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A pharmacodynamic study of *Charaka Vishaghna Mahakashaya* with its correlation with anti-oxidant activity

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ABSTRACT

Background: Free radicals are by products of normal cellular metabolism. A balance of free radicals and antioxidants is required for proper physiological functioning. The balance between the production of free radicals and antioxidant defences in the body has important health implications. **Aim & objective:** to study the pharmacodynamics of *Vishaghna Mahakashaya* & the probable mode of action through which it can act as antioxidant. **Discussion:** *Vishaghna Mahakashaya* includes 10 individual drugs which might act as *Vishaghna*. *Vishaghna* property can be understood as the property to act against *Visha*. *Rasapanchaka* of the *Vishaghna Mahakashaya* are predominantly *Madhura, Tikta & Kashaya Rasa, Laghu & Ruksha Guna, Ushna Virya & Katu Vipaka* and proved the concept of *Vipritarthkari Chikitsa* of *Visha.* **Conclusion:** *Vishaghna Mahakashaya* can have potential antioxidant activity. And can play an important role in counteracting the excess free radical. Further studies can be conducted to study its role as antioxidant.

Key words: *Antioxidant, Free Radcial, Vishaghna, Vishaghna Mahakashaya,*

INTRODUCTION

Agada Tantra has always been a part of our life & society. In the past it was used as means to manage & diagnose the bites of *Sarpa, Keeta, Loota, Mushakadi*, etc., to protect the king from getting harmed by the enemies, *Visha Kanya,* knowledge about *Dushit Aahar, Jala* & *Bhoomi* along with their treatment.

With the modernisation of world, there has been modernisation of the world *Visha. Visha* can be defined as the substance that after entering the body causes the vitiation of the *Dhatus* (bodily tissues) and also deteriorates the health of human being i.e., it causes '*Vishada*'(sadness).[1]

The world *Visha* can have both physiological as well as mental aspect with respect to *Sharirika* & *Mansika Vyadhi*.

In present time the word *Visha* can be understood correlated and understood through following modern terms:

- Processed food
- Food adulterants
- Environment toxicology (air, water, & soil pollution)
- Use of plastics
- Cosmetic toxicology (use of chemical-built soap, creams, lotions, toothpaste etc.)
- Occupational toxicology (use of agricultural pesticides, exposure to radiation)

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- Alcohol intake
- Unhealthy dietary pattern
- Drug abuse of substances like heroin, opium, cannabis & other re-creational drugs
- Cigarette smoking

In this article we are going to understand the free radical, antioxidants & how *Vishaghna Mahakashaya* mentioned in *Charaka Samhita* can represent potential antioxidant property.

Materials and Methods

Free radical

Free radicals are the products of normal cellular metabolism. A free radical can be defined as an atom or molecule containing one or more unpaired electrons in valency shell or outer orbit and is capable of independent existence. The odd number of electron(s) of a free radical makes it unstable, short lived and highly reactive.[2] Because of their high reactivity, they can abstract electrons from other compounds to attain stability. Thus, the attacked molecule loses its electron and becomes a free radical itself, beginning a chain reaction cascade which finally damages the living cell.[3]

Free radicals are generated either by normal cell metabolism or by external sources (pollution, cigarette smoke, radiation, medication).

Free radicals are involved in many pathological conditions such as many types of diabetes, neurodegenerative diseases, cardiovascular diseases (CVDs), cancer, cataracts, asthma, rheumatoid arthritis, inflammation, burns, intestinal tract diseases, progerias and ischemic and post-ischemic pathologies.[4]

Antioxidant[5]

Antioxidants are endogenous or exogenous substances which inactivate the free radicals. These substances include the following:

- Vitamins E, A and C (ascorbic acid) e.g., citrus fruits, guava, amla, pumpkin, almonds etc.
- Sulfhydryl-containing compounds e.g., cysteine and glutathione.
- Serum proteins e.g., ceruloplasmin and transferrin

In the most general sense, a natural or synthetic antioxidant directly or indirectly functions to minimize damage to biomolecules (mostly proteins, lipids, and DNA) caused by reactive oxygen species (ROS) and/or reactive nitrogen oxide species (RNOS).

Vishaghna Mahakashaya / Gana has been mentioned at several places in the *Samhita's*.

Charaka Samhita[6]

- Mentioned under 50 *Mahakashaya.*
- हरिद्रामञ्जिष्ठासुवहासूक्ष्मैलापालिन्दिचन्दनकतकशिरीषसिन्धुवारश्लेषमातक इति दशेमानि विषघ्नानि भवन्ति। च.सू.4/16
- *Haridra, Manjishta, Suvaha, Sukshma Ela, Palindi, Chandan, Katak, Shirisha, Sindhuvara, Shleshmatka*

Sushruta Samhita[7]

- Mentioned under 37 *Ganas*.
- *Gana → Aragvadhadi Gana, Lodhradi Gana, Eladi Gana, Shyamadi Gana, Patoladi Gana, Utpaladi Gana.*

Ashtanga Samgrah[8,9]

- He has mentioned both *Mahakashaya* and *Gana.*
- *Vishaghna Mahakashaya → Manjistha, Shleshmatka, Rajni, Suvaha, Shirisha, Palindi, Chandana, Katak, Nirgundi.*
- *Ganas → Anjanadi Gana, Patoladi Gana, Aragvadhadi Gana, Rodhradi Gana, Arkadi Gana, Eladi Gana, Shyamadi Gana.*

Ashtanga Hrudaya[10]

- Mentioned only *Ganas*
- *Anjanadi Gana, Patoladi Gana, Aragvadhadi Gana, Rodhradi Gana, Arkadi Gana, Eladi Gana, Shyamadi Gana.*

Table 1: *Raspanchak* of *Vishaghna Mahakashya*

Name	*Rasa*	*Guna*	*Virya*	*Vipaka*	*Karma*
Haridra[11]	*Tikta, Katu*	*Ruksha, Laghu*	*Ushna*	*Katu*	*Kapha-Pittahara, Varnya,*

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					Prameha, Shotha,
Manjistha[12]	*Madhura, Tikta,Kashaya*	*Guru, Ruksha*	*Ushna*	*Katu*	*Shotha, Raktaatisara, Kushta, Visarpa*
Suvaha[13] *(Rasna)*	*Tikta*	*Guru*	*Ushna*	*Katu*	*Kapha-Vatahara, Shotha, Vatika-Amya*
Sukshma Ela[14]	*Katu,*	*Laghu*	*Sheeta*	*Katu*	*Kaphanashak, Shvasa, Kasa, Mutrakrucha*
Palinidi[15] *(Trivit)*	*Madhura*	*Laghu Ruksha Tikshna*	*Ushna*	*Katu*	*Vatahara, Shotha, Udarroga, Pitta Jvara*
Chandan[16] *(Rakta)*	*Tikta, Madhura*	*Guru*	*Sheeta*	*Katu*	*Raktapitthara, Chakshushya, Vrishya*
Kataka[17]	*Madhura, Kashaya,*	*Laghu,*	*Sheeta*	*Madhura*	*Kapha-Vatahara, Chakshushya*
Shirisha[18]	*Madhura, Tikta*	*Laghu,*	*Ushna (Anushna)*	*Katu*	*Vishaghna, Shoth, Visarpa, Vranaropan*
Sindhuvara[19]	*Katu, Tikta, Kashaya*	*Laghu*	*Ushna*	*Katu*	*Vata-Kaphahara, Chakshusya, Keshya, Krimighna, Shotha*
Shleshmatak[20]	*Madhura*	*Snigdha, Guru, Pichila*	*Sheeta*	*Phala-Madhura Tvak-Katu*	*Pitta-Kaphahara, Visphota, Visarpa*

Table 2: *Visha Guna*

SN	*Visha Guna*	*Charaka* [21]	*Sushruta* [22]	*Vagbhata* [23]	*Sharanghdhar* [24]
1.	*Laghu*	+	+	+	-
2.	*Ruksha*	+	+	+	-
3.	*Aashu*	+	+	+	-
4.	*Vishad*	+	+	+	-
5.	*Vyavayi*	+	+	+	+
6.	*Tikshna*	+	+	+	-
7.	*Vikasi*	+	+	+	+
8.	*Sukshma*	+	+	+	+
9.	*Ushna*	+	+	+	-
10.	*Anirdeshiya*	+	-	-	-
11.	*Apaki*	-	+	+	-
12.	*Avyakt Rasa*	-	-	+	-
13.	*Chedi*	-	-	-	+
14.	*Madavaha*	-	-	-	+
15.	*Jeevitahar*	-	-	-	+
16.	*Yogavahi*	-	-	-	+
17.	*Agneya*	-	-	-	+

Table 3: Ingredients Phytochemical & their Pharmacological actions

SN	*Vishaghna Dravya*	Part used	Phytochemical constituents	Pharmacological action
1.	*Haridra*[25] *Curcuma longa* *Zingiberaceae*	Rhizome	Curcuminoids, curcumin, desmethoxycurcumin, dihydrocurcumin	Antibacterial, cholagogue, insecticidal, antifungal, anti-inflammatory, antiprotozoal, cns depressant, antifertility, antarthritic,

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				hypocholesteremic, antihepatotoxic, antihistaminic
2.	*Manjistha*[26] *Rubia cordifolia* *Rubiaceae*	Stem	Alizarin, purpurin, xanthopurpurin, munjistin, glucose, sucrose	Antioxidant, antibacterial, anticancer, anti-inflammatory, anti-tumor, antiviral, hemostatic, anti-lipid peroxidative activity, hypoglycemic.
3.	*Suvaha*[27] *Pluchea lanceolata* *Asteraceae*	Root, leaf, whole plant,	Quercetin, quercitrin, isorhanetin, pleuchioside, pleuchiol	Anti-inflammatory, anti-oedema, spasmolytic, anti-implantation, analgesic.
4.	*Sukshmaela*[28] *Elettaria cardamomum* *Zingiberaceae*	Seed	α- pinene, sabinene, myrcene, limonene, cineol, cymene	Hepatoprotective, anti - inflammatory, analgesic, antispasmodic, anti-microbial, anti- fungal
5.	*Palindi*[29] *Operculina turpethum* *convolvulaceae*	Root	α- & β-Turpetheins, coumarin, 4'-0-methylpigenin, luteolin	Antibacterial, anti-inflammatory, cathartic, anti-helminthic, cardiac depressant and spasmodic to smooth and skeletal muscles.
6.	*Rakta Chandan*[30] *Pterocarpus santalinus Linn.* *Fabaceae*	Heart wood	Santalin A, santalin B, isopterocarpolone, pterocarpol & pterocarptriol	Hypogylcaemic, antispasmodic, coagulant, nematicidal, anti-inflammatory, anti-arthritic, cns depressant, anticonvulsant, depressant, anti-androgenic, anti-bacterial, antipyretic, anti-allergic.
7.	*Katak*[31-34] *Strychnos potatotroum* *loganiaceae*	Seeds, root	diaboline (major alkaloid) and its acetate ,brucine, loganin, mannose, sucrose, arachidonic, lignoceric, linoleic, oleic, palmitic, and stearic acids.	Anti diabetic, anti-inflammatory, anti-ulcer, hepatoprotective, antioxidant, anti-arthritic, antinociceptive, antipyretic effect, anti-diarrheal, diuretic, contraceptive efficacy, anti microbial.
8.	*Shirisha*[35] *Albizzia lebbek* *Mimosoideae*	Bark, flower, seed,	Melanoxetin, okanin, phytosterol, flavonoids, alizziagenin	Anti protozoal, hypogylcemic, anticancer, spermicidal, abortifacient, anti-asthmatic, anti- allergic, analgesic, antifertility, anti-fungal, anti-ovulatory, anti-anaphylactic, antibacterial, hypotensive, cns depressant, and bronchodilator.
9.	*Sindhuvara*[36] *Vitex negundo* *Verbenaceae*	Leaf	Hentriacontane, β-sitosterol, β-sitosterol acetate, stigmasterol, vanillic acid	Anti-inflammatory, antibacterial, moderate cns depressant, anti-fertility, anti-spasmodic, analgesic, hepatoprotective, estrogenic, anti-convulsant, anti-arthritic, diuretic,

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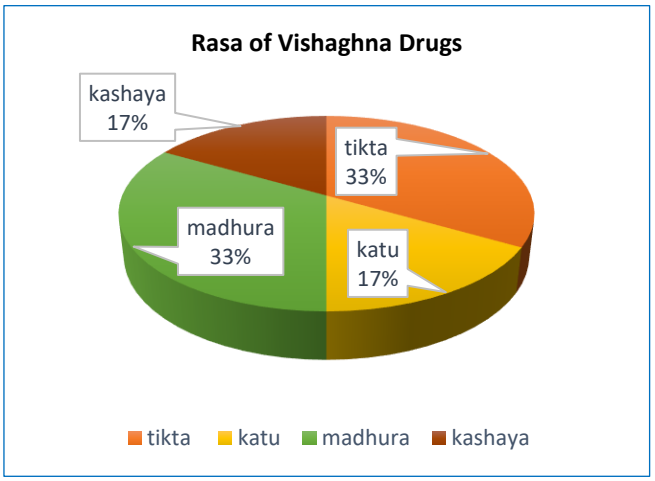
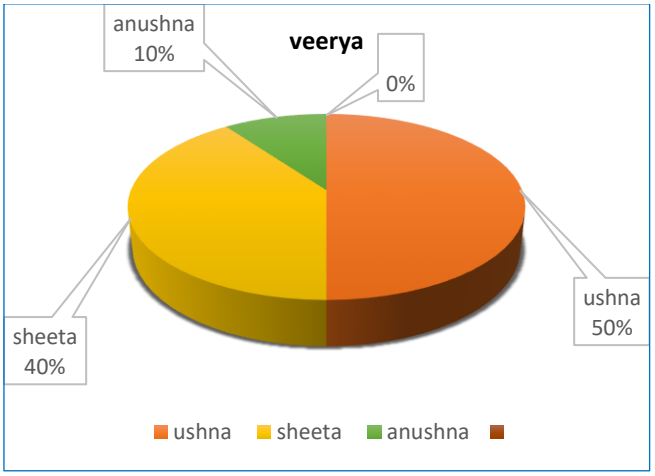
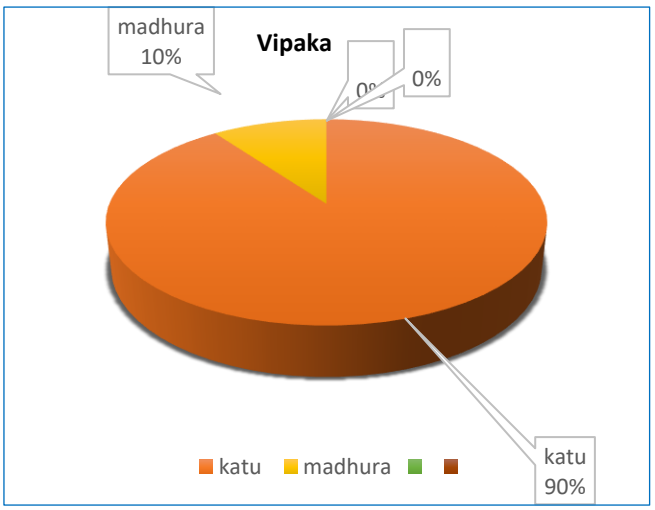
				antimicrobial, anti-parkinsonian, anti-psychotic, anti-depressant, antihistamine releasing activity, mosquito repellent activity, antifeedant, anti-filarial, juvenomimetic, antiandrogenic.
10.	Shleshmatak [37-40] *Cordia dichotoma* *Boraginaceae*	Stem bark, fruit	α-amyrins, betulin, octacosanol, lupeol-3rhamnoside, β-sitosterol, β-sitosterol-3glucoside	Normoglycemic, wound healing activity, anti-microbial, antifungal, analgesic, anti-bacterial, cytotoxic activity, anti-oxidant activity, anti-diabetic activity, anti-helminthic activity, anti-ulcer, anti-inflammatory, anti-implantation activity.

Discussion

There are 50 *Mahakashaya* as per *Acharya Charaka*. One of the *Mahakashaya* taken for study was *Vishaghna Mahakashya.* There are ten drugs in each *Mahakashaya* i.e., *Haridra, Manjistha, Suvaha (Rasna), Sukshma Ela, Trivrut, Rakta Chandan, Katak, Shirisha, Shleshmatak & Nirgundi*. These *Mahakashaya* can be used both internally and externally. Moreover, out of the *Panchvidha Kashaya Kalpana*, it can be further used in many other dosage forms such as *Swarasa, Kalka, Kwath, Phanta* or *Hima Kalpana.* The dominant *rasa* are *Madhura* & *Tikta* (33%) followed by *Katu* & *Kashaya* (33 %) consecutively. Among *Guna's* of *Vishaghna Dravya, Laghu Guna* (40%) seems to be dominating followed by *Ruksha Guna* (20%), *Pichila , Snigdha* (7%) & *Tikshna Guna* (6%) respectively. *Ushna Veerya* (50%), followed by 40% *Sheeta Veerya* with 10 % of *Anushna Veerya*. In *Vipaka* also, *Katu* (90%) is the dominating *Vipaka* followed by the *Madhur Vipaka* (10%).







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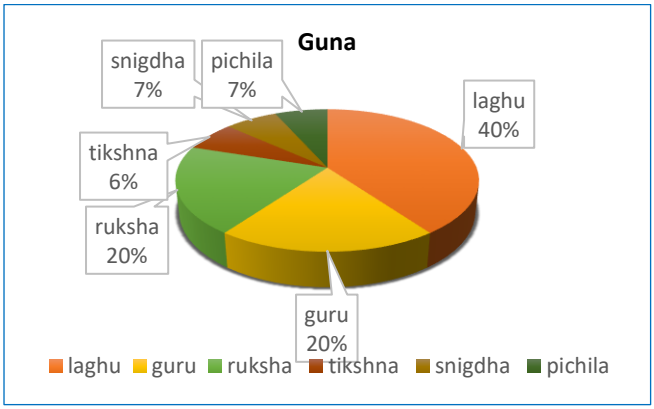

Rasapanchaka of *Vishaghna Mahakashya*

It can be seen that these *Vishaghna Mahakashya Dravya's* will act against the *Visha* by the virtue of their *Dravyaguna* properties. It is observed that these *Vishaghna Mahakashya* possess *Dravyguna* proprties which seems to be similar to the properties of *visha*. These *Dravya's* possess the same potential similar to *Visha* to fight against the *Visha*, so that it can reach the places where *Visha* has been placed in the body. Although among the rasa where *Madhur & Tikta* seems to be prevailing, will help in the process of fighting the *Visha* along with the healing. As per *Acharya Charaka*, *madhura Rasa* & *Tikta Rasa* is responsible for *Vishaghna* property which justifies its role as *Vishaghna.*[87]

These 10 drugs individually possess antioxidant properties proved through modern methods. Various research has been conducted on the constituents of *Vishaghna Mahakashaya* accounts for its antioxidant properties. Properties of *Vishaghna Mahakashaya* when compared to *Visha Guna, Laghu, Ruksha, Ushna & Tikshna Guna* seems to be common. Similarly, when compared with *Oja Guna, Snigdha, Sheeta, Pichila & Madhura Guna* seems to be common. When the formulation possesses properties like *Visha*, it will counteract against *Visha* with almost same strength, as *Visha* acts in the body. With the similarities in properties of *Oja*, it will help in preventing the after effects of *Visha* by its *Snigdha, Sheeta, Pichila & Madhura Guna*.

Conclusion

It is observed that *Vishaghna Mahakashya* can act antioxidant and act against free radcials through its *Dravyaguna* property. Similarly, the free radicals act at cellular and tissue level, and seems to act in similar way to *Visha* such as, *Marmaghna* i.e., it effects the vital organs, by its *Sukshama Guna* it is acting at cellular level and destroying the healthy cells. Due to its *Vyavayi & Vikasi Guna*, it travels freely in *Rakta* and causes the further vitiation of other *Doshas*. Free radicals are not limited to any specific system or organ and may get situated anywhere i.e., *Vishada Guna*. Due to its *Laghu Guna*, it is difficult to treat. So, the *Vishaghna Mahakashaya* which is defined as the *Mahakashaya* will act against or counteract the effect of *Visha*. The concept of *Vipritarthkari Chikitsa* is also justified. Therefore, analytical study can be done to establish its role as antioxidant.

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