Khanda Chikitsa Sthan
B.P.NI	*Bhavaprakasha nighantu*
DH.NI	*Dhanvanthari nighantu*
PRIY.NI	Priya Nighantu
RAJ.NI	*Rajanighantu*
K.NI	*Kaideva nighantu*
M.N.	*Madanapala nighantu*

INTRODUCTION:

ARDRAKA (Ginger) is obtained from underground stem or rhizomes of ZINGIBER OFFICINALE, an herbaceous tropical perennial plant belonging to the family ZINGIBERACEACE.

KAIYADEVA NIGHANTU[17] described ginger into two forms one is wet form (ARDRAKA) & another is dry form (SUNTHI). **Ardraka** has Katu (pungent) ras, GUNA: Laghu, Ruksha (dryness), VIRYA Ushna (Hot potency.) VIPAK Katu and **Sunthi** has RASA katu(pungent) GUNA snigdha VIRYA Ushna(Hot potency.) VIPAK Madhura (Undergoes sweet taste conversion after digestion.) DOSHAGHNATA Kaphavatahara. Its karma(action) is Due to its ushna quality it acts as kapha-vata samak, aam pachak and srotasuddhi-karak.

Main chemical composition[18] of GINGER is 'GINGEROL' along with essential oil resin, nonalol, zingerone, gycine, curcumene, β- D- curcumene, β-bourbornene, d-borneal, citral, d-camphene, citronellol, geraniol, α-& β- zingiberenes, zingiberol, , paradol, gingerenone A, ginger glycolipids A, B, & C; gingerdiol; gingerone B & C, nutrients like Protein, carbohydrates, crude fibre, Vitamin C, E, K, Calcium, Iron, Zinc etc.

ARDRAKA (ginger) is one of the important drugs mentioned among the Ayurvedic classical texts. Ardraka is also mentioned as Mahabhaisajya. Reference of Ardraka are found in many Vedas, Ayurvedic Samhitas, Nighantus etc. which is written 5000 years back. It is extensively used as a spice, food preservative in our kitchen and also used as a home remedy for cough. The action of Ardraka mentioned in different Ayurvedic classics are sleshmahara (useful in productive cough), deepan (improves digestion strength), rochana (improves taste), svarya (improves voice), hrdya (acts as cardiac tonic), shophahara (relieves swelling), shoola prashamana (relieves abdominal colic pain), hikkahara (relieves hiccups) etc. Ardraka is one of the important ingredient in the following yogas (preparations) like SHADANGA PANIYA used in Jwara (fever), daha (burning sensation), MISRAKA SNEHAM used in gulma (gas trouble), PANCHKOL GHRITA used in rajayakshma (Tuberculosis), udar rog, CHITRAKADI VATI used in grahani chikitsha etc. which is mentioned in **CHARAK SAMHITA**[1] NAVAYAS LOHA in prameha rog, SATHPAL GHRITA in udar rog etc.is mentioned in **SUSRUTA SAMHITA**[2]; HINGWADI GHRITA in gulma chikitsa, TALISPATRA churn in rajayakshma etc. which is mentioned in **ASTANGA HRYDAYA**[3]; In *Ashtanga hridaya chikitsasthana,* 1st chapter it is mentioned that *hima* of *chandana, shunti ambu, parpataka* and *ushira* cures *thirst* and *jwara* and it is having *pachana* action. Likewise, plenty of references are available scattered in various ancient classics.

In modern Science[24], in recent scientific studies, ARDRAKA (ginger) is proved a non-toxic highly promising natural anti-oxidant compound having a wide spectrum of biological function (antimicrobial, antitumor, anti-diabetic, anti-inflammatory, immune-modulator etc.). Safety evaluation studies indicate that Ginger are well tolerate even at a very high dose without any toxic effect. Ginger is a best appetizer; it improves taste and relieves anorexia. It improves digestion and helps to relieve abdominal colic pain. It is useful in respiratory tract, effective in arthritis, menstrual pain, motion sickness etc. Observing the current extensive studies on GINGEROL and other chemical composition of ARDRAKA (Ginger) and also seen its availability of extensive references of various uses of ARDRAKA in ancient Ayurvedic classics, we felt need of a database study on ARDRAKA as there is no such complete database study till now in Ayurvedic Classics as well as in other medical Sciences.

A **database**[25] is a single software application that use tables, forms, reports etc. for relating different data to one another. This research work will provide newer knowledge and better updates of the ARDRAKA (Ginger). So, this database work will be beneficial for the future and current researchers in research field and Physician in the treatment purpose of different diseases, as it provides ready literary review in easy and better manner. After complete data collection in Excel format it was hyperlinked in internet and published along with modern aspects in collaboration with Bio-engineering Research Laboratory, Dept. of Bio-sciences and Bio-engineering, Indian Institute of Technology (IIT), Guwahati.

NEED OF THE STUDY

- Many references of Ardraka are available in Ayurvedic classical texts but in scattered form. So, to collect all this information in one simple and regular pattern and till date no any such database study is available on Ardraka hyperlinked with recent modern studies. Therefore, a database study of Ardraka is needed.
- It will provide a complete knowledge and better updates about Ardraka starting from Vedas period till recent studies in easy manner, which will help current and future researchers in the research field as well as Physician in the treatment purpose.

AIM AND OBJECTIVES:

AIM:

To make an exhaustive database on Ardraka available in ancient Ayurvedic classics as well as modern studies.

OBJECTIVES:

1. To make this exhaustive database, first scattered references of Ardraka available in various ancient Samhitas will be collected.
2. This classical database of Ardraka will be hyperlinked with the references of recent modern studies and will be generalized for the benefit of clinicians as well as future researchers.

MATERIALS AND METHODS

Materials

1. Classical texts, including Brihatrayee, Laghutrayee, Nighantus etc.
2. Dravya guna texts.
3. Texts related to ARDRAKA.
4. Relevant data from Articles, Journals, Scientific papers and other published works available in Internet media related to ARDRAKA.

Methods:

1. The available references of ARDRAKA will be arrange on the following manners:
    - List of chapters in Ayurveda classics in which ARDRAKA is mentioned.
    - List of the ARDRAKA mentioned as a single herb and its Formulations.
    - Steps of Procedure for the preparation of these formulations.
    - List of other ingredients present in the formulations of ARDRAKA.
    - List of the diseases in which ARDRAKA is indicated.
    - Mode of application of ARDRAKA and its formulations:
    - Pharmacological action of chemical constituents presents in ARDRAKA evaluated by the help of drug testing laboratory.
    - Sodhana & marana of dhatu, updhatu, rattan etc. with the help of ARDRAKA. Research work done about toxicity of ARDRAKA.
    - Different references of ARDRAKA in modern Science.
    - Patent data in which ARDRAKA is used as one of the ingredients.
    - Table chart of the above points that will be hyperlink with recent additional database studies.

2. Publication of a complete database study of ARDRAKA (Ginger) in peer reviewed International database journal in collaboration with Bio-engineering Research Laboratory, Dept. of Bio-sciences and Bio-engineering, Indian Institute of Technology (IIT), Guwahati.

HISTORICAL REVIEW

It first appeared in the writings of Confucius in the 5" century BC., and ithas been used medicinally in the west for at least 2000 years. It was introduced by the Spaniards to the Americas and is now cultivated extensively in the west indies. The Portuguese introduced it to west Africa.

- **VEDIC KALA: Rigveda (4000 B.C), Yajuh (1200-1000 B.C) and Atharvaveda (1500-1000 B.C) etc**

Different description found about ardraka from different ancient author as follows[22]

- Vishvabheshaj term is used for water and rice in Rigveda (**4000 B.C**).
- Ardraka is delineated in Agnivesh (7^{TH} BC).
- Guhyasutra, Jaimini Brahman quotes the name Srungbera
- Suntha or sunthi described in the Guhyasutras is considered as a type of grass, but not a ginger.
- In Amarkosha dry ginger is denoted as Nagara and vishvabheshaj etc. while describing fresh ginger as Ardraka and shringber.

However, all the main text of Ayurveda described it extensively and is one of the commonly used herbs in Ayurveda. It is specifically used for digestive disorders and inflammatory conditions.

SAMHITA KALA:

CHARAK SAMHITA^{-1} (agnivesh-1000BC→charak-2-3rd century BC→ drirhaval-4th century AD)

Description of shunthi in charaka samhita.

The formulations of drugs containing ardraka/sunthi are found **210** available in **Charaka Samhita**, there is in charak **sutar sathan** total compounds are **21**. Out of those 6 in 2^{nd} chapter, 7 in chapter 4^{th}, 2 in 13^{th} chapter, 1 in 24^{th} chapter, 1 in 25^{th} chapter, 4 in 27^{th} chapter, similarly in **Viman Sathan** total compounds are **6** in 7^{th} chapter.

In **Sarir Sathan** total compounds are **4** in 8^{th} chapter. In chakak **Chikitsa Sathan** total compounds are **179** available, out of those 3 in 1^{st} chapter, 4 in 2^{nd} chapter, 8 in 3^{rd} chapter, 2 in 4^{th} chapter, 12 in 5^{th} chapter, 5 in 7^{th} chapter, 7 in 8^{th} chapter,4 in 9^{th} chapter, 2 in 10^{th} chapter, 3 in 11^{th} chapter, 12 in 12^{th} chapter, 9 in 13^{th} chapter, 11 in 14^{th} chapter, 14 in 15^{th} chapter, 11 in 16^{th} chapter, 6 in 17^{th} chapter, 16 in 18^{th} chapter, 8 in 19^{th} , 3 in 20^{th}

chapter, 1 in 21th chapter, 1 in 22nd chapter, 7 in 23rdChapter, 2 in 24th chapter,13 in 26th chapter,1 in 27th chapter, 7 in 28th chapter, 4 in 29th chapter and 3 compounds are in 30th chapter. As per below table **1 to 210**

SUSRUTA SAMHITA-2: (Adya or vriddha Susruta-1000-1500B.C→ Susruta-2nd century AD→ Nagarjun- 5th century AD→ Chandrat-10th century AD)

DESCRIPTION OF SHUNTHI IN SUSHUTRA SAMHITA

Similarly, to Charaka compound of medicine use in different disorders having sunthi/ ardraka are available in **Susrut Smahita183.** There is in **Susrut sutar sathan** total compounds are **20**. Out of those 1 in 14th chapter, 2 in 37th chapter, 2 in 38th chapter,1 in 39th chapter, 7 in 44th chapter, 7 in 46th chapter. similarly, in **Sharir Sathan** total compounds are **3** out of those 1 in 2nd chapter and 2 in 10th chapter. In **Chikitsa Sathan 39** compounds are found in which ardraka is mention. out of those 2 in 5th chapter, 1 in 6th chapter, 2 in 7th chapter, 1 in 8th chapter, 7 in 9th chapter, 1 in 10th chapter, 1 in 11th chapter, 2 in 12th chapter, 4 in 14th chapter, 1 in 15th chapter, 1 in 16th chapter, 1 in 17th chapter, 1 in 18th chapter, 2 compounds in 19th chapter, 3 in 22th chapter, 1 in 23rd chapter, 2 in 24th chapter, 4 in 37th chapter and 2 in 38th chapter. Similarly, **12** compounds found in **kalpa sathan,** in which ardraka is mention. out of those 1 in 2nd chapter, 5 in 5th chapter, 1 in 6th chapter, 3 in 7th chapter and 2 in 8th chapter. As per my studies I found **109** compounds in **Su. Utar Tantra** in which ardraka is mention. out of those 2 compounds found in 9th chapter, 2 in 10th chapter, 3 in 11th chapter,4 in 12th chapter, 1 in 13th chapter, 1 in 15th chapter, 3 in 17th chapter, 2 in 19th chapter, 3 in 21st chapter, 1 in 23rd chapter, 1 in 24th chapter, 2 in 26th chapter, 7 in 39th chapter, 16 in 40th chapter, 3 in 41st chapter , 16 in 42nd chapter, 1 in 43rd chapter, 4 in 44th chapter,1 in 46th , 3 in 47th chapter, 1 in 50th chapter, 6 in 51st, 9 in 52nd chapter, 1 in 53rd chapter, 2 in 55th chapter, 3 in 56th chapter, 3 in 57th chapter, 1 in 58th chapter, 1 in 59th chapter, 3 in 60th chapter, 2 in 61st chapter and1 compound in 62nd chapter of utar tantra. Thus, Total compound of ardraka available in Susrut Samhita are 183. As per below table **from 211 to 393: -**

ASTANGA SANGRAHA-4 (600 AD):

DESCRIPTION OF SHUNTHI IN ASTANGA SANGRAHA SAMHITA

The formulations of drugs containing ardraka/sunthi are found **35** available in Astang Sanghra sutar sathan . out of those 1 compound found in 5TH chapter, 2 in 7th chapter, 4 in 8th chapter, 1 in 9th chapter, 1 in 10th chapter, 4 in 11th chapter, 3 in 12th chapter, 3 in 14th chapter, 7 in 15th chapter, 2 in 16th chapter, 1 in 17th chapter, 2 in 18th chapter, 2 in 24th chapter and 2 in 25th chapter. Thus, Total compound of ardraka available in Astang Sanghra sutar sathan are 35. As per below table **from 394 to 428: -**

ASTANGA HRIDAYA[-3] (700 AD):

Similarly, to the other samhita's compound of medicine use in different disorders having sunthi/ ardraka are available in **ASTANGA HRIDAYA 311.**There is in **Sutar Sathan** total compounds are **16** having ardraka. Out of those 2 in 3rd chapter, 1 in 4th chapter, 3 in 6th chapter, 1 in 7th chapter, 2 in 10th chapter, 3 in 14th chapter, 3 in 15th chapter, 1 in 27th chapter, Similarly, **4** compounds found in **Sarir Sathan**, Out of those 1 in 1st chapter and 3 in 2nd chapter. There is in **Kalpsiddhi Sathan** total compound found **8** having sunthi/ ardraka. Out of those 5 in 2nd chapter, 1 in 3rd chapter, 1 in 4th chapter and 1 in 5th chapter in kalpasidhi sathan. There is in **Chikitsa Sathan215** compounds are found in which ardraka is an ingredient. Out of those 13 in 1st chapter, 3 in 2nd chapter, 29 in 3rd chapter, 5 in 4th chapter, 10 in 5th chapter, 11 in 6th chapter, 32 in 7th chapter, 19in 9th chapter, 19 in 10th chapter, 2 in 11th chapter, 2 in 12th chapter, 1 in 13th chapter, 15 in 14th chapter, 13 in 15th chapter, 10 compounds found in 16th chapter, 9 compounds are found in 17th chapter, 10 compounds in 19th chapter, 4 in 20th chapter, 7 in 21st chapter and 1 compound found in 22nd chapter of Astang Hardya Chikitsa sathan. Similarly, there is in **A.H. Utar Sathan** total compounds are having ardraka/sunthi **68.** Out of those 2 in chapter 1st , 6 in chapter 2nd , 1 in 3rd chapter, 9 in 5th chapter, 2 in 6th chapter, 1 in 7th chapter, 2 in 11th chapter, 3 in 13th chapter, 4 in 16th chapter, 2 in 18th chapter, 5 in 20th chapter, 13 in 22nd chapter, 2 in 30th chapter, 1 in 34th chapter, 2 in 35th chapter, 3 in 36th chapter, 4 in 37th chapter, 1 in 38th chapter and 5 compounds found in 39th chapter in which ardraka/sunthi as an ingredient. Thus, Total compound of ardraka available in Astang Hardya are 311. As per below table **from 429 to 739: -**

SHARANGADHAR SAMHITA[-5] (1300 AD): Similarly, to the other samhita's compound of medicine use in different disorders having sunthi/ ardraka are available in

SHARANGADHAR SAMHITA147. There is in purav khand 4th chapter 1 formulation of ardraka is available. In madhamkhand 1st chapter 1 formulation is found of ardraka,42 in 2nd chapter, 4 in 5th chapter,25 in 6th chapter, 14 in 7th chapter, 3 in 8th chapter, 12 in 9th chapter, 7 in 10th chapter, 2 in 11th chapter and 19 in 12th chapter. In utarkhand 3 in 4th chapter, 1 in 5th chapter, 1 in 8th chapter,1 in 10th chapter,8 in 11th chapter and 3 in 13th chapter. Thus, Total compound of ardraka available in **SHARANGADHAR SAMHITA** are **147**. As per below table from **740 to 886**: -

BHEL SAMHITA[-8] (7[-th] cent AD[)]

Similarly, to the other samhita's compound of medicine use in different disorders having sunthi/ ardraka are available in **BHEL SAMHITA 15**. Out of them 2 in 2nd chapter, 1 in 6th chapter, 1 in 7th chapter, 2 in 10th chapter, 1 in 14th chapter, 3 in 16th chapter, 2 in 17th chapter, 3 in 19th chapter. Thus, Total compound of ardraka available in **BHEL SAMHITA are 15**. As per below table from **887 to 901: -**

CHAKARDUTT[-9] (11th centuary[)]

Similarly, to the other samhita's compound of medicine use in different disorders having sunthi/ ardraka are available in **CHAKARDUTT 69.**There is in jawar chapter 11 formulation of ardraka is available.10 in jawaratisar chapter, 15 in atisar chapter, 15 in grahni chapter and also 18 in arsh chapter. Thus, Total compound of ardraka available in **CHAKARDUTT 69.**As per below table from **902 to 970: -**

IN NIGHANTUS:

- In ***Kaideva nighantu[17]***, *(15th cent.)* it is mentioned that it is having *katu rasa* and *ushna veerya.* It is *deepana* and *vrushya* and it cures *shvasa, kasa, vami, hikka, vibanda, vata* and *pitta doshas.* Kaidev (*15th cent.)* described the medicinal properties of the terminal buds of the rhizomes separately. It is mainly indicated in Amavata.

- Kaiydev described Adranagaram and Adrakam_ separately. Their properties are also different according to him.

In ***Rajanighantu***[14], *(17th cent.)* it is mentioned that it is having *katu rasa* and *ushna veerya.* It is *deepana* and *hridya* and it cures *shopha* and diseases of *throat.*

In ***Bhavaprakasha Nighantu***[13,7] **(1600 AD):** *(16th cent.)* it is mentioned that, before the meals it always *pathya* with the help of *lavana* for *bhakshanartha.* It causes *agnisandeepana, ruchya* and *vishodhana* of *kantha and jihva.* It cures *kushta, pandu, rakthapitta, vrina* and *jwara.* It is contraindicated in *daha* condition and also *nidaagha* and k*sharadhruthus.*

In ***Madanapala Nighantu***[12] ***(14th cent.)***, it is mentioned that it is having the actions like *ruchya, amavathagni, paachani* and *laghu.* It is having *snigdha* and *ushna guna, katu vipaka* and cause *vibandha* of *vatha* and *kapha.* But *Ardraka* is having *guru guna* and *deepana* and *bhedana* actions.

In ***Sharangadhara samhitha***[5] ***(1300 AD)***, it is mentioned that *shunti* with *guda* and *thila, kalka* is prepared and taken with *anupana* i.e., *dugdha* cures *parinama shoola* and *amavata.*

In ***Dhanvanthari Nighantu***[-10] ***(8-10-thcentury AD)***, it is mentioned that *shunti* is having *snigdha* and *ushna guna* and *vrishya* property. It cures *shopha, aruchi, vathodara, shvasa, pandu, shlipada* etc

CLASSIFICATION ACCORDING TO NIGHANTUS[-10-17]

Name of Nighantu	Varga
Dhanvantari Nighantu	Shatapushpadi Gana
Shodhala Nighantu	Shatapushpadi Varga
Madanpala Nighantu	Shunthyadi Varga
Bhavaprakasha Nighantu	Haritakyadi Varga
Raja Nighantu	Pippalyadi Varga
Priya Nighantu	Pippalyadi Varga
Nighantu Adarshal	Pippalyadi Varga
Kaidev Nighantuu	Aaysadhi Varga

AYURVEDIC REVIEW

Zingiberaceae family that is widely cultivated for its edible, underground rhizome, the term also is used to refer to this pungent, aromaticum rhizome, which is commonly dried and prepared as a popular spice and is sometimes refer to as ginger root. In a broader sense, the term ginger can be applied to all plant in the genus Zingiber and the Zingiberaceae family is known as the “ginger family”

The word ginger comes from the ancient Sanskrit singabera, meaning Shaped like a horn.”

Shunth = to purify

¶ÉÖh`öÒ<ÊiÉ º´ÉÉÊ¨É ¶ÉÖh`öÒ - ¶ÉÖÎh`öiÉ(AADARSH NIGHANTU-P.N.989)

Kaiydev described Adranagaram and Adrakam_ separately. Their properties are also different according to him.

In Amarkosha dry ginger is denoted as Nagara and vishvabheshaj etc. while describing fresh ginger as Ardraka and shringber.

1. Shunti
2. Ardraka (According to *Kaiyadeva nighantu, Raja nighantu, Bhavaprakasha nighantu, Priyanighantu, Madanaphala nighantu* etc.)

But Vishvabheshaj term is used for water and rice in Rigveda.

SYNONYMS OF SUNTHI[22]

Sl. No.	PARYAY	B.P.NI	DH.NI	PRIY.NI	RAJ.NI	K.NI
1.	Aadrak	+	+		+	
2.	Shringver	+	+		+	
3.	Katubhadra	+	+		+	+
4.	Katugranthi	+			+	
5.	Aadrika	+				
6.	Shunthi	+	+		+	+
7.	Vishva	+		+	+	
8.	Vishv	+	+		+	

9.	Nagar	+	+		+	+
10.	Vishvabhaisaj	+	+		+	
11.	Katuushna	+			+	
12.	Ushna	+			+	
13.	Mahaaaushadh	+	+	+	+	+
14.	Vishvaaaushadh		+		+	+
15.	Gulmmula				+	
16.	Mulaj				+	
17.	Kandaj				+	
18.	Var				+	
19.	Saikteshat				+	
20.	Aanupaj				+	
21.	Apakshak				+	
22.	Aadrakhya				+	
23.	Rahuchatramsushak				+	

INTERPRETATION OF SOME SYNONAMES:

Synonyms indicating:

1. The habitat of the plants

1	Vishvabhesaj	Universally reputed drug.

2. Indicating similarities of morphological characters (SwarupaBodhak)

1	Avakchatram	The leaves shaped like Umbrella.
2	Ahichchatrakam	Flowers in radical spikes on long peduncles like serpent's hood.

3. Synonyms indicating the part used (pryojyang)

1	Shringber	The kand is nodular.

4 (Indicating pharmacological action and therapeutic usage (Guna- Karma)

1.	Ardraka	The drug creates the tongue wet.
2.	Sunthi	To purify or which is dry. Drug which purify the body from malas, which absorbs watery substance of kapha,

		which fight with samadosha
3.	Vishva	Its assimilated quickly.
4.	Mahaushadha	Best medicine for all disease.
5.	Nagaram	Considered best among katu rasa dravya.
6.	Usanam	Causing burning sensation.
7.	Kaphari	Decrease the kapha
8.	Katu	Having katu rasa.
9.	Katukardan	Having katu rasa.
10.	Shoshanam	Causes dryness by absorbing excess fluid from the body
11.	Shauparnam	It removes visha.

CLASSIFICATION

CLASSIFICATION ACCORDING TO SAMHITAS:

NAME OF SAMHITA	NAME OF GANA/VARGA
Charaka Samhita	Shirovirechan, Dipaniya; Shitaprashamana Truptighna, Arshoghna,Trishnanigrahana, Shoolprashamana.
Sushutra Samhitau	PippalyadiGana, Trikatu
Astang Samgraha	Shirovirechan, Dipaniya, Truptighna, Shoolaprashmana,Sheetashamana, PippalyadiGana
Astang Hridaya	NasyapayogiDravya, VachadiGana

CLASSIFICATION ACCORDING TO NIGHANTUS[10-17]

Name of Nighantu	Varga
Dhanvantari Nighantu	Shatapushpadi Gana
Shodhala Nighantu	Shatapushpadi Varga
Madanpala Nighantu	Shunthyadi Varga
Bhavaprakasha Nighantu	Haritakyadi Varga
Raja Nighantu	Pippalyadi Varga
Priya Nighantu	Pippalyadi Varga
Nighantu Adarshal	Pippalyadi Varga
Kaidev Nighantuu	Aaysadhi Varga

RASA PANCHAKA OF SHUNTHI[10-17]

		D.N	R. N	M.P. N	B.P. N	K. N
Rasa	Katu	+	+	+	+	+
	Tikta					
Guna	Snigdha	+	+	+	+	+
	Laghu			+	+	+
Veerya	Ushna	+	+	+	+	+
	Sheeta					
	Anushna					
Vipak	Madhur			+	+	+

Medicinal properties[-18]

SUNTHI:

RASA	**katu**(pungent)
GUNA	**snigdha**
VIRYA	**Ushna**(Hot potency.)
VIPAK	**Madhura** (Undergoes sweet taste conversion after digestion.)
DOSHAGHNATA	**Kaphavatahara**

ARDRAKA:

RASA	**Katu** (pungent)
GUNA	**Laghu, Ruksha** (dryness),
VIRYA	**Ushna** (Hot potency.)
VIPAK	**Katu**
DOSHAGHNATA	**Kaphavatahara**

KARMA OF SHUNTHI[10-17]

		D.N	R. N	M.P. N	B.P. N	K. N
1.	Swash	+	+	+	+	+
2.	Shool		+	+	+	+
3.	Kas			+	+	+
4.	Shoth	+	+	+	+	+
5.	Arsha			+	+	+
6.	Aanaha			+	+	+
7.	Udarrog	+	+	+	+	+
8.	Vibandh			+	+	+
9.	Hridrog			+	+	+
10.	Vami			+	+	+
11.	Hidhma					+
12.	Aruchi	+				
13.	Pandu	+				
14.	Adhman		+			

DOSHA KARMA

		D.N	R. N	M.P. N	B.P. N	K. N
1	Kaphavatnut			+	+	
2	Vatkaphapaham		+			+
3	Kaphavathanti	+				

SINGLE DRUG THERAPY[-1]

- To take Shunthi with warm water in Atisar for aampachan acc to Achraya charak.
- Shunthi with jaggary alleviates kamla, Hikka, Shotha, and Ajirna.
- To take Sunthi before meal for Agnidipanam.
- Sunthi with gaumutra benefits in Urusthambha.

IMPORTANT FORMULATIONS:

ÊjÉEò]Öõ, ´ªÉÉä¹ÉÉÊnù ´ÉÊ]õ, {É\SÉEòÉä±É, +¦ÉªÉÉÊnù ¨ÉÉänùEò, Eèò¶ÉÉä® MÉÖMMÉÖ±ÉÖ, ÊSÉjÉEòÉÊnù ´ÉÊ]õ, ®úÉºxÉÉÊnù MÉÖMMÉÖ±ÉÖ, +VÉ¨ÉÉänùÊnùSÉÚhÉÇ, +Ê´É{ÉÊkÉEò®úSÉÚhÉÇ, Ê¶É´ÉÉIÉÉ®ú{ÉÉSÉxÉSÉÚhÉÇ, ÊSÉjÉEòPÉÞiÉ, nùÉb÷Ò ¨ÉÉvªÉPÉÞiÉ, ®úÉºxÉÉ{É\SÉEòC´ÉÉIÉ, +¦ÉªÉÉÊnùC´ÉÉIÉ, ºÉÉè¦ÉÉMªÉ ¶ÉÖh`öÒ {ÉÉEò.

Therapeutic Uses: ´ÉÊ¨É, ·ÉÉºÉ, ¶ÉÚ±É, EòÉºÉ, ½þnùÉ¨ÉªÉ, ¶±ÉÒ{Énù, ¶ÉÉälÉ, +¶ÉÇ, +ÉxÉÉ½þ =nù®ú

Preparation of sunthi powder:[-5]

Nicely powdered dry ardraka filtered through cloth is called sunthi churn

(ref. Sarangadhara Samhita madhamkhand 6/1)

- For any dry Ayurvedic herb, in coarse powder or raw form, excluding fine powders, the shelf life is one year.

(Reference: Sharangdhara Samhita Purvakhanda).

Fresh ginger:[-29]

Fresh ginger benefits: Ardraka – Vishva Bheshaja:

Usually all spices with pungent taste are un-aphrodisiac and increase Vata Dosha. Except Pippali – Long pepper fruit and Ardraka – Ginger Rhizome

Green ginger / fresh ginger is

Rochaka – appetiser,

Deepana – improves digestion strength

Vrushya – aphrodisiac

Its juice is useful in Vata and Kapha disorders

Vibandha – constipation.

Sanskrit verse

Katu – pungent taste

Ushna – Hot in potency

Guru – heavy

Rooksha – dry

Madhura Vipaka – undergoes sweet taste conversion after digestion

Hrudya – acts as cardiac tonic, congenial for heart

Deepana – improves digestion strength. Ginger is known to improve pancreatic digestive enzymes – trypsin and chymotrypsin.

Ruchida – improves taste, useful in relieving anorexia

Shophahara – relieves swelling, oedema, anti-inflammatory

Kaphahara – balances Kapha, useful in productive cough, asthma

Kantamayaapaha – Useful in throat disorders,

Svarya – improves voice

Vibandhahara – relieves constipation

Anahahara – relieves gas, fullness of abdomen, bloating

Shoolajit – relieves abdominal colic pain

Bhedini – relieves constipation

Jihva Vishodhana – cleanses and clears tongue, relieves white coating

Kaphavatahara – Balances Kapha and Vata

Shwasahara – useful in treatment of asthma and chronic respiratory disorders.

Kasahara – useful in cough and cold

Vamihara – relieves vomiting

Hikkahara – relieves hiccups

Dry Ginger:

Dry ginger is unctuous, promotes digestion, aphrodisiac, hot in potency, balances Vata and Kapha, sweet in Vipaka, cardio- tonic and palatable.

Madhura Vipaka – Undergoes sweet taste conversion after digestion.

Vrushya – aphrodisiac, improves vigour

Rochana – improves taste, relieves anorexia

Hrudya – acts as cardiac tonic, congenial for heart

Sasneha – has some amount of unctuousness, oiliness

Laghu – light to digest

Deepana – improves digestion strength

Shophahara – relieves swelling, oedema, anti-inflammatory

Vatodara – Useful in ascites due to Vata Dosha imbalance, bloating

Shwasahara – useful in treatment of asthma and chronic respiratory disorders.

Panduhara – Useful in anaemia, early stage of liver disorders

Shleepada – useful in Elephantiasis

Grahi – absorbent. Being hot in nature, it helps to absorb excess moisture especially in intestines.

Vibandhanut – Breaks down stool particles into small pieces by its piercing qualities, relieves constipation

Amavataghni – useful in rheumatoid arthritis

Ginger is very effective to relieve dizziness, menstrual pain, arthritis pain, motion sickness and weight loss.

Usually herbs which are Grahi (absorbent) are not useful in constipation. But Ginger is an exception. For this, Bhavaprakasha says that ginger is absorbent for sure and is a mild laxative. It helps to break down the stool mass but does not help in its expulsion (na tu mala patane)

DIFFERENCE – FRESH AND DRY GINGER:[-29]

Difference between fresh ginger and dry ginger (ginger powder):

Ardraka – Wet Ginger – Rooksha (Dry) + Ushna (Hot)

Shunti – Dry Ginger – Snigdha (unctuous, oily) + Ushna (hot)

Wet ginger has dryness (Rooksha) and dry ginger has some oiliness or unctuousness in it.

Wet ginger – Bhedini – can cause diarrhoea or more useful in constipation. Dry ginger – Grahi – absorbent, bowel binding, useful in IBS. It also relieves constipation, but not so useful as wet one in relieving constipation.

Wet ginger is usually used for short period of time. This is because of its dryness (lack of oiliness).

Dry ginger is Snigdha – unctuous, oily hence tolerable for long period of time. Hence, can be used for long time.

Effect of wet ginger is seen more on stomach and intestines.

Effect of dry ginger is seen both on stomach-intestines (Jatharagni) and at tissue level (Dhatvagni).

Dry ginger loses the moisture and becomes more concentrated. Hence it is hotter than wet ginger.

Dryness vs unctuousness

Bhavaprakasha – Haritakyadi Varga

"ārdrikā bhedinī gurvī tīkṣṇoṣṇā dīpanī matā |
kaṭukā madhurā pāke rūkṣā vātakaphāpahā |**"**

Ardraka – wet ginger is told as Ruksha (in the second line) – dryness.

Bhavaprakasha – Haritakyadi Varga chapter

"śuṇṭhī rucyāmavātaghnī pācanī kaṭukā laghuḥ |
snigdhoṣṇā madhurā pāke kaphavātavibandhanut |**"**

First word of second line – Snigdha – unctuous. So, dry ginger has unctuousness. Because of this unctuousness quality, associated with hotness, the hotness of dry ginger lasts for a longer period of time (Consider fire, with oil as fuel, it burns longer). This is the reason; it can act in deeper tissues

Hotness of dry ginger is limited for a short period of time. Because the fire in it is very dry. There is no oiliness. Hence, it acts locally on the stomach and intestine level fire (jataragni). Fresh ginger does not have unctuousness. During the process of drying, probably the hidden volatile oil principles become more active, leading to unctuousness. When it is fresh, the watery content subsides any hidden oily principles.Fresh ginger is drier when compared to dry ginger, due to lack of unctuousness (unctuousness and dryness are opposite qualities). Because fresh ginger is drier, the fire is also very dry, hence, the intensity is strong

but lasts only for a shorter period of time.When there is oiliness along with hotness, the intensity of fire is sustained for a longer period of time.

Cough remedy[-3]

(Reference: Astanga Hrudayam, Kasa Chikitsita Adhyaya, 3/118-119.)

During chronic cough, chest injury, chronic bronchitis, tuberculosis etc conditions, 48 ml of juice of fresh ginger is consumed daily along with milk. The dose is increased by 6 ml, every day. This is continued for one month. During this period, the patient should drink only milk and abstain from eating solid foods.

This recipe is best to promote nourishment, lifespan, strength, skin health and immunity.

According to Bhojana Kutuhalam eleventh chapter, The fresh wet ginger is ruchya(imparts taste), aggravates vata and treats vitiation of pitta and rakta. Wet ginger when mixed with guda(jaggery) results in strengthening, alleviates vata and kapha and stimulates digestive fire. It loosens the stools, is a cardio tonic, very hot in potency, nourishes the dhatus and cures loss of voice.

Wet ginger is pungent in taste, hot in potency, imparts taste, aphrodisiac, becomes cold and light after metabolism. Promotes formation of urine, nourishing in nature, good for throat, stimulates the digestive fire and promotes digestion. It treats gulma, bloating of abdomen, liver diseases, tandra, colicky pain, haemorrhoids, depletion of dhatus and chronic cold.

It also helps in treating cough, dyspnoea, fever, vomiting, heart diseases and vitiated vata. The fresh juice extracted from wet ginger instilled into the ear instantly cures ear ache.

Mode of action in Ayurveda:[-1,3]

Due to properties rasa, virya, doshaghana etc of ardraka and sunthi's most of formulations used in kaphavataj disorders such as swas, kaas, hikka, sula, hardya roga, chardi etcGinger is an aromatic stimulant to gastrointestinal tract and stomachic, also sialagogue and digestive. Externally, a local stimulant and sub facient. Due to its ushna quality it acts as kapha-vata samak, aam pachak and srotasuddhi-karak.Ginger being aromatic and pleasant by pungent, is commonly used as a spice agent in the preparation of condiments, curries ginger bread and a conserve and syrup are made from the fresh younger rhizomes.

Therapeutic uses:

It is used in all types of kaphavataj disorders.Externally it is used in aamvat, sandhisotha as poultice in lukewarm condition. In order to remove coldness and lassitude it can be used as poultice and sunthi churna is indicated for manage mixing with oil. In sotha roga sunthi churna is applied for udvartana.

Systemic uses:

Nervous system: it is useful in all type vatika disorders.

Digestive system: it is used in anorexia, hiccough, vomiting, agnimandya, kosthavat, adhmana, udarshool and in arsha it is effective. It acts as good aam pachaka and fresh ginger is used with salt for improving appetite and for a gestion of foods.

Respiratory system: it is prescribed in kash, swash, hiccough and pratichhay (allergic rhinitis). The appraisal juices are used as adjuvents.

Cardiovascular system: it is used as cardiac stimulant also effective in hridyashool, slipad, sotha, aamvata and sitapitta.used in the form of churna and juice of fresh ginger as adjuvant with other medicine.

Reproductive system: sunthi is used as vajikaraka drug. The express juice of ginger is very useful in fever specially in sannipatika fever and in visham jwara sunthi churna is useful.

Due to its ushna, tikshna qualities ardraka is contraindicated in kustha, pandu, raktapitta, vrana and in summer season.

MODERN REVIEW:

Latin name — Zingiber officinale Roxb.

Family — Zingiberaceae

Classification and varieties:[-29]

1. **Dry form Sunthi**
2. **Wet form ardraka**

- Peeled Ginger
- Red sand coated Ginger
- Limed Ginger

1. Jamaica Ginger
2. Cochin Ginger
3. African Ginger
4. Indian or Bengal Ginger
5. Ratoon Ginger

Different types of ardraka (fresh ginger)[-26]

There are 6 basic types and 4 types by color:

A. Basic types of fresh ginger:

1. Culinary ginger
2. Globba ginger
3. Grocery store ginger
4. Hedychium ginger
5. Kaempferia ginger
6. Small rhizome ginger

B. Ginger types by color:

1. Baby ginger
2. Blue Hawaiian ginger
3. White ginger
4. Yellow ginger

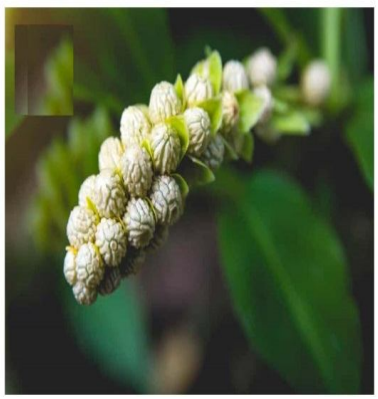
White Zinger

Peeled Zinger

Sand Zinger

1. Culinary Ginger

2. Globba Ginger

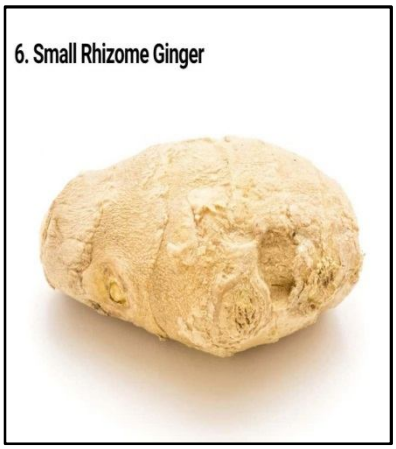


3. Grocery Store Ginger

4. Hedychium Ginger

5. Kaempferia Ginger

6. Small Rhizome Ginger



Systemic classification[22]

- Sub-kingdom: Phanerogamia
- Division: Angiospermae
- Class: Monocotyledanae
- Subclass: Petaloideae
- Series: 2 – Epigynae (Overy inferior)
- Natural order: Zingiberaceae
- Genus: Zingiber
- Species Officinale

HABITAT[19]**:**

The Zingiberace family comprises over 50 genera and more than 1500 species, distributed throughout tropical Africa, Asia, and the Americas. Ginger originated in the tropical rainforest in Southern Asia, but it is known in the wild. Extensively cultivated all over India. The plant is known to have grown in India and china for many countries.

Ginger (Zingiber officinale Roscoe) is a sterile, reed-like plant with a pungent and aromatic rhizome on which it relies for vegetative propagation. The plant is a cultigen, that is, it is only known from cultivation. Its wild origins are not known with certainty but are believed to be India or South-East Asia (Mabberley, 1997; Vaughan & Geissler, 1997). Ginger has a very long history of use, both as a spice and as a medicinal plant, and is mentioned in ancient Sanskrit texts and in classical Buddhist, Arabic, Greek and Roman literature (Govindarajan, 1982a). It was used widely in Europe by the tenth century (Vaughan & Geissler, 1997) and was first exported from Jamaica, where it became a significant agricultural crop, in 1547 (Mabberley, 1997). It is now cultivated in many tropical and

subtropical regions including India, Africa, China, the West Indies and Australia, with the annual world production estimated at 100,000 tons in 2000 (Bartley & Jacobs, 2000; Evans, 2002).

VERNICULAR NAME:

Assamese and Bangali	Ada
Gujarati and Marathi	Adu, Ale
Hindi	Adrak, Duk, Soonth
Kanarese	Alla , Adraka , Has sunthi
Kasmiri	Shoont
Konkani	Ala, Alen,Sunti
Malayalam	Andrakam, Chinchatakam
Oriya	Ardroka, Oda, Sunthi
Prakriti	Singhabera
Punjabi	Adi, Adrak,Sonth
Sanskrit	Apkrishnaka, Anupajam, Apakashaka (sulmamula, Jatilashringi; kandara, kaphari,katubhadra, katubheda; Katugranthi
Tamil	Allam, Artiragam
Telugu	Allamu, Ardrakamu
Urdu	Ardraka
Italian	Enzero
Japanese	Kankyo
Persian	Shangabir
Portuguese	Foimber
Rumanian	Shimber
Russian	Imbir
Scandinavia	Ngefaer
Sinhalese	Inguru
Spanish	Oengiber
Arabic	Zanjabil
Brazilian	Mangaratia
Chinese	Chiang pi

English	Ainger
Dutch	Sember
French	Gingembre
German	Ingwer
Hungarian	Gsyoember

Dry ginger names in different languages:

Hindi name	Sont, Saunth, Sunth, Singhee
Kannada name	Ona shunti, shunti,
Bengali name	Shunt, Sunt, Shunti
Telugu name	Shonti, Sonti
Tamil name	Shukku, Chukku
Malayalam name	Chukka
Gujarati name	Shuntya, sunt, soont
Farsi name	Janabeel
Arabian name	Janjabeele Aavis

CHIEF CHARCTERS:[-28]

It is an erect plant, that grows 3-4 feet tall

- **Stem** — annual, which rises to 3 to 4 feet in height, is solid, cylindrical, erect, and enclosed in an imbricated membranous sheathing.
- **Leaves** — lanceolate, acute, smooth, five or six inches long by about an inch in breadth, and stand alternately on the sheathes of the stem. The flower stalk rises by the side of the stem from six inches to a foot and like it is clothed with oval acuminate sheaths; but it is without leaves and terminates in an oval, obtuse bracteate spike.
- **Flowers-** The flowers are of a dingy yellow colour and appear 2 or 3 at a time between the bracteal scales.
- **Rhizome** — it has biennial or perennial, creeping rhizome. The recent root is from to 4 inches long somewhat flattened on its upper and under surface, knotty, obtusely and irregularly branched or lobbed, externally of a light ash colour with circular rugae, internally yellowish white and fleshy.

CHEMICAL COMPOSITION:[-28]

1) 50% starch
2) 9%protein
3) 6-8% lipids
4) 2% protease
5) 1-3% volatile oils, vit a and niacin.
6) 3% essential oil that cause the fragrance of the spice.

The main constituents are sesquiterpenoids with zingiberine as the main component. Lesser amount of other sesquiterpenoids (Bisabolene and farnesene) and a small monoterpenoid fraction (cineol, citral)

Pungent taste is due to nonvolatile phenylpropanoid derived compounds, particularly gingerols and shegoals.

The secondary metabolites found in the rhizome of ginger that are of primary interest can broadly be divided into volatile compounds (extractable by steam distillation) and non-volatile phenolic compounds, the major ones of which have pungent properties. It is generally considered that the pharmacological activity of ginger rhizome resides with compounds from these classes, in particular the non-volatile pungent phenolic compounds.

The term oleoresin, when applied to ginger, refers to the volatile oil, the pungent compounds and other compounds extracted by means of solvents (ethanol or acetone) (Connell, 1969; Govindarajan, 1982a).

Ginger owes its pungency to phenolic compounds. In the fresh rhizome the major type comprises a series of homologous phenolic alkenones known as gingerols and derivatives thereof such as ginger diols. The principal of these compounds is [6]-gingerol with 8- and 10-gingerol occurring in lower concentrations (Connell & Sutherland, 1969; Denniff et al., 1981). When subjected to heat or alkali treatment, however, gingerols are converted to a corresponding series of homologous shogaols by dehydration and/or to the compound zingerone (Connell, 1969; Connell & Sutherland, 1969). The shogaols possess greater pungency than the corresponding gingerols (Denniff et al., 1981).

It is clear from the above that the current state of knowledge of the pharmacokinetics of ginger compounds in humans is embryonic. Expanding this knowledge and including information about oral bioavailability of compounds with known pharmacological activity should be a priority and ought to precede further clinical trials of ginger for inflammatory conditions.

Part used, dosage:[18]

Part Used: Rhizome

Dosage: Fresh Juice 5-10 ml;

Powder 1-2 g;

syrup 2-5 ml in a single or divided dose per day.

PHARMACOGNOSTICAL STUDY[21]

The word pharmacognosy is formed by combination of ‘Pharmakon' means drug and ''gignosco' means ‘to acquire knowledge’. So, Pharmacognosy can be defined as a branch of bio-sciences that deals with the knowledge and authentication of medicinal and related products of crude or primary type originated from both plants and animals in the details form. Pharmacognosy is an important link between pharmacology and medicinal chemistry. In Ayurveda the description regarding the plants are available in the Nighantus § Granthas; wherein various synonyms are given to each plant while describing it. In this pattern many drugs are available under one name and the same name _ has been given to several drugs. So, while going through the Ayurvedic texts no one can properly understand as to which exact drug should be taken. While marketing Ayurvedic drugs, the business minded people mix spurious and adulterant drugs in the original drug which makes it difficult to identify the original drug. Let the Vaidya be highly educated and experienced, unless he gat correct drug, he cannot provide relief to his patients on which depends ultimately his success and reputation. So, the crux of the entire problem virtually revolves round proper identification of the drug. The original and basic approach towards pharmacognosy includes study of morphological system, study of cell structure and organization and study of tissue systems which still hold a key in identification of the correct species of the plant. Keeping all these in mind, a Pharmacogenetic study of rhizome of Zingiber Officinalis roxb. was planned to authenticate that rhizome which have been used in this study is original or adulterated, pharmacogenetic study is undertaken.

OBSERVATION AND RESULTS

- Organoleptic Study of shunthi

Sample	Test	Colour	Odour	Touch
Shunthi	Agreeable and Pungent	Off white	Aromatic	Corse

- **Macroscopic Study of Shunthi**

The size and shape of sample of Shunthi (zinzgiber officinalis roxb.)

Size	5 to 15, 1.5 to 6.5 cm
Shape	The rhizomes are laterally compressed, bearing short flat, ovate and oblique branches on the upper side, with bud at the apex.
Fracture	Short and fibrous
Extra features	Longitudinal striations

- **Powder microscopic characters of Zingiber Officinalis Roxb.**

Sl. No.	Characters	Present+
1	Cork	
	a) Outer	+
	b) Inner	+
2	Cortex	+
3	Oleo resin cell	+
4	Starch grains	+
5	Endodermis	+
6	Ground tissue	+
7	Vascular bundle	+

PHYTOCHEMICAL STUDY[-21-22]

Ayurveda the Indian Science of Medicine has the largest collection of medicinal plants than elsewhere in any other science. In ancient period the scenario of medicinal preparation was entirely different than what it is today. Those days Vaidya used to collect the drugs themselves from the places where they were growing in the natural state. All care was taken by them during collection of drugs considering age of the plants, part of the plant to be collected, season of collection, time of collection; and preparation of medicine by manual

power with taking all precautions regarding adulteration, contamination; along with chanting Mantras and holy procedures during preparation.

Today Ayurvedic science is spreading its wings all over the world where the drug lore of this system has been the center of global interest. Ayurveda has quoted that; as the Prakriti varies from person to person similarly every drug has got its own physical and chemical characteristics, which help to separate it from other' closely related drug. The Phytochemical studies of these drugs done by making' use of various parameters help in standardizing the drug and authenticate it. So, to sustain its valuable contribution in alleviate disease in this modern era it is expected an imminent need for a well-coordinated research plan touching phytochemical study of drug. It is essential to gratify the international standards and quality control of the drug used by convincing the drug regulatory authorities. The present study was carried out to evaluate the Phyto-chemical parameters of test drug.

MATERIALS AND METHODS

Organoleptic parameters

The primary subtle parameters yet important, the affirmation of which generates confidence in patient as well as in the physician besides quality control measures Rupa (colour), Rasa(taste), Gandha (odour) and Sparsha(texture) pertaining to Panchendriya Pariksha are noted.

Physiochemical parameter

1. Loss on drying (LOD)

The moisture content of a drug should be determined for the percentage of its active chemical constituents because its percentage depends upon air dried basis. So, the moisture content of the drug should be minimized in order to prevent decomposition of the crude drugs either due to chemical change or microbial contamination.

Procedure

1 gram of drug sample was taken in a pre-weighed dried Petri dish. It was dried in an oven at 105°C until reaching a constant weight. The Petri dish was taken out, self-cooled and weighed immediately. The weight loss i.e. loss on drying was calculated and expressed as % w/w.

2. Ash value (AV)

This test was conducted to evaluate the percentage of inorganic salts, naturally occurring in the drug or adhering to it or deliberately added as a form of adulteration.

Procedure:

1 gram accurately weighed sample was taken in a pre-weighed dried crucible. It was incinerated in a muffle furnace up to 450°C. The crucible was taken out, self-cooled and weighed immediately. From the weight of the ash, the ash value was derived with reference to the air-dried drug. It was calculated and expressed as %w/w.

3. Water soluble extractive (WSE)

This test was carried out to determine the water-soluble extractive and approximate measures of their chemical constituents of the test drug.

Procedure:

5 gm. of the sample was weighed accurately. To it 50 ml of distilled water was added and kept covered overnight. It was stirred intermittently in the initial period. Next day, it was filtered. 20 ml of the filtrate was accurately measured with a pipette and transferred to the already weighed evaporating dish. The evaporating dish was placed on a water bath for evaporation of the water. After evaporation of the water it was dried in an oven, allowed cooling and weighed immediately. From the weight of the residue obtained, the percentage of water-soluble extractive was calculated and expressed as %w/w.

4. Methenol soluble extractive (MSE)

This test was carried out to determine the methanol soluble extractive of the test drug.

Procedure:

The method adopted for this experiment was same as that of water-soluble extract but by using methanol instead of water. Percentage of methanol soluble extract was calculated and expressed as% w/w

5. PH value

This test is carried out to determine the pH of the test drug with the help of pH meter.

Procedure:

10g of test drug sample was weighted and taken in a conical flask. Then add 50 ml accurately measured water was added and stirred well for few minutes; this solution was kept for some time and then filtered it through filter paper. The filtered solution was taken in a beaker. Ph meter and electrodes were standardized with buffer solution of known 1.e.7 ph. Electrodes were rinsed with distilled water and introduce the test solution contained in a small beaker. pH value of solution was read

OBSERVATION AND RESULTS PHYSIO-CHEMICAL PARAMETERS

Analytical Data of Powder of Shunthi

Sl. no	PARAMETERS	w/w%
1	Loss on Drying	4.78%
2	Ash Value	6.20%
3	Water soluble Extractive	3.22%
4	Alcohol Soluble Extractive	9.22%
5	Acid insoluble Ash	1.45%
6	Ph10% solution	7.20

GOVT. OF ASSAM
OFFICE OF THE STATE DRUG TESTING LABORATORY (AYUSH)
JALUKBARI, GUWAHATI-781014
Email: dtlayushassam@gmail.com

REPORT NO. DTL (AY)/PGR/028/20-21 **DATE:** 27/06/2020

CERTIFICATE OF TEST OR ANALYSIS

Receieved from : Dr. Deepak Kumar,PG scholar GAC
Reference No. : Letter dated 21/06/2020
Date of received of sample : 21/06/2020
Name of product : Ginger
Sample type : Raw

SL. NO.	NAME OF TEST	OBSERVATION	
1	Physical Evaluation	Net weight	280 gm
		Types of sample	Dried powder
	PHARMACOGNOSTIC EVALUATION		
2	Organoleptic Evaluation	Colour	Off white
		Odor	Aeromatic
3	Microscopic Evaluation	Powdered Microscopy shows presence of parenchyma cells. spiral vessel, calcium oxalate crystals,starch grains etc.	
4	Thin Layer Chromatography	TLC of ethanolic extract was carried-out as per references. Four major spots were identified(UV short wave) & R_f value were determined.	
5	Phyto-Chemical Screening	Test for Phenols	Present
		Test for Alkaloids	Present
		Test for Glycosides	Present
		Test for Flavanoids	Present
		Test for fats and oils	Present
		Test for Tannins	Present
		Test for Tarpenoid.	Present
	CHEMICAL EVALUATION		
6	Physico-Chemical Evaluation	LoD (Loss on Drying)	4.78 %
		Total Ash	6.20 %
		Acid Insoluble Ash	1.45 %
		Alcohol Soluble Extractive	9.22 %
		Water Soluble Extractive	3.22 %
		Ph(10% solution)	7.20

27/06/20

(Dr. R. K. Sharma)
In-charge
State Drug Testing Laboratory (AYUSH)
Jalukbari, Guwahati-14

In-Charge
Drug Testing Laboratory (AYUSH)
Jalukbari,Guwahati-14

SUBSTITUTE & ADULTERATION:

Ginger should contain minimum 3.22% of water-soluble extractives,9.22% Alcohol soluble extractives. It should offer maximum 6.20%of Total ash, 1.45% Acid insoluble ash, PH (10% solution) is 7.20 and minimum 4.78% water soluble ash Adulteration can be detected by routine microscopical examination. Powdered ginger may have been prepared from 'wormy' drug, and so attention should be paid to the absence of insect fragments. Adulteration may also take the form of the addition of 'spent ginger 'which has been exhausted in the preparations of essence. This may be detected by the official standards for alcohol-soluble extractive water-soluble extractives, total ash and water-soluble ash. The powdered material is adulterated with exhausted or unscraped material in such material powdered capsicum is sometimes added to increase pungency.

PHARMACOLOGICAL EFFECT:[-22,25]

- Effect on the gastrointestinal tract

The active components of ginger are reported to stimulate digestion, absorption, relieve constipation and flatulence by increasing muscular activity in the digestive tract. The effectiveness of ginger (940 mg) in motion sickness is compared to that of dimenhydrinate (100 mg) in male and female as having extreme or very high susceptibility to motion sickness. The study concluded that ginger was superior to dimenhydrinate in preventing motion sickness. Ginger administration (lg) prior to elective gynecologic laparoscopy is also found to be effective in _ preventing postoperative nausea and vomiting. The effect of ginger is also similar to that observed with 100 mg metoclopramide.

- Antimicrobial effect

Ginger has strong antibacterial and to some extent antifungal properties. In vitro studies have shown that active constituents of ginger inhibit multiplication of colon bacteria. These bacteria ferment undigested carbohydrates causing flatulence. This can be counteracted with ginger. It inhibits the growth of Escherichia coli, Proteus SSP Staphylococci, Streptococci and Salmonella 21, 22. The ginger extract has antimicrobial action at levels equivalent to 2000 mg/ ml of the spice. Ginger inhibits aspergillus, a fungus known for production of aflatoxin, a carcinogen 23,24. Fresh ginger juice showed inhibitory action against Angier, S. cerevisiae, Myco-derma SPP. And L. acidophilus at 4, 10,12 and 14% respectively at ambient temperatures...

- Effect on cardiovascular system

In traditional Chinese medicine, ginger is used to improve the flow of body fluids. It stimulates blood circulation throughout the body by powerful stimulatory effect on the heart muscle and by diluting blood. The improved circulation is believed to increase' the cellular metabolic activity, thus contributing to the relief of cramps and tension. A Japanese study showed that active constituents in ginger reduced the blood pressure and decreased cardiac workload. Ginger reduced the formation of proinflammatory prostaglandins and thromboxane thus lowering the clotting ability of the blood. The inhibition of platelet aggregation by ginger mis more than the similar effects observed with garlic and onion. Ginger can prevent the increase in cholesterol levels following intake of cholesterol-rich diet. Ginger is also known to possess antioxidant properties.

- Effect on blood pressure

Several pieces of evidence, mainly from rat studies, have suggested that ginger exerts many direct and indirect effects on blood pressure and heart rate. More recently, Ghayour and Gilani. reported that the crude extract of ginger induced a dose-dependent (0.3-3 mg/kg) fall in the arterial blood pressure of anesthetized rats. In Guinea pig paired atria, the crude extract exhibited a cardio depressant activity on the rate and force of spontaneous contractions. In rabbit thoracic aorta preparation, the crude extract relaxed the phenylephrine induced vascular contraction at a dose 10 times higher than that required against K-induced contraction. Ca2+ channel- blocking activity was confirmed when the crude extract shifted the Ca2+ dose-response curves to the right, similar to the effect of verapamil. It also inhibited the phenylephrine control peaks in normalCa2+-plus and Ca2+-free solutions, indicating that it acts at both the membrane-bound and the intracellular Ca2+ channels. When tested in endothelium- contraction at a dose 14 times less than that required for relaxing the PE-induced contraction. The vasodilator effect of the crude extract was endothelium-independent because it was not blocked by either L-NAME (a non-selective inhibitor of nitric oxide synthase used experimentally to induce hypertension) or atropine and also was reproduced in the endothelium-denuded preparations in the same dose range. These data indicate that the blood pressure- lowering effect of ginger is mediated through blockade of voltage dependent calcium channels. In another paper, the same group [6] concluded that the blood pressure lowering action of aqueous ginger extract was through a dual inhibitory effect mediated via

stimulation of both muscarinic receptors and blockade of (Ca2+ channels. Interestingly, they also noted that the different constituents of ginger might have opposing action son the reactivity of blood vessels.

- Effect on blood clotting

The effect of an aqueous extract of ginger on platelet thromboxane-B2 (TBX2) and prostaglandin-E2 (PGE2) production was examined after giving rats a raw aqueous extract of ginger daily for a period of 4 weeks, either orally or intraperitoneally (IP). A low dose of ginger (50 mg/kg) administered either orally or IP did not produce any significant reduction in the serum TBX2 levels. However, ginger administered orally caused significant changes in the serum PGE2 at this dose. High doses of ginger (500 mg/kg) were significantly effective in lowering serum PGE2 when given either orally or IP. However, TXB2 levels were significantly lower in rats given 500 mg/kg ginger orally, but not IP. These results suggest that ginger could be used as an anti-thrombotic and anti-inflammatory agent.

- Antiemetic effect

The mechanism of action of ginger's effect on nausea and vomiting remains uncertain. However, there are several proposed mechanisms. The components in ginger that are responsible for the antiemetic effect are thought to be the gingerols, shogaols, and Galan lactone, a diterpenoid of ginger. Recent animal models and in vitro studies have demonstrated that ginger extract possesses ant serotoninergic and 5- HT3 receptor antagonism effects, which play an important role in the etiology of post-operative nausea and vomiting. In a randomized, placebo-controlled, crossover trial of 16 healthy volunteers, ginger (1gorally) had no effect on gastric emptying. It appears unlikely that ginger ‘Santi-emetic or anti-nausea effects are mediated through increased gastroduodenal motility or through increased gastric emptying. Using gastro duodenal manometry, Mickle-field et al. demonstrated that oral ginger increases antral motility during phase III of the migrating motor complex (MMC) and increases motor response to a test meal in the corpus. However, ginger had no significant effect in the antrum or corpus during other phases, except fora significant decrease in the amplitude of antral contractions during phase II of the MMC. Additionally, there was no effect of ginger on duodenal contractions or on the "motility index."

- Antitussive effect

(6) - shogaol, generally more potent than (6)- gingerol, has exhibited antitussive effects.

- Immunomodulatory effect

In vitro evidence indicates that ginger has immunomodulatory effects and is an effective antimicrobial and antiviral agent.

- Lipid effect

Oral ingestion of ginger extract has been shown to have hypo cholesterol emic, hypolipidemic, and ant atherosclerotic effects in cholesterol-fed rabbits and in_ rats. Inhibition of LDL oxidation and attenuated development of atherosclerosis has also been observed in apolipoprotein E-deficient mice.

- Weight loss effect

Spiced foods or herbal drinks, such as those that contain ginger, have the potential to produce significant effects on metabolic targets, such as satiety, thermogenesis, and fat oxidation. A significant clinical outcome sometime may appear straightforwardly but also depends too strongly on full compliance of subjects. Thermogenic ingredients, such as ginger, may be _ considered as functional agents that could help restore a _ "positive energy balance" and prevent obesity.

- Anti-inflammatory effect

Ginger has a long history of use as an anti- inflammatory and many of its constituents have been identified as having anti- inflammatory properties. Ginger has been found to inhibit prostaglandin biosynthesis and interfere with the inflammatory cascade and the vanilloid nociceptor. Ginger has been shown to share pharmacological properties with non-steroidal anti-inflammatory drugs (NSAIDs) because it suppresses prostaglandin synthesis through the inhibition of cyclooxygenase-1 and cyclooxygenase-2. However, ginger can be distinguished from NSAIDs based on its ability to suppress leukotriene biosynthesis by inhibiting 5-lipoxygenase. This discovery preceded the observation that dual inhibitors of cyclooxygenase and 5-lipoxygenase may have a better therapeutic profile and have fewer side effects than NSAIDs. It was also discovered that a ginger extract derived from Zingiber

officinal (and Alpinagalanga) inhibits the induction of several genes involved in the inflammatory response, including genes encoding cytokines, chemokines, and the inducible enzyme cyclooxygenase-2. This discovery provided the first evidence that ginger modulates biochemical pathways activated in chronic inflammation. Identification of the molecular targets of individual ginger constituents provides an opportunity to optimize and standardize ginger products with respect to their effects on specific biomarkers of inflammation.

- Antinociceptive effect

(6)-shogaol has produced anti-nociception and inhibited the release of substance P in rats, seemingly via the same receptor to which capsaicin binds. However, it was observed to be 100 times less potent and to elicit half the maximal effect of capsaicin.

- Antioxidant effect

In vitro, ginger has been shown to exhibit antioxidant effects. (6)-gingerol appears to be the antioxidant constituent present in ginger, as 1t was shown to protect HL-60 cells from oxidative stress. Ginger oil has dominative protective effects on DNA damage induced by H202. Ginger oil might act as a scavenger of oxygen radical and might be used as an antioxidant.

- Radio protective effect

In vitro, pre-treatment with [6]-gingerol reduced UVB-induced intracellular reactive oxygen species levels, activation of caspase-3, -8, -9, and Fas expression. It also reduces UVB-induced expression and _ transactivation ofCOX-2. Translocation of NF-KB from cytosol to nucleus in HaCaT cells was inhibited by [6]- gingerol via suppression of IxBa phosphorylation (ser-32).Examination by EMSAs~ and immunohistochemistry showed that topical application of [6]-gingerol (30 uM) prior to UVB irradiation (5 kJ/m2) of hairless mice, also inhibited the induction of COX-2 mRNA and protein, as well as NF-KB translocation.

HIGH PERFORMANCE THIN LAYER CHROMATOGRPHY (HPTLC):[-27]

INTRODUCTION

Detection and identification of a compound from the group of the compounds efficiently in the presence of pure reference compounds, otherwise, efficient separation and establishing the marker compounds is the hall mark of High-performance thin layer chromatography.

In these the plates are coated with high performance silica gels, which are of very small and uniform in size (about 5) Il m). The high-performance silica gel gives more efficient and reproducible separation than conventional grades of silica gel. Small volumes of samples are applied over it, the spots are compact and the spots can be used quantified with the help of the scanner using photo densitometry. The term HPTLC is used for the technique in which substances are accurately assayed using high performance grades of silica gel. This has been utilized on Methanolic extract of the raw drug eight samples of Pippali for establishing the fingerprints and to study for the presence of identical chemical constituents

Chromatographic conditions:

Preparation of samples- 2.5gm of powder was extracted with 50 ml methanol and kept overnight then it was filtered and 20 ml filtrate was concentrated to 1Oml. This solution was used for spotting. Piperine has been taken as reference standard.

Adsorbent Layer: Aluminum- backed Silica gel GF 60

Sample Application: By Auto-sampler CAMAG

Lino mat V Mobile Phase: 1- Toluene: Diethyl ether: Dioxane 62.5:21.5:16

Detection: 1l- Viewing the TLC chromatogram at 254 nm under UV

2- Viewing the TLC chromatogram at 366 nm Under UV Procedure

Chromatography were performed on aluminium-backed silica gel GF 60 plates (Merck) of 0.5 mm thickness. Before use the plates were prewashed with methanol, dried, and activated at 110 oc for 1 hr. between two glass plates of larger dimensions to prevent deformation of the plates. [1234]

Samples (5)-LL) were applied to the plates, as 5mm bands, 5mm apart and lcm from the edge of the plates, by means of a Camag Lino mate V sample applicator fitted with a 100)-LL Hamilton syringe. The data pair technique was used for application of samples to the plate. After drying of the spot, plates were placed in one of the troughs of a Camag_ twin-trough chamber and the mobile phase Toluene - Diethyl ether — Dioxane, 62.5: 21.5 :16

(v/v) (20ml), was placed in another trough. Plates were left to equilibrate for 30 min. at 25 + 2 oc and then placed in mobile phase. After that plates were developed with Toluene - Diethyl ether -Dioxane, 62.5: 21.5 :16 (v/v), as mobile phase in a Camag twin -trough chamber previously saturated with mobile phase vapour for 30 min. The development distance was 7 em (development time 3min.). After development, plates were dried in a current of hot air and then scanned at _= 254 nm and_ =366 using a deuterium lamp, with a Camag Scanner III under control of Win CATS software version 1.2.1 for both data acquisition and processing. The scanning wavelength was 254 nm, the scanning speed 20 mm s-1, the offset 10%, and the sensitivity (SPAN) was optimized to 19. Peak height and peak area were integrated for the entire track. Under those condition, R value of gingerol0.56 under long Uv.

DENSITOMETRIC EVALUATION OF TLC

PLATE

Densitometric scanning was performed with a Camag T.L.C. scanner III in reflectance absorbance mode at 254 nm and 366 nm under control of win CATS software (V 1.2.1 Camag). The slit dimensions were 6 mm x 0.45 mm and the scanning speed was 20 mms"!

QUALITATIVE TESTS

HPTLC ANALYSIS

HPTLC of Standard gingerol and sample of SHUNTHI

Sample	Extract	Solvent system	Under 254nm		Under 366nm	
			No. of spots	Rf Value	No. of spots	Rf Value
SUNTHI	Methanol Extract	Toluene Diethyl ether : Dioxane 62=5 21.5 -16	12	0.04, 0.09 0.12 0.25,	10	0.04, 0.09 0.12 0.30, 0.35,

TOXICITY OF GINGIBER[-23]

In the present study ginger in a single dose of 2500 mg/kg body weight produced significant drop in both systolic and diastolic blood pressures and decrease in the heart rate when compared with their negative control rats. Ginger is a medicinal plant that has been widely used in Chinese, in treatment of hypertension (Ali et al., 2008). In a study of acute toxicity performed on hydro-alcoholic extract of ginger rhizome in mice, it was found that the drug was nontoxic up to a dose of 1500 mg/kg body weight (Jagetia et al., 2004). In the heart rate context, remarkable bradycardia was found after oral administration of the ginger component, 6-shogaol in a dose of 70 mg/kg in mice (Suekawa et al., 1984). In the present acute toxicity. study, the single dose of ginger produced hyaline changes in some areas of cardiac myocytes with other areas showed faint dissolved nuclei of a pre necrotic stage.

It was reported that myocyte necrosis can result from ischemia that is followed by reperfusion (Schoen, 1999). After hypotension a post ischemic / reperfusion and reoxygenation state occur resulting in the production of Xanthene oxidase and O2 that

generate superoxide radicals which result in extensive tissue damage (McCord and Roy, 1982). In the present subacute toxicity study, ginger administration was not associated with any mortalities and abnormalities in general conditions, behavior, growth, and food and water consumption except for that the rats were calmer than their control rats. This was consistent with Rong et al. (2009) who administered ginger powder by oral gavage in doses of 500, 1000 and 2000 mg/ kg for 35 days and reported nearly the same results. In the present study administration of ginger in a dose of 50 mg/ kg for 28 days produced no significant change in both systolic and diastolic blood pressures while it produced a significant decrease in heart rate when compared with the negative control rats. In a dose of 500 mg/ kg for 28 days, ginger produced a significant drop in systolic and diastolic blood pressures and heart rate when compared with the negative control rats. The dose of 50 mg/ kg produced waviness of some myocardial fibers at their border in the cardiac tissue while 500 mg/ kg produced cloudy swelling and granular cytoplasm, with disappearance of capillaries due to swelling of cells. These findings are parallel to that found by Schoen, (1999) who reported a waviness of myocardial fibers at the border in cases of myocardial ischemia. Furthermore, ginger is recommended by the traditional healers in South Asia for treatment of cases of cardio-myopathy, high blood pressure, palpitations and to improve the circulation for its use as a vasodilator (Kapoor, 1990; Duke, 2002). Pharmacological studies were performed on (6)-gingerol and (6)-shogaol which are the pungent constituents of ginger (Zingiber Officinale Roscoe). In the cardiovascular system, both constituents produced depressor response at doses of 70 mg/ kg on the blood pressure of rats (Suekawa et al., 1984).

In hypertensive animals, ginger has a generally dose-dependent hypotensive effect, in addition ginger caused vasodilatation in rats and rabbits following induced vasoconstriction, and exhibited calcium channel-blocking activity similar to verapamil (Ghayur and Gilani, 2005b). The only human trial to address hypertension, found a synergistic effect between ginger and nifedipine (Young et al., 2006).

The in-vitro experiments revealed that ginger is a partial vaso- relaxant in a concentration of 5 mg/ ml as it produced a relaxant effect on rabbit's aortic strip precontracted with phenylephrine. While preincubation with L-NAME significantly attenuated the ginger-induced relaxation indicating that the vasodilator effect of ginger is partially mediated through nitric oxide synthesis or release. L- nitro- arginine methyl ester (L- NAME) is a nitric oxide synthase inhibitor (Colas et al., 2000). These results are consistent with those of Ghayour et al., (2005) who reported that ginger induced a dose-dependent (3-10 mg/kg) fall in the arterial blood pressure (BP) of anaesthetized rats which was partially blocked by

atropine (1 mg/ kg). Cholinergic compounds are known to cause a fall in BP by activation of muscarinic receptors located on the endothelium of blood vessels and the cholinergic receptor mediated vasodilatation is due to release of NO from the endothelium (Furchgott and Zawadski, 1980) and consequent increase of cGMP contents in the vascular smooth muscles in response to activation of guanylyl cyclase (Andrianopoulos and Papa Petropoulos, 2000). The bradycardic effect of ginger may be partially due to the antimuscarinic effect of ginger as evidenced by (Gilani and Cobbin, 1986) who found that ginger produced a partial blockade with atropine which is a competitive muscarinic antagonist. This study revealed that Pre-incubation of the rabbit's aortic strip with ginger significantly reduced the calcium chloride induced contraction of highly- depolarized aortic strip. This demonstrated that ginger has a calcium channel blocking effect as revealed by (Ghayur and Giliani, 2006). These results are parallel to those of (Bolton, 1979; Mecca and Love, 1992) who reported that a vasodilator component mediated by the aqueous ginger extract was due to calcium channel blockade, as it relaxed the high K+ - induced contractions specifically as well as shifted the Ca2+ dose-response curves to the right as reported by (Godfraind et al., 1986; Karaki et al., 1997).

In case of skin disorders, anaemia, dysuria, bleeding disorders, non-healing wounds, fever, while having burning sensation, during summer and in spring, fresh ginger should be avoided. It is safe to use ginger in low amounts during pregnancy and lactation and in children. It may cause worsening of gastritis in people having sensitive stomach.

REFERENCE:

(A STUDY OF THE CARDIOVASCULAR TOXIC EFFECTS OF ZINGIBER OFFICINALE (GINGER) IN ADULT MALE ALBINO RATS AND ITS POSSIBLE MECHANISMS OF ACTION

BY **Iman A. Elkhishin and Ibrahim A. Awwad*,** Departments of Forensic Medicine and Clinical Toxicology, Pharmacology*, Faculty of Medicine, Zagazig, **Vol. XVII, No. 2, July 2009**)

Some patents in which is as an ingredient:

	Pharma	Patents in which ardraka as an ingredient
1	Dhanvantari Guj. Herb[-31]	1.Dabolax tablet 2.Rumon capsule 30 cap D herb 3.Shivaxar Pachan churna 4. Sunslim tablet
2	Dhootpapeshwar[-32]	1. A Flu-O-Cil Forte 30 tablet 2. Abhra Loha 30 tab. 3. Drakshovn syrup 330 ml 4. Mincof syrup 100 ml 5. Stri vyadhihari ras
3	Jark pharma[-33]	1.Emu syrup 2.Evera syrup 3.Gasodin powder 4.Gasodin syrup 5.Gasodin capsule 6. Jark liv syrup 7. Sleemo capsule 8. Sleemo liquid 9.Vargino capsule 10.Immuno-BS Herbal tonic
4	Maharishi Ayurveda Product[-34]	1. Amlanta tablet
5.	Nagarjun pharmaceuticals Ahmedabad[-35]	1. Anarmix syrup 100 ml 2. Arshoghana Kashaya 200 ml 3. N-karshya tablet 4.N-Liv Syrup 200 ml 5. N-liv tablet 60 tablet 6. Abhayadi Chatussama vati
6.	Nagarjuna Herbal conc. Ltd.	1.Allergin Granules 100 gm 2.Artilon capsule 3.Nutral tablet 4.PAE DO Syp. 100 ml 5.Pyrid tablet 6.Rheumat 90 syp. 7.Rheumat Balm 20 gm 8.Rheumat tablet 9.Sciatilon capsule 10.Vyoshadi Vataka 100 gm
7.	S G Phyto Pharma	1.Corina Plus syrup 100 ml 2.Decrin Plus Capsule 30 ml 3.Marvin Capsule 30 ml 4.Mebarid syrup.60 ml 5.Nilsin cap 550 cap 6.Palsineuron cap 30 cap. 7.Sunarin capsule 30 capsule
8.	Shri Dhanwantri Herbals	1.Tribhuwana Mishran
9.	Kottakkal	1.Gynakot tablet

		2.Talisule Granules 3.Pilocid tablet 4. Mensokot tablet 5. Mensokot syrup 6.Respikot tablet 7. Vasakot syrup 8. Vasakot syrup S F (Sugar free) 9. Ostikot
10.	Dabur	1.Honitus syrup 100 ml 2. Stimulex 3. Rhematil oil 4.Rheumatil gel 5.Mensta syrup 6.Mensta tablet 7.Gastrina 8.Camne Vid 9.Avipattikar tablet 10.Imudab syrup
11.	Vyas pharma	1.Vigogem tablet 2.Vyas Sunthi churna 3. Shiva gutika
12.	Vaidyaratnam	1.Digestol syrup 2.Rheumacalm tablet 3.Neeli tailam 4.Manjishtadi kashayum tablet 5. Dasmoolarasnadi kashayam gulika tablet 6.Kalasakadi kasahayam 7.Dasmoolarasnadi kashayam 8.Panchakol asavam 9.Soothikamrutham 10.Sudarasanarishtam
13.	Amil pharma	1. Amycordial syrup 2. Amycordial tablet 3. K G Tone forte syrup
14.	Zandu	1 Ayush kwath 2 Kesari Jivan rasayan
15.	Charaka	1. Cephagraine tablet 2. Cephagraine nasal drop 3. Ojus tablet 4. Chropaxe tablet 5. Kofol tablet 6. Kofol lozenges mint. 7. Manoll syrup 8. Regulax forte 9. Rymanyl capsule
16.	Baidyanath	1. Gaisantak bati 100 tab 2. Kabzhar churna 3. Sundari sakhi syrup 4. Sundari sakhi tablet

17.	Unjha pharma	1. Allerzun tab. 2. Amiri jivan tablet 3. Amoebac tablet 4. Unjha Balamrit syrup 100 ml
18.	Sandu	1. Dadimavaleha syrup 2. Haemol forte tablet 3. Corysan tablet 4. Sarak churn
19.	Vasu health care	1. Zeal S F syrup 2. Zeal granules 3. Zeal kid drops 4. Zeal cough syrup 5. Ranger capsule 6. Ranger syrup 7. Vasu PEP-UP Syrup 8. Vasu Zeal Lozenges 9. Vasu Vasulax Tablet
20.	Multani	1. Rhumed S G KIT 2. Rhumed S G Tablet 3. Rhumed S G Oil 4. Rhumed S G Ointment
21.	Kerla Auyrveda	1. Gandharvahastadi castor oil 2. Vyoshadi vatkam 3. GT capsule
22.	Himalaya	1. Koflet syrup 2. Koflet H ginger lozenges 3. Koflet -S F linctus 4. Evecare syrup 5. Evecare capsule 6. Abana 7. Rumalaya tablet 8. Rumalaya ointment 9. Rumalaya oil 10. Evacare fort liquid 11. Himalya gasex syrup lemon ginger 12. Himalya gasex tablet 13. Mentate D S Syrup 14. Mentate syrup 15. Tablet pure trikatu-Digestive wellness herb
23.	Patanjali	1. Divya pidantak vati 2. Divya pidantak kwath 3. Divya pidantak oil 4. Divya churna 5. Divya vatari churna 6. Divya swasari ras 7. Divya herbal tea 8. Divya Patanjali sunthi
24	Macleods pharmaceuticals	1. Enzoheal tablet
25	Sun pharmaceutical industries	1. Heptagone tablet

26	Bixa botanical india	1. Zingiber officinale 200 gm bottle
27	B Jain Pharma	1. Zingiber officinale 200 CH(30 ml)
28	Deve Herbes India	1. Pure zinger essential oil
29	Healthvit	1. Zingiber powder
30	Biological E Ltd.	1. Bestozyme capsule
31	RKM Health Care	1. Cofrest DM Syrup

DISCUSSION

Discussion is the analytical elucidation of the literary materials and acquired clinical findings in order to provide the perception of certainty in entirety. Any research work without discussion about its nature, usefulness and importance is said to be incomplete. Vitarka sambhasa (capability to discuss on the basis of Shastra) is one of the six qualities which should be present in an able scholar (Ch.Su.9:27). Discussion enhances the knowledge and discussion on the basis of the Shastra, becomes the root of establishment of the concept. This study entitled ***"A DATABASE STUDY ON ARDRAKA (Zingiber officinale) USED FOR THE TREATMENT OF VARIOUS DISORDERS AS MENTIONED IN AYURVEDIC CLASSICS"***

Before the conclusion of the work it is necessary to discuss about the findings of all sections.

Discussion is elaborated under the following headings:

1. Discussion on review of literature
2. Discussion on drug review
3. Discussion on karma (therapeutic uses) along with probable mode of action
4. Discussion on modern action
5. Discussion on toxicology
6. Database study.

1. Discussion on review of literature:

The word ginger comes from the ancient Sanskrit word singabera, meaning Shaped like a horn. Ardraka was first described in Rigveda in the name of Vishvabheshaj and latter it was described in different Ayurvedic Samhitas and Nighantus in different names. In ***Kaideva nighantu***[17], *(15th cent.)* it is mentioned that it is having *katu rasa* and *ushna veerya.* It is *deepana* and *vrushya* and it cures *shvasa, kasa, vami, hikka, vibanda, vata* and *pitta doshas.*

In ***Rajanighantu***[14], *(17th cent.)* it is mentioned that it is having *katu rasa* and *ushna veerya.* It is *deepana* and *hridya* and it cures *shopha* and diseases of *throat.*

In Bhavaprakasha Nighantu13, (16th cent.) it is mentioned that, before the meals it always pathya with the help of lavana for bhakshanartha. It causes agnisandeepana, ruchya and vishodhana of kantha and jihva. It cures kushta, pandu, rakthapitta, vrina and jwara. It is contraindicated in daha condition and also nidaagha and ksharadhruthus.

In Madanapala Nighantu12 (14th cent.), it is mentioned that it is having the actions like ruchya, amavathagni, paachani and laghu. It is having snigdha and ushna guna, katu vipaka and cause vibandha of vatha and kapha. But Ardraka is having guru guna and deepana and bhedana actions.

In Sharangadhara samhitha5 (1300 AD), it is mentioned that shunti with guda and thila, kalka is prepared and taken with anupana i.e., dugdha cures parinama shoola and amavata.

In ***Dhanvanthari Nighantu***[-10]***(10-thcentury)***, it is mentioned that *shunti* is having *snigdha* and *ushna guna* and *vrishya* property. It cures *shopha, aruchi, vathodara, shvasa, pandu, shlipada* etc

2. **Discussion on drug review:** It has two forms wet form and dry form.The fresh rhizomes are known as to be ardraka and dried rhizomes as be sunthi. Both are same in rasa and virya but differ in vipaka and guna. Ardraka is katu in vipaka and ruksha in guna while sunthi is Madhur vipaka and snigdha guna. Main chemical composition[18] of GINGER is 'GINGEROL' along with essential oil resin, nonalol, zingerone, gycine, curcumene, β- D-curcumene, β-bourbornene, d-borneal, citral, d-camphene, citronellol, geraniol, α-& β-zingiberenes, zingiberol, , paradol, gingerenone A, ginger glycolipids A, B, & C; gingerdiol; gingerone B & C, nutrients like Protein, carbohydrates, crude fibre, Vitamin C, E, K, Calcium, Iron, Zinc etc.

   Acharya Charak mentioned Ardraka in Deepaniya, Arshoghna, Truptighana, Stanyashodhan, Shitprashamana, Trishnanighrahanan, Shoolprashamana Mahakashaya.due to their kaphavata har properties

3. Discussion on karma (therapeutic uses) with probable mode of action:

Due to properties rasa, virya, doshaghana etc of ardraka and sunthi's most of formulations used in kaphavataj disorders such as swas, kaas, hikka, sula, hardya roga, chardi etc

Ginger is an aromatic stimulant to gastrointestinal tract and stomachic, also sialagogue and digestive. Externally, a local stimulant and sub facient. Due to its ushna quality it acts as kapha-vata samak, aam pachak and srotasuddhi-karak.

Ginger being aromatic and pleasant by pungent, is commonly used as a spice agent in the preparation of condiments, curries ginger bread and a conserve and syrup are made from the fresh younger rhizomes.

Therapeutic uses:

It is used in all types of kaphavataj disorders.

Externally it is used in aamvat, sandhisotha as poultice in lukewarm condition. In order to remove coldness and lassitude it can be used as poultice and sunthi churna is indicated for manage mixing with oil. In sotha roga sunthi churna is applied for udvartana.

Systemic uses:

Nervous system: it is useful in all type vatika disorders.

Digestive system: it is used in anorexia, hiccough, vomiting, agnimandya, kosthavat, adhmana, udarshool and in arsha it is effective. It acts as good aam pachaka and fresh ginger is used with salt for improving appetite and for a gestion of foods.

Respiratory system: it is prescribed in kash, swash, hiccough and pratichhay (allergic rhinitis). The appraisal juices are used as adjuvents.

Cardiovascular system: it is used as cardiac stimulant also effective in hridyashool, slipad, sotha, aamvata and sitapitta.used in the form of churna and juice of fresh ginger as adjuvant with other medicine.

Reproductive system: sunthi is used as vajikaraka drug. The express juice of ginger is very useful in fever specially in sannipatika fever and in visham jwara sunthi churna is useful.

Due to its ushna, tikshna qualities ardraka is contraindicated in kustha, pandu, raktapitta, vrana and in summer season.

4. Discussion on modern action:

- Effect on the gastrointestinal tract- The active components of ginger are reported to stimulate digestion, absorption, relieve constipation and flatulence by increasing muscular activity in the digestive tract.
- Antimicrobial effect- Ginger has strong antibacterial and to some extent antifungal

properties. In vitro studies have shown that active constituents of ginger inhibit multiplication of colon bacteria.

- Effect on cardiovascular system - It stimulates blood circulation throughout the body by powerful stimulatory effect on the heart muscle and by diluting blood. A Japanese study showed that active constituents in ginger reduced the blood pressure and decreased cardiac workload.
- Effect on blood pressure - Several pieces of evidence, mainly from rat studies, have suggested that ginger exerts many direct and indirect effects on blood pressure and heart rate. Research shows that it acts as a calcium channel blocker.
- Effect on blood clotting - High doses of ginger (500 mg/kg) were significantly effective in lowering serum PGE2 when given either orally or IP. However, TXB2 levels were significantly lower in rats given 500 mg/kg ginger orally, but not IP. These results suggest that ginger could be used as an anti-thrombotic and anti-inflammatory agent.
- Antiemetic effect - The mechanism of action of ginger's effect on nausea and vomiting remains uncertain. However, there are several proposed mechanisms. The components in ginger that are responsible for the antiemetic effect are thought to be the gingerols, shogaols, and Galan lactone, a diterpenoid of ginger.
- Antitussive effect - (6)-shogaol, generally more potent than (6)- gingerol, has exhibited antitussive effects.
- Immunomodulatory effect - In vitro evidence indicates that ginger has immunomodulatory effects and is an effective antimicrobial and antiviral agent.
- Anti-inflammatory effect - Ginger has a long history of use as an anti- inflammatory and many of its constituents have been identified as having anti- inflammatory properties.
- Antioxidant effect - In vitro, ginger has been shown to exhibit antioxidant effects. (6)-gingerol appears to be the antioxidant constituent present in ginger, as 1t was shown to protect HL-60 cells from oxidative stress.
- Radio protective effect - In vitro, pre-treatment with [6]-gingerol reduced UVB-induced intracellular reactive oxygen species levels, activation of caspase-3, -8, -9, and as expression. It also reduces UVB-induced expression and _ transactivation ofCOX-2.

5. **Discussion on toxicology:** A single dose of ginger in a dose 5 times the high dose (2500 mg/ kg) can be toxic by causing severe hypotension and bradycardia with induction of hyaline changes and fainting of some nuclei in cardiac myocyte fibres of a pre- necrotic stage. Administration of ginger to rats for 28 days in the low dose (50 mg/ kg) produced bradycardia with waviness of some cardiac muscle fibres. Ginger in a high dose (500 mg/ kg) for 28 days, produced both hypotension and bradycardia with degenerative changes in cardiac myocyte fibers. The hypotensive and bradycardic effects of ginger may partially, be due to induction of vasodilatation by increasing nitric oxide release or synthesis and partially due to a calcium channel blocking effect. Also, a cholinomimetic effect could be contributed in the cardiovascular effects of ginger.

From the above discussion it is observed that the action of ardaka (ginger) as per modern review are almost coincides with the therapeutic effects of depicted in ayurvedic classics

In my study I collected some patent formulations of different pharma in which ardraka is as an ingredient.

6. **Discussion on database study:**

In my study the formulations of drug containing ardraka/sunthi are found **210** available in charaka Samhita similarly compound of medicine use in different disorders having sunthi/ ardraka are available in susrut smahita **183** in astang sanghra **35** in astang hardya **311** in sarangdhar **147** in bhel Samhita **15** in chakardat **69** accordingly total number of formulation have been noted number in to **970.** All these formulations are useful mostly in kaphavataj diseases as describe as above. In my present study outlined as **“a database study on ardraka used for the treatment of various disorders as mentions in ayurvedic classics”** these elements are collected as per as possible from possible sources of ayurvedic classics.

The study also incorporated some of previous work regarding uses of ardraka to pacify the diseases occurring in different system & such works of using ardraka and diseases having tabled from 1 to 970.

SUMMARY

Ardraka (ginger) is not only adds delicious flavor to food, it is also full of nutrients. People have been using the root for cooking and healing for thousand years. ARDRAKA (ginger) is one of the important drugs mentioned among all the Ayurvedic Samhitas and Nighantus. Ardraka is also mentioned as Mahabhaisajya. Reference of Ardraka are found in many Vedas, Ayurvedic Samhitas, Nighantu etc. which is written 5000 years back. It is extensively used as a spice, food preservative in our kitchen and also used as a home remedy for cough. It has sleshmahara, deepen, rochana, svarya, hridya shophahara, shoola prashamana, hikkahara etc. property. Ardraka is one of the main ingredients of many Ayurvedic drug in other way we can say it is widely used multipurpose medicine mentioned in different Ayurvedic texts. It contain- 50% starch, 9%protein, 6-8% lipids, 2% protease, 1-3% volatile oils, vit a and niacin., 3% essential oil that cause the frangrance of the spice. The main constituents are sesquiterpenoids with zingiberine as the main component. Lesser amount of other sesquiterpenoids (Bisabolene and arsenene) and a small monoterpenoid fraction (cineol, citral). Due to this chemical composition it acts as an antihypertensive, blood veso dilator, anti-emetic, anti-inflammatory, antitussive, immunomodulator, antioxidant etc. Safety evaluation studies indicate that Ginger are well tolerate even at a very high dose without any toxic effect. But if Ardraka take in a dose 5 times the high dose (2500 mg/ kg) can be toxic by causing severe hypotension and bradycardia with induction of hyaline changes and fainting of some nuclei in cardiac myocyte fibers of a pre- necrotic stage.

Ancients writings from Roma, Greece, China and Arab countries all describe ginger used as medicine.it was popularly used in Asian medicine as a treatment for stomach and different abdominal diseases including nausea. Other traditional medicinal uses of ginger include treating joint pain, cold and flu like symptoms, stomach pain, menstrual cramps and skin burns.

Today people skill considers ginger a natural way to sootha and upset stomach and there’s research to back up its health benefits. Ginger is also used in tons of modern recipes.

All the data of Ardraka were collected from different Ayurvedic Samhitas and Nighantus along with Ayurvedic and modern research paper were finally hyperlinked.

CONCLUSION

The database study of ardraka (zingiber officinalis) in reference to the ayurvedic and modern texts shows that ardraka widely used in ayurvedic since long ago is undoubtedly the very important medicine. The fresh rhizomes are known as to be ardraka and dried rhizomes as be sunthi. Both are same in rasa and virya but differ in vipaka and guna. Ardraka is katu in vipaka and ruksha in guna while sunthi is Madhur vipaka and snigdha guna. Ardraka performs many therapeutic functions and it recommended by ayurvedic acharyas in various diseases. Due to various properties it is widely used in different diseases like ama-vata, GIT disorder, respiratory diseases, fever, anorexia, dyspnoea, malabsorption, haemorrhoids, chronic fever, anaemia etc. Now scientific evidences are also available in support to enormous number of pharmacological activities of ginger such as cardio protective as hypoglycaemic, hypolipidemic, anti-inflammatory, antiemetic, antimicrobial, antioxidant, antiproliferative, neuro protective, hepatoprotective action. Because of its multiple uses, perhaps it is referred as Vishwausdham & Mahaushadham meaning Universal remedy and Great remedy.

The following eight benefits of ardraka (ginger) are very important

- Reduces cold and cough
- Beneficial for heart
- Treated inflammation
- Prevents cancer
- Ginger improves brain functionality
- Treat muscle pain
- Treats indigestion
- Prevents nausea.

  These benefits of ardraka have been enunciated in different chapter of ayurvedic classics.

From the overall data base study found that ginger is versatile herb with phenomenal phototherapeutic and medicinal properties. It would be difficult to find a place or nutation on this globe that has not benefited through this extra ordinary aromatic herb.

From this exhaustive database study on ardraka available scattered references in ancient ayurvedic classics as well as modern studies collected in one simple and regular

pattern it would be provided a complete knowledge and better updates about ardraka starting from vedas period till recent studies in easy manner which will help current and future researchers in the research field as well as physician in treatment purpose.

REFERENCE

According to table

1. **Charak Samhita**-1 sutar sthan Chapter-2,4,13,24,25,27
   2 viman sthan-7
   3sarir sthan- 8
   4chikitsasthan1,2,3,4,5,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,26,27,28,29,30
2. **Susruta Samhita**- sutar sathan Chapter-14,37,38,39,44,46
   Sarir sathan -2,10
   Chikitsa sthan-5,6,7,8,9,10,11,12,14,15,16,17,18,19,22,23,24,37,38
   Kalp sathan-2,5,6,7,8,
   Utartantra-
   9,11,12,13,15,17,19,21,23,24,26,39,40,41,42,43,44,46,47,50,51,52,53,55,56,57,58,59,60,61,62.
3. **Ashtanga Hridaya**- sutar sthan Chapter.3,4,6,7,10,14,15,27
   Sarir sthan-1,2
   Kalpsidhi sathan-2,3,4,5
   Chikitsa sathan-1,2,3,4,5,6,7,910,11,12,13,14,15,16,17,18,19,20,21,22
   Utarsathan-1,2,3,5,6,7,11,13,16,18,20,22,30,34,35,36,37,38,39
4. **Astang Sanghrah**- sutar sathan Chapter 5,7,8,9,10, 11,14,15,16,17,18,24,25.
5. **Sarangdha**r- purvkhand Chapter-4
   Madhamkhand-1,2,5,6,7,8,9,10,11,12
   Utarkhand-4,5,8,10,11,13
6. **Yogratnakar**- Y.R.P 1.8,1.14,14,2.55
7. **Bhavaprakash** – Chapter 5, 14,26, 54 etc.
8. **Bhel Samhita** – Chapter-2,6,7,10,14,16,17,19
9. **Chakarda**t- Chapter-1,2,3,4,5
10. Dhanavantri, **Dhanavantri Nighantu**2nd edition-1998, sloka 73-74, P.No.-83.
11. .Sodhala**, Sodhala Nighantu**, Ist edition, 2009, sloka 333-334, P.No.64
12. **Madanapala nighantu** of Madanapala, 1st edition 2010, Sunthyadi varga , sloka 12-15 P.no-308-309

13. .**Bhavaprakasha nighantu** of Bhavamisra reprint 2012, Haritakyadi varga, sloka 53- 58, P.no-137
14. Raja, **Raja Nighantu** of Pandit Narhari lind edition, 1998, Pippalyadi varga, shoka 11- 20, P.No.- 135-137.
15. **Priya nighantu** edited by Priyavat Sharma1st edition,2004, Pippalyadi varga, shoka 1-2, P.No.- 57.
16. **Nighantu adarsha** by Bapalal vaidya1st edition, 1985, Pippalyadi varga, P.no-345-356
17. **Kaiyadeva nighantu** edited and translated by Priyavat Sharma reprint 2009, Aushadhi varga, sloka 1165-1169, P.no- 215
18. Prof.D.Shanth kumar Lucas,**Dravyaguna Vijnana** page no 363,364,365
19. Dr.K.Nishteswar, Text book of **Dravyaguna** P.No-307
20. some controversial drugs in Indian Medicine page no-328-339
21. The ayurvedic Pharmacopoeia of India,Goverment of India,department of AYUSH,Part-1,volume-4,P.No-92
22. "A PHARMACO- CLINICAL STUDY OF SHUNTHI (Zingiber Officinale Roxb.) CHURNA IN THE MANAGEMENET OF AMAVATA W.S.R. TO RHEUMATOID ARTHRITIS'' [Doctor of Medicine- Ayurved] DRAVYAGUNA by Milan Prajapati Guide Dr.Anil Pandya M.D. (Ayu.) Post Graduate Department of Dravyaguna Parul institute of Ayurveda, Limda- Vadodara 2017
23. **A STUDY OF THE CARDIOVASCULAR TOXIC EFFECTS OF ZINGIBEROFFICINALE (GINGER) IN ADULT MALE ALBINO RATS AND ITS POSSIBLE MECHANISMS OF ACTION** BY **Iman A. Elkhishin and Ibrahim A. Awwad*,** Departments of Forensic Medicine and Clinical Toxicology, Pharmacology*, Faculty of Medicine, Zagazig, **Vol. XVII, No. 2, July 2009**)
24. **journal of food science & technology (CCRAS1988 V.34(1),1997)**
25. https://en.m.wikipedia.org
26. http://www.homeperch.com/different-tpes-of-fresh-ginger/
27. Ref HPTLC:
    1. E.Sthahl, Thin layer Chromatography- A Laboratory handbook,2nd edn. CBS, New Delhi, India, pp-60-86.
    2. J. Touchstone and J.Sharma, Techniques and Application of Thin Layer Chromatography, 3rd edn. John Wiley and Sons, USA, 1982, p.140.

3. P.D.Sethi, High performance Thin Layer Chromatography, Quantitive Analysis of pharmaceutical Formulations, CBS, New Delhi, India,1996, pp.10-18.
4. J.Sharma and B. Fried, Handbook of thin layer Chromatography, 2nd edn. Marcel Dekker,1996, pp.16-17.

28. CHIFE CHARACTER

www.botanicalauthentication.org

29. **www.easyauyrveda.com/2014/12/20ginger-benifits-research**

30. https://dhanwantri.com

31. https://sdindia.com

32. https://www.jarkpharma.com

33. https://maharshiayurvedaindia.com

34. https://www.nagarjunmaayurveda.com