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# UNRAVELING THE CONCEPTUAL UNDERSTANDING OF THE ANTI-INFLAMMATORY EFFECTS OF DASHAMOOLA: A CRITICAL STUDY FROM A MODERN PERSPECTIVE

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## ABSTRACT

Inflammation is a part of the complex biological response of body tissues to harmful stimuli. Inflammation in Ayurveda is known by different names like *Shotha, Shopha* etc. Ayurveda treats the concept of inflammation as (a) Symptom of a disease (b) An independent disease and (c) A complication of diseases. There are numerous formulations explained by our *Acharyas* for the management of inflammation. *Dashmoola* is thought to be one of the most powerful combinations of several plants utilized in *Ayurveda* for the management of *Shotha*. The paper deals with the concept of understanding the Anti-inflammatory effects of *Dashamoola* in *Ayurveda* with relevant Modern perspective.

**KEYWORDS:-** *Anti-inflammatory, Dashamoola, Inflammation, Shot.*

## INTRODUCTION

*Sopha* (Inflammation) is a complex biological response of vascular tissues to harmful stimuli, such as pathogens, damaged cells, or irritants. The classical signs of an acute inflammation are pain (Dolor), heat (Calor), redness (Rubor), swelling (Tumor), and loss of function (functio laesa). Inflammation is a protective attempt by vascular reaction and cellular reaction to remove the injurious stimuli and to initiate the healing process.[1] Changes in the tissue micro-environment, such as the accumulation of cell debris, and systemic changes in metabolic and hormonal signals, also likely contribute to the development of chronic inflammation.[2] In Ancient literature swelling or inflammation is explained in different terminology, *Varna-Sopha*, *Abhighataja-Sopha*, *Sotha* or *Swayathu*. *Vranasopha* is Inflammatory Swelling, *Abhighataja Sopha* – Traumatic Swelling, *Sotha / Swayathu* is the

swelling as a pathological process. Although *Vrana Sopha, Sotha, Vidradhi, Arbuda, Granthi, Apachi, Kilaka, Meda Roga, Hrudroga, Yakruit-Dalludaha, Plihodara, Jalodara* and so on are different disease entity, even those have their inflammatory back ground.[3]

*Dashmoola* is thought to be one of the most powerful combinations of several plants utilized in *Ayurveda*. *Dashmoola*, according to *Ayurveda*, works primarily on the *Vata Dosha*, reducing its aggravation. *Dashamoola* is a group of ten herbs *Bilva, Patala, Agnimantha, Shyonaka, Gambhari, Brahati, Gokharu, Kantakari, Prishniparni, Shalaparni. Dasamoola* is the drug of choice in *Sotha. Dashamoola* has an anti-inflammatory, analgesic, and anti-platelet effects comparable to that of aspirin.[4]

The paper deals with the concept of understanding the Anti-inflammatory effects of *Dashamoola* in *Ayurveda* with relavent Modern perspective.

## METHODOLOGY

The research is purely a literary one. Modern medicine classifies inflammation as (a) Acute and (b) Chronic (exceeding 3 weeks).[5] Inflammation is the body's response to trauma or infection and is in fact a healing process. The molecular and cellular interactions are directed to facilitate a return to physiologic homeostasis and tissue repair. The response is composed of both local events and a systemic activation mediated by Cytokines. If tissues health is not restored inflammation becomes chronic and continually damages host tissue.[6]

The classics have given extensive coverage to *Shotha* as a disease by dedicating entire chapters to the subject.[7] The disease *Shotha* includes both Oedema and Oedematous inflammation. Inflammation associated with oedema has been treated as an independent disease in the *Samhitas, Charaka*, *Susruta* and *Astanga Sangraha. Shotha* as a disease indicates oedematous condition with general symptoms of heaviness, instability, an elevation of heat, thinning of veins, discolouration.[8]

Chronic inflammation is a cardinal sign of chronic degenerative disorders.[9] A low grade chronic inflammation is also the symptom of most aging diseases.[10] Aging and degenerative disorders go hand in hand. Most of the age-related diseases such as Arthritis, Diabetes, Osteoporosis, Atherosclerosis, Parkinson's disease and Alzheimer's disease are underlined by chronic inflammation. This has been suggested by increased serum levels of inflammatory mediators like cytokine levels in the subjects.[11] Studies have also proved that aging is

accompanied by a 2-4 fold increase in the levels of cytokines.[12] Rudolf Virchow the German physician in the 19th century suggested a link between inflammation and cancer, cardiovascular diseases, diabetes and other chronic diseases.[13] Indeed, in recent years his observations have been confirmed and a molecular basis of most chronic diseases and the associated inflammation has been identified.[14]

*Charaka* narrated that all the diseases can be interpreted as the manifestation of *Sopha* in different structure of the body. *Sushruta* explained the *Vrana* as the outcome of *Vrana-Sopha*. *Vidradhi* & *Arbuda* are the subsequent stages of *Sopha*. As per the explanation of *Ayurvedic* dogmas various intrinsic and extrinsic etiological factors, cause the aggravation of all the three dosha, which in turn vitiate the *Rakta Dosha* that either travel through the vessels (*Rasayani* or *Srotos)*, or may localise in the area of trauma, where ever there is low immunity or relatively weakened structure (*Kha Vaigunya*) resulting in the causation of a *Shopha*. In *Shopha*, (Table no 1) pain is because of vitiated *Vata*, burning sensation and suppuration by vitiated *Pitta*, swelling and discharge by vitiated *Kapha* and the area appears red because of the involvement of vitiated *Pitta/Rakta*.[15]

**Table 1: Classical signs of inflammation with its *doshic* involvement.**

| **Feature** | ***Dosha* Involvement** | **Clinical presentation** | **Pathophysiology** |
|---|---|---|---|
| Rubor | *Pitta* vitiation | Erythema due to capillary dilation | Increased blood flow, Elevated cellular metabolism |
| Calor | | Warmth due to increased blood flow | Vasodilatation, Increased Blood Flow |
| Tumor | *Kapha* vitiation | Edema | Vasodilatation, Extravasation of fluid (Permiability) |
| Dollar | *Vata* vitiation | Pain due to local pressure and stimulation of nerve endings | Release of Soluble Mediators, Cellular influx (Chemotaxis), Elevated Cellular Metabolism |
| Functio laesa | | Alteration in function | |

**Treatment**

*Acharya Charaka* has put forth the *Svayathu Hara Gana* which is nothing but the *Dosamoola* in his fifty pharmacological bases of classification. *Dashamoola* contains ten plants - *Aegle marmelos, Oroxylum indicum, Stereospermum suaveolens, Premna integrifolia, Gmelina arborea, Solanum xanthocarpum, Solanum indicum, Desmodium gangeticum, Uraria picta*

and *Tribulus terrestris*. In the *Ayurvedic* system of medicine it is used as analgesic, antiarthritic, against cough, rheumatism, etc. Many of these ingredients have been evaluated in experimental models of inflammation and pain and have shown to possess anti-inflammatory and analgesic activities for e.g., *Oroxylum indicum, Desmodium angeticum, Premna integrifolia L.* and *Gmelina arborea, Aegle Marmelos, T. terrestris, Solanum xanthocarpum, Premna Integrifolia*.[16] However, surprisingly the widely prescribed *Dashamoola* has never been evaluated in any of the experimental and clinical study.[16] Hence it was out of interest to review the probable pharmacological action of *Dashamoola* in inflammation based on its chemical constituents. The chemical constituents of the 10 drugs are mentioned in Table 2.

**Table 2: The botanical name, Family and Chemical constituents of dashamoola.[17]**

| S.No. | Name of the *Dravya* | Botanical name | Family | Chemical constituents |
|---|---|---|---|---|
| 1. | *Bilva* | *Aegle marmelos* | Rutaceae | Tannic acid, umbelliferine, Alkaloid, most important active principle is marmel oxalic acid, vitamin C, carotene, steroid, calcium, iron, phosphate compound |
| 2. | *Agnimant ha* | *Clerodendru m phlomidis* | Verbenacea e | Pectolinarige nin, Scutellarein, Apigenin, hispidulin, clerosterol, clerodin, cerolic acid, ceryl alcohol etc |
| 3. | *Shyonaka* | *Oroxylum indicum* | Bignoniacea e | "Oroxylin – A" bitter crystalline alkaloid, baicalein and chrysin (flavons), glycoside, pectin, tannic acid. |
| 4. | *Patala* | *Stereosperm um suaveolens* | Bignoniacea e | Crystalline bitter substance |
| 5. | *Gambhar i* | *Gmelina arborea* | Verbenacea e | viscid oil resin, an alkaloid, a trace of benzoic acid |
| 6. | *Shalapar ni* | *Desmodium gangeticum* | Fabaceae | 7 alkaloids and a new β phenlethylla mine base of the halostachine have been isolated from roots |
| 7. | *Prishnipa rni* | *Uraria picta* | Fabaceae | u.lagopodioid es- flavonoids |
| 8. | *Brihati* | *Solanum indica* | Solanaceae | Solanine, carotene, carpesterol, solanocarpon e, diosgenin, B-sitosterol, lanosterol, solasonine, solamargine, solasodine, vit.c etc |
| 9. | *Kantakari* | *Solanum xanthocarpu m* | Solanaceae | B-carotene, carpesterol, diosgenin, solasodine, B- solamargine, solasonine, solanocarpine, tomatidienol etc |
| 10 | *Gokshura* | *Tribulus* | Zygophyllac | Campesterol, B-sitosterol, |

| | | | | |
|---|---|---|---|---|
| | | *terrestris* | eae | stigmasterol, neotigogenin |

## DISCUSSION

Probable mode of action of Dashamoola with respect to the chemical constituents as an anti-inflammatorydrug:

Most of the drugs in this combination processes Alkaloids, tannic acids and flavonoids in it.

### 1. Alkaloids[18]

- Plant alkaloids are one of the largest groups of natural products, it represents a highly diverse group of chemical entities.
- Most alkaloids are well-defined crystalline substances which unite with acids to form salts.
- The basic characteristic of alkaloids allows the formation of salts with mineral acids (hydrochlorides, sulfates, nitrates) or organic acids(tartrates, sulfamates, and maleates).
- Several studies showed that the alkaloid suppress antigen and mitogen-induced lymphocyte proliferation, natural Killer cell cytotoxicity, histamine release by mast cells, interleukin-1 (IL-1) secretion by human monocytes and the action of PAF (platelet activating factor) on platelets (Seow et al., 1989)
- Thus, acts as a potent anti-inflammatory and analgesic drug

### 2. Tannic acids[19][20]

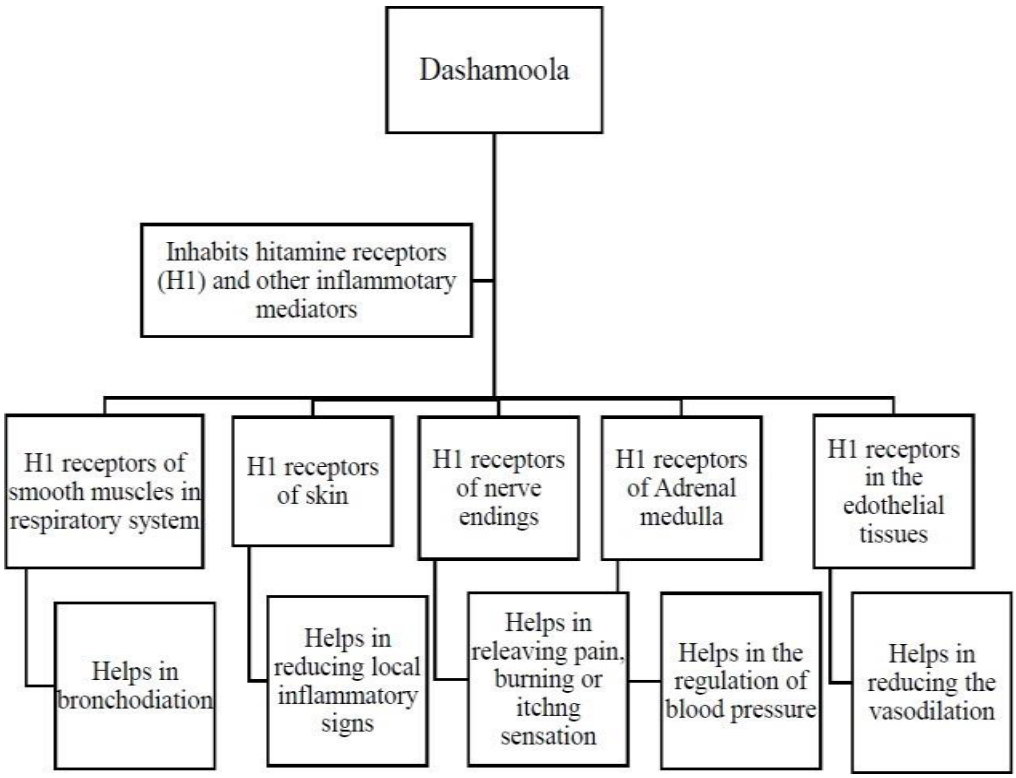
- Tannic acid is a naturally occurring astringent hydrolysable polyphenol.
- TA, have a high affinity for proline-rich proteins in human saliva, which results in the precipitation of these proteins and the sensation of reduced mouth tissue lubrication.
- Reactive oxygen species can trigger oxidation chain reactions that disrupt normal cellular activity, triggering inflammation and tissue death.
- TA has been shown to act as an antioxidant against hydroxyl radical formation and have high superoxide anion radical and hydrogen peroxide scavenging, but also acts as a prooxidant, most notably binding copper ions in chromatin and damaging DNA.
- TA may also produce antimicrobial activity through its interactions with the cell membrane. It is hypothesized that phenolic compounds can form hydrogen bonds between their hydroxyl groups and bacterial membrane proteins. The bonding with hydroxyl groups results in changes in membrane permeability, an increase osmotic pressure and cell destruction.

- TA acts as an anti-inflammatory, antibacterial.

### 3. Flavonoids[21]

- Flavonoids may affect specifically the function of enzyme systems critically involved in the generation of inflammatory processes, especially tyrosine and serine-threonine protein kinases.
- The inhibition of kinases is due to the competitive binding of flavonoids with ATP at catalytic sites on the enzymes.
- It has been reported that flavonoids are able to inhibit expression of isoforms of inducible nitric oxide synthase, cyclooxygenase, and lipooxygenase, which are responsible for the production of a great amount of nitric oxide, prostanoids, leukotrienes, and other mediators of the inflammatory process such as cytokines, chemokines, or adhesion molecules.
- Much of the anti-inflammatory effect of flavonoid is on the biosynthesis of protein cytokines that mediate adhesion of circulating leukocytes to sites of injury.
- Certain flavonoids are potent inhibitors of the production of prostaglandins, a group of powerful proinflammatory signaling molecules and acts as an anti-inflammatory agent.

**Probable mode of action of Dashamoola and Histamine**



## CONCLUSION

Although, these roots individually possess various beneficial activities, together in a specified proportion, they are used as a standard Ayurvedic formulation for inflammatory disorders. Even the plant parts used are different for the treatment of same disease in same formulation. Out of various dosage forms of Dashamoola described in Ayurveda, some frequently prescribed are Dashamoolarishta, Dashamoola Churna, Dashamoola Ghrita, Dashamoola Kalpa, Dashamoola Kwatha and Dashamoola Oil. Alkaloids, tannic acids and flavonoids present in Dashamoola may act as potent anti-inflammatory and anti-oxidant. Also, through the above mentioned probable mode of action on histamine (H1) receptors it acts as Anti-inflammatory and thus it can be practiced in Acute/Chronic inflammatory condition as it is able to break the pathology of inflammation. Further clinical studies are essential to find out its specific systematic action in the human being in future.

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