Dhoopana-A Concept of Fumigation in Ayurveda

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ABSTRACT

Concept of disinfection or fumigation is very important as every host has not optimum level of immunity to defend himself against pathogens causing diseases and so it is commonly practiced in many developed nations to prevent transmission of viral diseases which are airborne in nature such as COVID-19. However, various review of modern fumigating physical & chemical agents e.g. Formalin which are expensive, having crumblsome technique & toxic nature are generally used for this purpose. Therefore, current situation of COVID pandemic demands for the replacement in Ayurveda e.g. Dhoopana Karma for such techniques. As it is cost effective, safe, convenient, effective, and lucrative method of sterilization. Main aim of this paper is to compile all scattered information regarding Dhoopana Karma from different Ayurvedic sculptures. All information of these karma which is in dispersed form is compiled & described under different heads such as history of Dhoopana Karma, synonyms, classification, indications (general & specific), various drugs useful for Dhoopana, their period for collection, different formulations for Dhoopana, instruments for Dhoopana, different modes of administration / procedure, method of storing and preservation of Dhoopana Dravya & duration of procedure in descriptive manner & tabular form. Extensive review

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related with Dhoopana Karma shows that that Dhoopan Karma which is a most common method of sterilization described in an ayurveda & it is categorized under topical (Bahiparimarjana) treatment. Broad spectrum utility of these different formulations of Dhoopana suggests demands for researches in future to study their various pharmacological properties & actions such as bacteriostatic or bactericidal, wormicidal, anti-inflammatory, antiseptic, antimicrobial, antifungal, antiviral, insecticidal anti –pyretic. Suchpe of vivid research may become helpful to prevent the need for medical intervention in entities such as COVID-19. On the basis of this review, it can be concluded that Dhoopana Karma can be used as a type of fumigation for massive & local sterilization in current dreadful outbreak of COVID-19.

**Keywords:** Fumigation; Dhoopan; anti-bacterial; disinfectant.

### 1. INTRODUCTION

Nowadays, COVID-19 outbreak is a specific type of nosocomial infection which is caused due to Corona Virus & it seems to be associated with serious or highly contagious condition. Transmission of this virus becomes favorable due to poor socioeconomic, crowded and unhygienic conditions. This viral disease is affecting a very bad impact on the health-care sectors as well as global economy. In present situation, neither vaccines nor safe and effective chemotherapeutic agents are yet discovered so main attention hould be primarily focused over preventative aspect of this disease. As this type of virus transmitted very quickly through various leading contaminated environmental vehicles such as inanimate and animate surfaces. Among various inanimate surfaces such as florrlaining, door bell acts as breeding ground for such type of virus which can be transmitted due to poor infection control practices. Highly vulnerable group for this type of infection includes person with old age, children, hin-satva, immune-compromised host, persons having resistance developed for antibiotics. It is necessary to provide optimum protection for such persons along with both patients suffering from this entity and hospital staff to decrease its prevalence.

Proper isolation of infected individuals becomes often difficult. By considering the recognition of vital role of various methods of disinfection, fumigation and sanitation in prevention of corona virus outbreak; high level sterilization or disinfection with certain disinfectant or antiseptic agents becomes necessary to control the spread of this infection [1].

General modern methods of sterilization are fumigation method such as Fogger machine or by using chemicals like Formaline solution, Potassium Permanganate, Hydrogen peroxide and silver nitrate etc. [2] However, all these methods of fumigation or disinfection in modern science are quite expensive & having overwhelming & harmful effects such as their carcinogenic nature, nasal irritation, respiratory damage e.g. dyspnoea, headche, hypersensitivity, allergic reaction, immune suppression, skin rash, eye irritation, unpleasant neurological signs [3,4]. This list of disadvantages is again upgraded due to cumbersome process of these current fumigation techniques i.e. lengthy process [5], unpleasant smell & emerging resistance. All these scenario demands for cost effective, safe, convenient remedies of sterilization in Ayurveda which can be adopted by common people at home also.

Concept of microbiology are exclusively narrated by our ancient Acharyas as Bhuta, Raksha, Jantu, Krumi, Graha etc. which can be compared with various infectious agents e.g. Viruses in contemporary view. Dhoopana is one among various traditional technique of sterilization like water purification, Homa, Yagna in Ayurveda. Among these various methods, some sterilization methods e.g. Payana, Dhoopana, Parisheka, Agnitapana etc. are described by Acharya Sushrut and under term Raksha Karma or Nirjantukikarana. Dhoopana Karma is classically indicated in Janpadodhwansa Vyadhi i.e. epidemics or Aoupasargik Rogas which suggests its exploring role in management of the various emerging infectious diseases. Dhoopana Karma is the comprehensive approach of sterilization in Ayurveda based on recent advances in technology and biophysics such as Heat, Chemicals or Radiation in contemporary science. It is beneficial in disinfecting environment of certain area [6].

#### 1.1 Aim

Considering the above scenario & current fact as previous research in microbiology shows various
researches conducted on disinfection of bacteria. However, desinfecotion of virus is not much highlighted. Therefore, it is necessary to prove potency of ayurvedic drugs for fumigation purpose & to estimate viral sensitivity of this Ayurvedic technique by encouraging various research. To achieve this goal, collection of various dispersed informations related with Dhoopana Karma is first thing which is followed by second thing of arranging this compilation in well concised manner to elaborate the role and efficacy of Dhoopana Karma in present context. This paper is foot step to pursue to these both goal.

2. MATERIALS AND METHODS

All relevant information with Dhoopana Karma is compiled from various classical text books of Ayurveda such as Bruhatatrayi, Laghutrayi with their commentaries, various peer reviewed Journals, previous research studies including dissertations conducted on similar subject in Ayurveda as well as in contemopary science from various databases.

2.1 Observations

Extensive review search on Dhoopana Karma shows that there are ample references regarding this Ayurvedic aspect of fumigation with its broad spectrum utility in clinical field as well as for health maintaince but in scattered form. All information collected & sorted under different heads such as History of Dhoopana Karma, synonyms, classification, indications (general & specific), various drugs useful for Dhoopana, their period for collection, different formulations for Dhoopana, instruments for Dhoopana, different modes of administration, method of storing and preservation of Dhoopana Dravya & duration of procedure. Every heads is narrated in descriptive manner & tabular form as follows:

- **History**

Dhoopana is the one of the traditional route of drug administration through the inhalation. Its description is affirmed as higher ceremonies such as Homa, Havana(Agnihotra), Yagya in Veda as well as Bruhatatrayi which are seems to be traditional method of Dhoopana Karma intended for sterilization at massive level [7]. Vivid description of microorganisms in various disorders such as Kustha, Yaksha, Atisara, Shiro Roga, Pandu, Shiro Roga, Hrudya Roga with use of Rakshoghana Gana, Krimighana Mahakasaya recommended in these conditions are observed through out various Ayurvedic sculptures [8].

- **Synonyms**

Various terms such as Rakshavidhi,Raksha Karma,Nirjantukikarana are used as synonyms for Dhoopana Karma [9,10].

- **Classification**

There are various types of Dhoopana Karma with respect to origin, mode of action, expected site of action, etc. are described through out Ayurvedic literature which are tabulated in Table 1.

| S.N. | Type of classification | Description |
|------|------------------------|-------------|
| 1    | On the basis of indications | Prevention of air-born diseases and healthy well-being |
|      | Preventive purpose      | To treat infectious and non-infectious diseases |
|      | Therapeutic purpose     | |
| 2    | On the basis of action [11] | Indicated for specific use |
|      | Dhoopa                 | To be done after Dhoopa to prevent reoccurrence of disease |
|      | Prati Dhoopa           | |
|      | AnuDhoopa              | - |
| 3    | On the basis of mode of administration [12] | Medicated fumes exposure to a whole |
|      | External               | As intake of medicated fumes via oral or nasal route i.e. Dhumapana. |
|      | Internal               | |
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| S.N. | Type of classification | Description |
|------|------------------------|-------------|
| 4    | On the basis of sources /origin

- **Sthavar** (plant origin)
  - Nimba, Vidanga, etc. [13]
- **Jangama** (animal origin)
  - Horn, Hair, etc. [14]
- **Khanja** (mineral origin)
  - Hartal, Manashila, etc.

| 5    | On the basis of area of exposure

- **Local Dhoopana**
  - Vrana Dhoopana
- **Systemic Dhoopana**
  - Jwara (generalised Dhoopana)

| 6    | On the basis of action on wound or pharmacokinetic properties of drug [15,16]

- **Vrana Kathinyakara Dhoopana**
  - Fumigation for hardening of excessively soft tissues of wound with aromatic drugs and heartwood of aromatic plants
- **Vrana Mardavakara Dhoopana**
  - Fumigation for softening of excessively hard tissues of wound with fumes of ghee, bone marrow and muscle fats (Vasa)

### Indications

Various references of Dhoopana Karma throughout Ayurvedic compendium shows that this Karma is useful for preventative, curative & miscellaneous purpose also. Acharya Charaka also advised to perform religious rituals like Yagya etc.regularly in the wake of epidemic diseases (Janapadodhvansa) [17]. Among all indications of Dhoopana Karma described in Ayurvedic texts, its preventative role was aimed at massive or general sterilization. It is chiefly indicated for sterilization or fumigation of operation theatres, labour theatres. It was highly recommended for wound management in Shalya Tantra to avoid secondary infection as well as to promote early healthy healing of wound. Main role of Dhoopana is to check over the spreading & growth of pathogenic as well as non pathogenic organisms on various surfaces and surroundings [18-25].

Its miscellaneous indications consists of its use for a good progeny, prosperity and auspiciousness. It also includes its use for contraception also e.g. Nimba Kastha Dhoopa mentioned by Yogratanakara [26]. In addition to these uses, Dhoopana has also been mentioned for its antimicrobial and growth promoting activities for the healthy production of plants in Vrikshayurved by Bruhattrayi. All these various indications of Dhoopana Karma are tabulated in Table 2.

### Table 2. General indications of Dhoopana

| S.N. | Curative purpose | Preventative or miscellaneous purpose |
|------|------------------|---------------------------------------|
| 1    | Vrana [27,28]    | Fumigation of Kumaragara [38,39], Arishitagar or Breshajagar [40], Vranagar [41], Sutikagar & Vranitagar for sterilization of dressing materials (Kavalika) for sanitization and purification of premises [42] |
| 2    | Arsha [29,30]    | To make sterile different pots, Yantras (blunt instruments) and 20 types of Shastras |
| 3    | Shwasa           | For a good progeny, prosperity and auspiciousness |
| 4    | Visha Vikara     | Repelling the insects, poisonous animals |
| 5    | Umada [31]       | To sterilize Asavas and Arishitas. |
| 6    | Apasmara         | For the healthy production of plants in Vrukshayurved, due to antimicrobial and growth promoting activities of Dhoopana drug |
| 7    | Karna Roga       | Contraception (Y.R.) |
| 8    | Yonivyapada      | To facilitate proper development of children. |
| 9    | Gatra-dourgandhya| Cold season [43] |
| 10   | Sukha Prasava (Easy and punctual delivery) | - |
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| S.N. | Curative purpose or obstructed labour) [32] | S.N. | Preventive or miscellaneous purpose |
|------|---------------------------------------------|------|-------------------------------------|
| 11   | Balagraha [33,34]                           | 12   | Kustha (Skin diseases) [35]         |
| 13   | Vataja Jwara [36]                           | 14   | Aparasanga [37]                     |

- **Drugs for Dhoopana**

Various Dhoopana Yoga with single drug e.g. use of Agaru which is used in Sheeta Jwara [44] or formulations composed of different drugs which are nomenclated by according to their action e.g. Sarvagraha Dhoopa, Visham Jwara, Nashaka Dhoopa etc. or name of the ingredient e.g. Tumburadi Dhoopana, Brihatyadi Dhoopana etc. Total 94 formulations are mentioned in texts for Dhoopana Karma. Karapathyadi Dhoopan has the maximum number of components that is 19. Dhoopana drugs includes various drugs originated from herbal, animal and mineral sources. In our ancient science, drugs selected for Dhoopana Karma have predominance of Agni and Vayu Mahabhuta e.g. Nimba, Guggulu, Sarshap, Vacha, Haridra, Ghee, Chandan, Ushir, Ela. Generally Kushthahara, Krimighna, Kandughna, and Vranaharanga drugs have mostly been used due to their anti-microbial properties. Ghee, Vacha, excreta of different animals, Guggulu & Sarjarasa was used in total 41,23,20,15 & 13 formulations of Dhoopana respectively. Various general Dhoopana dravyas according to different Acharyas are given in Table 3.

Various formulations for Dhoopana according to different clinical conditions & different uses given by different Acharyas are described in Table 4.

Various formulations for Dhoopana of specific material or article according to different Acharyas are described in Table 5.

Apart from these, various 40 Dhoopana Yogas are given by Acharya Kashyapa which are mentioned in Table 7.

| S.N. | Indications | Drugs |
|------|-------------|-------|
| 1    | Jwara Prodomal stage | Leather and hairs of goat, sheep, Vacha, Kustha, Guggulu, Neem & honey or Excreta of cat [52] Jau & Ghee for Vishama Jwara with chills [53] |

Table 3. Various general Dhoopana Dravyas according to different Acharyas

| S.N. | Acharays/ Samhita | Drugs |
|------|-------------------|-------|
| 1    | Atharvaveda       | Guggula, Ajashringi for Kriminashana [45] |
| 2    | Charak Samhita    | Krimighana Mahakasaya (Guduchi, Karkatshringi, Hingu, Inguli, Kantakari, Twak, Nimba, Patol, Apamarga, Guggul) [46,47] |
| 3    | Sushruta          | Rakshogha Gana - Guggul, Agaru, Sarjras, Vacha, Gaur Sarshapa, Lavan, Nimbapatra, Ghrut [48] |
|      |                   | • Fumigation of postoperative wound with analgesic (Vedanahara) and disinfectant drugs (Rakshogha) [49] |
| 4    | Kashyapa          | Rakshogha Drvays - Ghrita, Hingu, Akshata, Skin of Reptile (Snake), Siddhartak (Brassica alba), Dev Nirmalya (flowers of herbs offered to god), Akshata (unbroken rice), Sarpa tvak (shed skin snake) and clothes of old Bhuddhist [50] |
| 5    | Miscellaneous     | Medicated smoking with a Varti made from the paste of Haridra, Patra, Erandamula, Laksha, Manahshila, Devadar, Haritala and Jatamansi [51] |

Table 4. Specific Dhoopana Drugs in different clinical conditions & different uses given by different Acharyas
| S.N. | Indications          | Drugs                                                                                   |
|------|----------------------|-----------------------------------------------------------------------------------------|
| 2    | Sheet Jwara          | Agaru [56,57]                                                                            |
| 3    | Vishamajwara         | Guggulu, Neemba, Vachasarsarshap Ghee [58]                                              |
| 4    | Jirna Jwara          | Guggulu, Nimba, Vacha, Kutha, Haritaki, Sarshapa, Yava with Ghrita [60]                 |
| 5    | Unmada               | Not specific drug are mentioned [61]                                                    |
| 6    | Apara Patana         | Yoni Dhoopana with Kacamani, Sarpnirmoka fumes [66]                                      |
| 7    | Kushtha              | Fumigation with Vidanga and Khadira [70]                                                 |
| 8    | Apasmar              | Guggulu, Vac, Haritaki, Sarsapa, Jatamansi, Lashuna, Hingu, Coraka [71]                 |
|      |                      | Pippali, Saindhava Lavana, Chitraka, Hingu, Vanshapatri, Kakoli, Sarshap, Kakanasha, Bakayana, Chanda, bones and nails of dog [72]. Levigation-urine of goat in Pushya Nakshatra Pitta of dog with Ghee in Pushya Nakshatra [73] |
|      |                      | Excreta of mongoose, owl, Villara, vulture, scorpion, snake, beak, feathers, excreta of crow, poisonous insects [74] |
|      |                      | Nakul, Uluka, Marjara, Gridha, Kita Hikakaja, excreta and beaks of birds [75]            |
|      |                      | Mouth, feathers & excreta of mongoose, owl, cat, vulture, scorpion, snake, crow & [76] |
| 7    | Arsha                | Human hairs, snake slough, cat’s skin, root of Arka, Shamileaves.                       |
|      |                      | Tumbaru, Vidanga, Devadaru, Aksat & Ghrita                                               |
|      |                      | Brhati, Ashvagandha, Pippali, Surasa & Ghrita                                            |
|      |                      | Dung of goat, Saktu and Ghrita                                                           |
|      |                      | Dung of elephant, Sarjarasa with Ghrita. [77]                                            |
|      |                      | Varahadivit Dhoopana [78]                                                                |
|      |                      | Hastipurshadi Dhoopana [79]                                                             |
|      |                      | Arka, Shami, human hairs, Sarpnirmoka, cat skin, Ashvagandha, Tulasi, Brhati, Pippali with Ghrita for letting of vitiated blood [80] |
| 8    | Vrana                | Vrana shodhan Kashaya- Tripala, Kher, Daruhalad Vada, , Pimpal, Pimpri Umbar and veta saal, Bala, Kusha, Nimra patra and badar leaves [81] |
|      |                      | Agaru, Chandana -Dhoopa for hardening and softening of wound tissue to relieves pain, discharges, foul odour, parasites infesting the ulcer, excessive looseness of tissue [82] |
|      |                      | Vrana Mardavakar -Ghrita + Vasa + Majia                                                   |

Shrivastaka, Sarala, Devadaru, Sarjarasa Guggulu, Yava, Ghrita
| S.N. | Indications         | Drugs                                                                 |
|------|---------------------|----------------------------------------------------------------------|
| 2    | Indications         | Drugs                                                                 |
|      | [83,84]             |                                                                      |
|      | Surasaadi Gana      | in wound with maggots [85]                                            |
|      | Vrana-rakshogna      | dhoopa -Guggulu (exudates Agaru , Sarjarasa),                         |
|      | Vrana-Gaura-Sarsapa | Hingu , Lavana , Nimbapatra and Ghruta [86]                           |
|      | In Vata Dushita      | Vrana with discharge- -Shreevestaka, Sarjarasa,                       |
|      | Vrana with         | Sala Devdaru, Sinsapa, Khadira, Asan, Karanja, Yava, Madhuchista,     |
|      | discharge-          | Bhurjapatra, Kshauma&Ghee [87]                                       |
|      | Sharanadhara        |                                                                      |
| 9    | Pradara             | After local snehana & Swedana in vaginal discharge - Sarala, Guggulu, |
|      |                     | Yava mixed with Ghrita or by bitter fish (Saphari) mixed with oil [89]|
| 10   | Garbhasanga         | Sarpanirmoka, Madanaphala [90]                                       |
|      | Krishna Sarpa       | Nimoka, Bhurja, Langali, Tumbi, Kuth, Sarsapa [91]                  |
| 11   | Newborn             | Raksoghanha Dhoopa with incenses warding off evil organism [92]      |
|      | Balaupchara         | (Shanti karma)- Guggulu, Agaru, Sarjarasa [93]                       |
|      | Vacha, Sarshap,     | Hingu, Lavana, Neem & Ghee [94]                                      |
|      | Crow &Trivrit- Vacha| Kustha, Shreevestaka, Sarshap& Ajya [95]                             |
| 12   | Karna roga          | Guggulu, Agaru, Ghrita [96,97]                                       |
|      |                     | Guggulu which helps in reducing pus and secretions [98]              |
| 13   | Yoni roga           | Bruhatiphala, Haridra , Daruwaridra [99]                             |
| 14   | Balagraha           | Horns, skin, hairs of cow, Sarpanirmoka, cats fecas, Nimbi , Kufaki, |
|      |                     | Madanaphala, Bhati, Yava, goat hairs, Devadaru, Sarsapa, Mayurapiccha, |
|      |                     | Sarjarasa, Tusaa, Hingu[100]                                         |
|      | Putikaranja, Dashanga| Sarshap, Vacha, Bhallataka, A jawaina, Kustha& Ghee-PutyadiDhoopaa[101]|
|      | Sarshap, Neem,      | Madar, Vacha, Bhojpatra, hooves of horse & Ghee-SarshapadiDhoopaa[102]|
|      | Bala Graha, Vishama-Jwara | Horn , skin tail of cow, snake slough, excreta of cat, goat hair, |                                                                                                                                 |
|      |                     | peacock feather, human hair, Neem, Kantakari, Banabhanta, Karpasa, Jau, |                                                                                                                                 |
|      |                     | Devdaru, Sarshap, Gandhabiroja, Tusha, Hinga&Ghee Levigation-goat urine-Goshringadi Dhoopa [103] |
|      | In SkandaGraha,     | KarpaasthadiDhoopa - Binaula, peacock feather,excreta of cat, human |                                                                                                                                     |
|      | Unmada, Pishacha,   | hair, snake slough, elephant tusk, horn of cow.Banbhanta, Nirmalya, |                                                                                                                                     |
|      | Rakshasa            | Madanaphala, Dalchini, Jatamansi, Bhusi, Vacha,Hinga& Maricha[104]    |
|      | Bhutagraha          | Karpasbijadi Dhoopa, Graha Roga , Jvara [105]                        |
|      |                     | Snake molt , hairs of camel, goat, sheep and cow,Vacha, Gunja, Sarshap& Ghee in SkandaGraha[106] |
|      |                     | Excreta of owl, hairs (human), nails of elephant or Skandapasmara |                                                                                                                                     |
|      |                      | hairs of a bull & Ghee[107]                                           |
|      | Shakunipratisedha   | Excreta of owl, hairs (human), nails of elephant or hairs of a bull & Ghee[108] |
|      |                      | Ajadi Roma Dhoopana, Skin & hair of goat &Richha, quills of     |                                                                                                                                     |
|      |                      | porcupine, skin of owl’s tail, Hinga levigated in goat urine[109]    |
| 15   | Kukkunuka           | Musta, Haridra, Daruwaridra, Pipali, Sarsapa with Ghrita [110]       |
| 17   | Netra Roga          | Mahanila Gutika [111]                                                |
| 18   | Visha (to eliminate | Tagara, Kutha, Bhujakpati Shira, Shirisha& Ghee                      |
|      | all kinds ofVishas) | Sarvavinashakadhooma[112]                                           |
### Indications

| S.N. | Type of Items | Ingredients of Dhoopana Yoga |
|------|---------------|-----------------------------|
| 1    | Shayaa, Vastras, Rooms Surroundings or Agara, and chairs | Shishuk Dhoop (destroys all diseases) - Ghrita, Jatamansi, Hartala, Musta, Ela |

### Drugs

- JatwadiDhoop - Jatu, Sarjarasa, Ushira, Sarshap, Patra, Valaka, Vella, Aruskar, Pura & Arjuna - Vishaghna destroys poison of animal & vegetable origin; witchcraft, magic do not have any effect [113]
- Sikhipichha(plumes of peacock), Valakasti, Sarshap, Chandana & Ghee A. ShikhipichadiDhoop Sikhipichha(plumes of peacock), Valakasti, Sarshap, Chandana & Ghee Human hair, Sarshap & Guda Kashypaktot Danshadhoop [114]
- SikhipchhadiDhoop [115]
- Shikhipicha, Kukputapicha, Taila & Lavana [116]
- Aakhuvishha Manjistha, Rajani & Lavana-Agardhooma [117]
- VishajaShyawathu Manjistha, Nata, Kusta, snake head & Ghee [118]
- Balaroga ( offers protection) 1] Rakshogtha Dhoopa Ghrita, Sarshapa, Hingu, Dev Nirmalya, Sarpatvaka [120]
  2] Shishuk Dhoop (destroys all diseases) - Ghruta, Jatamansi, Hartala, Musta, Ela
  3] Arishta Dhoop (destroys all diseases) - Ghrita, Nimbi, Patra, Puspa, Phala, Tvaka.
- Contraception Nimbakasha dhoop to be used as a contraceptive.
- To wipe out snakes, mice, spiders and insects Lakh, Khas, Tejpatra, Guggulu, Bhallatak, Arjun, Sarjarasa, Safed Aparajita & Ghee [121] Dhoomagadha
- HikkaPratisedha Sarjarasa & Manashila [122] Ghee, Horn, leather & hairs of cow [123]
- Alsaka Rasnadi Dhoopana - Rasna, Katphala, Shadgrantha, Bothrihatis, Aguru, Guggulu, Ativisa, Kusta, Patra, Vyaghranakha & Ambuda Dry or mixed with cow urine [124]
- Shopha Yava, Madan, Bhurja, Shami & Ghee [125]

### Table 5. Drugs for fumigation of specific items according to different Acharyas

| S.N. | Type of Items | Ingredients of Dhoopana Yoga |
|------|---------------|-----------------------------|
| 1    | Shayaa, Vastras, Rooms Surroundings or Agara, and chairs | Sarshap, Atasi, Hingu, Guggulu, Vacha, Brahmi, Jatamansi [126]     
  • Peacock Feathers, Shirisha and Ghee [127]     
  • Shikhipicha (Plumes Of Peacock), Sarshap, Chandana [128] |
| 2    | Kumaragarap (Paediatric ward - Sterilising of beddings, clotheings, pillows, blankets covering of child) | Yava, Sarsapa, Atasi, Hingu, Guggulu, Vaca, Coraka, Brahmi, Jatamansi, Ashoka, Rohini, Sarpnimok with Ghrita [129]     
  • dried crow feather’s along with Trivarta, Vaca, Kushta, Srivesta, Sarsapa with little ghrita (Clarified butter) [130]     
  • Dead crow with Sarpi, Vasa, Majja Raksoghana Dhoopa [131]     
  • Guggulu [132]     
  • Dried crow and Trivrita [133] |
| 3    | Postoperative management of wound (Fumigation of wound & beds as well as to remove foul odour and flies) | Guggulu, Agaru, Sarjarasa, Vacha, Sarsapa, Lavana with Ghrita [134]     
  • Guggulu, Agaru, Sarjarasa, Vacha, Gaura-Sarsapa, Hingu, Lavana, Neem & Ghee [135]     
  • Guggulu, Agaru, Sarsapa, Sarjarasa, Vacha, Nimba, Hingu, Lavana with Ghrita [136] |
| 4    | Vanaritagar, Shalya mandir (operation) | Raksoghana drugs such as Sarshapa, Nimba, Lavana with Ghrita fumigation to be done twice a day for 10 days [137] |
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| S.N. | Type of Items | Ingredient of Dhoopana Yoga | Benefit |
|------|---------------|----------------------------|---------|
|      | theatre) to destroy microbes & avoid their reattack the surgical patient | Guggulu, Agaru, Sarjarasa, Vacha, Shwetasarashap, Lavan, Neemba, Ghee, Sarshap, Ghee, Neemba, Lavan [138,139,140] |         |
| 5    | Vayushuddhi   | Haridra, Ativisha, Abhaya, Ela, Musta [141,142] |         |
| 6    | Patient room  | Sarshapa, Sarpisha and Lavana (twice a day for ten days) [143] |         |
| 7    | Raksha Vidhana| Gomaya&Agaru [144,145] |         |

Table 6. Special Dhoopan Yoga in Kashyapasamhita

| S.N. | Name of Dhoopa | Dhoopana Dravya | Benefit |
|------|----------------|----------------|---------|
| 1    | Arishta Dhoopa[146] | Ghee, leaves-root-flowers-fruits and bark of Nimba | Destrys Krumi, Bhoota, Pishaccha, It brings good fortune immediately |
| 2    | Subsequent(prati) | Ghee Padmaka, Urshira Balaka, Keshara and Rasa | Beneficial in all the diseases |
| 3    | Grahaghna[147] | Urine and feces of dog, body hair of peacock, Vacha, Ghee and Sarshapa Ghruta, Sarpa nirmok (shedskin of snake), Grudhra vit (feces of vulture), Kaushik vit (feces of owl), Vacha (Acorus calamus), Hinga (Ferula foetida) | Eradicate Graha, Epilepsy |
| 4    | Kama[148] | Ghee, Kana, husk of Vrihi, body hair and hide of monkey, Vacha Sarashava Kushtha and Ela | Eradicate Grahas |
| 5    | Chaturangika[149] | Ghee, Marrow, Fat and Laksha | Used in the less vitiation of Doshas in emaciated child and in disease caused by Graham |
| 6    | Dashanga[150] | Ghee, White Siddharthaka Kushtha Bhallataka Vacha body hair of goat, lagara bark of Bhoorja tree and Guggulu | In all the diseases especially in epilepsy, Grahas and Uparagrasas |
| 7    | Rakshogha[151] | Ghee, Siddhearthaka Hingu garland left over from sacrificed for God, pieces of rice, slough of snake, a piece of monk’s rob | Capable of killing the demons |
| 8    | Svastika Dhoopa[152] | Ghruta, Shallaiki (Boswellia serrata), Jati Pushpa (Jasminum grandiflorum), Shrish Pushpa (Albizia lebbeck), Nameru. | To increase auspiciousness. |
| 9    | Punya Dhoopa[153] | Ghruta, Kunjar danta (elephant tusk), Aja tanuja (body hair of goat), Mesha Tanuja (body hair of aries), Goshrunga (cow horns) | For holy people & holy purpose |
| 10   | Varuna Dhoopa[154] | Shreesveshtak (Pinus roxburghii), Laksha (Encrustations of lac insect-Laccifera lacta), Padmak (Prunus cerasoides), Chandan (Santalum album), Devadaru (Cedrus deodara), Tulas (Ocimum sanctum), Shal (Shorea robusta | Shlesma Roga in summer season. |
| 11   | Shri Dhoopa[155] | Ghruta, Sarpa tvak (shed skin of snake), Bilva (Aegle marmelos), Sara, Siddharthak (Brassica alba), Laksha (Encrustations of lac insect-Laccifera lacta) | For prosperity |
| 12   | Kumar Dhoop [156] | Ghruta, Sarjaras (Vateria indica), Sauviranjani, Bhallatak (Semecarpus | Facilitates proper development of |
| S.N. | Name of Dhoopa | Dhoopana Dravya | Benefit |
|------|----------------|-----------------|---------|
| 12   | S.N. | Name of Dhoopa | Dhoopana Dravya | Benefit |
| 13   | Maheshwar Dhoop[157] | Ghruta (Cow ghee), Guggul Communiphora wightii, Bilva (Aegle marmelos), Devadar (Cedrus deodara, Nameru, Yav Hordeum vulgare) | Cures Graharoga children. |
| 14   | Agneya Dhoop[158] | Ghruta, Gobala (cow’s hair) | Useful in all Graharoga diseases. |
| 15   | Bhadrarankar Dhoop [159] | Ghruta, Haya bala (horse’s hair), Khara bala (donkey’s hair), Ushtra bala (camel's hair), Rushabhdhak, Chatushpad nakha (nails of animals with four limbs) | This Dhoopa is considered to be auspicious, beneficial for Kapha Dosha and diseases with unknown origin. |
| 16   | Uttam Dhoop [160] | Ghruta, Siddharthak ((Brassica alba), Honey, Bheda Shrunga (horns of aries), Ajapaya (milk of goat), Khara Mutra (urine of donkey), Khara Bala (donkey's hair), Soma (camphor)) | Protects from unknown, bad energies. |
| 17   | Moha Dhoop [161] | Ghruta, Siddharthak (Brassica alba), Chorak (Angelica galuca), Guggul (Commiphora wightii), Varahi kanda (Dioscorea bulbifera), Jatamansi (Nardostachys jatamansi). | Helps one to get attractive. |
| 18   | Shishuk Dhoop[162] | Ghruta, Granthaparni (Leonotis nepetaefolia), Jatamansi (Nardostachys jatamansi), Tagar (Veleriana wallichii), Jalamusta, Hirnera (Coleus vettiveroides), Shatapushpa (Anethus sowa), Hartal (yellow orpiment), Manashila (Realgar), Musta (Cyperus rotundus), Ela (Elettaria cardamomum). | Destroys all diseases. |
| 19   | Brahma Dhoop [163] | Ghruta, Siddharthak ((Brassica alba), Laja (puffed rice), Kusha (Desmostachya bipinnata), Brahmi (Herpestes monniera) | All Graha Rogas. |
| 20   | Sukhprada Dhoop [164] | Ghruta, Gokshur (Tribulus terrestris), Vasuka, Haridra (Curcuma longa), Daruhalidra (Berberis aristata), Jalamusta, Vacha Acorus calamus), Bharangi (Clerodendrum serratum) | Considered to increase happiness. |
| 21   | Sarvarog Shasya Dhoop [165] | Ghruta, Padmak (Prunus cerasoides), Ushir (Vetiveria zizanioides), Netrabala (Coleus vettiveroides), Nagakesha (Mesua ferrea), Sarjaras (Vateria indica) | Beneficial in treating all diseases. |
| 22   | Mahoday Dhoop | Ghruta, Vanar loma (body hair of monkey), Kukkutanda (hen egg), Vacha (Acorus calamus), Siddharthak (Brassica alba) | Beneficial in all diseases. |
| 23   | Apasmar Nashan | Ghruta, Nimba Patra (Azadirachta indica), | epilepsy. |
| S.N. | Name of Dhoopa | Dhoopana Dravya | Benefit |
|------|----------------|----------------|---------|
| 24   | Sarva rogaha Dhoop [167] | Ghruta, Nimba Azadirachta indica), Tulasi patra (Ocimum sanctum), Ashvaghna patra (Nerium indicum), Go Bala (cow hair), Mesha Bala (aries hair), Basta Bal (goat hair) | Destroys all diseases |
| 25   | Gana Dhoop [168] | Ghruta, Akshata (unbroken rice), Jati Pushpa (Jasminum grandiflorum), Honey, Siddharthak (Brassica alba), Vacha (Acorus calamus) | All diseases originating from Bhuta. |
| 26   | Grahanashan Dhoopa no. 1 [169] | Ghruta, Guggul (Commiphora wightii) | Graharogas. |
| 27   | Grahanashan Dhoopa no. 2 [170] | Ghruta, Devadaru (Cedrus deodara) | Graharogas. |
| 28   | Grahanashan Dhoopa no. 3 [171] | Ghruta, Krushna Agaru (Aquilaria agallocha) | Graharogas. |
| 29   | Grahanashan Dhoopa no. 4 [172] | Ghruta, Sarshap (Brassica alba) | Graharogas. |
| 30   | Grahanashan Dhoopa no. 5 [173] | Ghruta, Kusha(Desmostachya bipinnata), Kashar Saccharumspontaneum), Shara (Ceratophyllum submersum), Darbha (Eragrostis cynosuroides), Ikshu (Saccharum officinarum) | Graharogas. |

- **Period for collection of Dhoopana Dravya**

As per Kashyapa, the procedure of preparation of these Dhoopana drugs and their collection are appreciated to do in Pushya or Maitraya Nakshatra from southeast or north direction [174].

- **Instruments for Dhoopana**

Acharya Charaka has described specific Yantra for Dhoopana which is a type of Dhoopana for systemic use as that drug introduced in nostril removes Dosha smoothly by suction force as Sharkanda (white stalk of Saccharum arundinaceum) is removed from Munja (leafy circle of Saccharum arundinaceum). This opinion is supported by Ashtang Sangraha also.

Specific Yantra for Dhoopana for local purpose has been especially & exclusively described by Sushruta & Sharanghdara Only. Vrana Dhoopana Netra described by Acharya Sushruta is made of Ashta Angula i.e. eight fingers long, having blunt mouth, thickness of Kalaya and a hole of horsegram size & it is generally used to sprinkle powdered herbal drugs [175]. Sharanghdara supported for the same about dimmenions of Dhoopana Yantra except its length described as 10 Angula [176]. According to Sushruta, Vrana Dhoopana should be given in such a manner that saturated steam produced by Ayurvedic drugs condensed and transfer to the wound in Sharava Samputa (closed container made by soil) [177].

- **Mode of administration / procedure**

Mode of administration of Dhoopana drug is mentioned as in different various forms of drugs such as Choorna, Kalka with with various aromatic drug [178,179,180,181].

- **Storing and Preservation**

Dhoopa made of plant origin drugs, when stored in air tight containers can be used for two years. Dhoopa made of minerals can be used for infinite time. Dhoopa mixture should not lose their original color and aroma.

- **Duration**

Twice a day for 10 consecutive days or till subsidal of diseases condition.

3. DISCUSSION

Dhoopana is the procedure nothing but fumigation with Ayurvedic herbs to prevent or
reduce contamination of air. The concept of Dhooopana is very well elaborated by various Acharyas especially by Sushruta & Kashyapa. Yagya in the form of medicated Dhooopana was performed by the intensity of mass hygiene. Acharya Vagbhatta has mentioned Dhoopan Karma (fumigation) of Vastra, Shayya in Sutrasthana. Acharya Kashyapa has mentioned 40 Dhoopanyogas in Dhoopa kalpaadhyaya. Wide range of drugs are provided by them for different preventative & curative aspect with their exclusive methods of preparation of Dhoopa. In Athravaveda, complete Sukta is devoted for Rakshoghana Karma. There are ample references of this Dhoopana Karma with its detail narration under head.e.g. types, indications, instruments & various drugs useful for it.

Main role of Dhoopana is to check over the spreading nature of pathogens & it is chiefly indicated for sterilization or fumigation of operation theatres, labour theatres. It was highly recommended for wound management in Shalya Tantra to avoid secondary infection as well to promote early healthy healing of wound. It is also indicated in clinical conditions which are transmitted by sneezing, breathing, talking, coughing, raising of dust, spraying of liquid, toilet flushing or any activities which generate aerosol particles or droplets. As microbes or pathogens have generally microscopic structures & these are narrated under terms of Bhuta, Graha, Jantu or Krimi in Ayurveda, Dhoopana is the ideal regime to kill such pathogens & to prevent spreading of infectious diseases especially COVID-19 originated from them through contaminated air.

Some environmental factors such as air-conditioned instruments, addiction of Smoking and dirty air increases the risk for getting vulnerable to Covid-19 as the dried form of Corona virus can survive on contaminated smooth surfaces for over 72 hrs at temperatures of 22-25°C and it is most contagious during the first three days after onset of symptoms. So contaminated surfaces are known to be significant vectors in the transmission of infections in the hospital setting as well as the community [182].

Extensive review of Dhoopan Karma highlighted that Dhooopana was routinely performed for massive & local sterilization in ancient era with the help of Dhooopana dravya which have Rakshoghana, Kushthahara, Krimighna, Kandughna, and Vranaharagana properties. Their bacteriostatic or bactericidal, wormicidal, anti-inflammatory, antiseptic, antimicrobial, antifungal, antiviral, insecticidal, anti pyretic effects are proved by different reaserch studies [183,184,185].

Mostly Agni and Vayu Mahabhoota Pradhan Dravyas are used for this procedure. These are Laghu, Sheeta, Ruksha and Vishada in nature. These qualities of Dravyas helps in its rapid spreadability and quicker combustion. Most of the Dravyas are volatile in nature. Their volatile nature would be a distinct advantage in lowering microbial contamination in air and on difficult to reach surfaces. Various Dhoopana Yoga in contagious disorders like viral fever or JWara and Kusaha suggests its antimicrobial activity. Antimicrobial action of Krimighna Mahakashya is described by Acharya Charaka [186] Antibacterial and disinfected properties of Sushrutokta Rakshogha drugs such as Guggul, Agaru, Sarjrasa, Vacha, Gaursharpa, Lavan, Nimbpatra, Ghrut are proved by Ahire et.al [187] while drugs having animal origin e.g., hairs, nails, horns etc. have sulphur which has desinfectant property present in keratin i.e., structural component which contains sulphur. In many formulations, excreta of different animals are used to repel mosquitoes, worms, maggots and other insects due to their smell & it was also used as these are inflammable due to combustible gases present in it. Dhoopana Dravyas like ghee, sarjarasa are also highly inflammable which helps for burning of dhoopa. Nimb, Guggul, Sarshapa, Nirgundi are proved for their anti-bacterial and disinfectant properties [188]. Properties of Dhoopanadvrya which are widely used in various Dhoopana Yoga are described in Table 7.

The role of Gomaya, Vacha & Ghrita in various Dhoopana Yoga can be justified as Antimicrobial (Bacillus and Pseudomonas) and Disinfectant Properties of Gomaya are proved by D Girija et al. (2013) that gomay showed the positive response in mycelia growth of plants pathogenic fungi which is also found as effective as penicillin and streptomycin in as per studies. Vacha has itself famous for its antimicrobial property. The main role of Ghee used in various Dhoopana Yogas is to help for rapid combustion of cellulose of herbs and keeps the fire alight. Cow dung is used for burning fire and cow Ghee along with Neema Patra should be added to do Dhooopana to fumigate places where prevention of the entry of pathogens is
expected. Moderate action of Arishta Dhoopana Yoga against Escherichia coli is proved by Gund et al. [204]. Antiviral properties of Manjistha, Katukrohini, Madhooka & Plaksha are proved by Sahu P. et al. [205]. In current scenario of dreadful outbreak of COVID-19, drugs having antiviral properties & Dhoopana Yoga mentioned in Jwara Roga can be used.

Loal effect of Dhoopana in specific disease or its effect in the from of Dhoopmapana can be explained on the basis of its different properties such as anticoagulant, vasodilator, anti-inflammatory, thrombolytic and anaesthetizing of drugs used in Yoga. Dhoopana Karma reduces inflammation, itching and eliminates infection by dilating blood vessels and increasing oxidation of blood which ultimately leads to adequate tissue perfusion and oxygenation by virtue of these properties [206,207].

In nutshell, Dhoopana with Ayurvedic drugs fulfill three aspects i.e. Sterilization, Disinfection & Antisepsis by removing or killing microorganisms both in vegetative or spore states by the process of freeing an article or a surface or a medium of them, by the destruction of all

| S.N. | Dravya                  | Properties | Active Principle | Mode of action                                                                 |
|------|-------------------------|------------|-----------------|--------------------------------------------------------------------------------|
| 1    | Guggulu (Commiphora mukul) | Tikta, Katu Laghu Saugandhi | Diterpinoids, amino acids | Krimighna (antibacterial against gram-positive bacteria and gram-negative bacteria) which helps in ceasing the growth of pathogens by destroying their intracellular fluids [189,190,191] |
| 02   | Neemba (Azadiracta indica) | Tikta Laghu Ruksha | Azadicarthin nimbin | Krimighna, Vishgna (antimicrobial, antibacterial property of Nimba against pyogenic bacteria e.g. staphylococcus aureus & staphylococcus pyogenus and antifungal agent) which helps to dry up the intracellular fluid present inside the bacterial wall & hampers the growth of the bacteria [192,193,194] |
| 03   | Vacha ((Acorus calamus) | Katu Laghu Tikshna | asarynidehyde | Krimighna (antibacterial agent against bacterial strains of Salmonella typhi, Pseudomonas aeruginosa, Klebsiella pneumonia and Staphylococcus aureus) helps to stop the bacterial growth [195,196] |
| 04   | Sarshap (Brassica compesteris) | Katu, Tikta Teekshna Ruksha | Allylisothiocyanate | Krimighna (bacteriocidal) [197] |
| 05   | Haridra (Curcuma longa) | Tikta, Katu Ruksha | Resin curcumene | Krimighna (antibacterial properties against gm+ve and gm–bacteria) [198,199] |
| 06   | Chandana (Santallum album) | Tikta, Madhura Laghu | Volatile oil | Krimighna (antimicrobial & Antifungal) and increases the effect of Dhoopankarma due to aroma [200] |
| 07   | Usheera (Viteveria zizinoids) | Tikta Laghu | Volatile oil | Krimighna and increases the effect of Dhoopankarma due to aroma [201] |
| 08   | Ela (Eletteria cardamomum) | Katu, Madhura Laghu | Camphene cyaniol | Krimighna (antibacterial) [202] |
| 09   | Agaru (Aqualaria agollacha) | Katu Laghu | Agarospiron | Krimighna (antibacterial & anti-inflammatory) & special use in Sutikagara [203] |
pathogenic organisms capable of causing infection & by the destruction of disease – causing micro-organisms to prevent infection in patients respectively. On the basis of this triad, it can be claimed that massive sterilization can be achieved through use of Dhoopana by reducing the microbial load of the environment. It destroys worms & germs in environment & it can be used in Pandemics like COVID as it is invasive form of route of herbal drug administration. In addition to these, these preparations are natural and biocompatible. In this way, Dhoopana Karma helps to avoid further spread of contagious diseases through contaminated air in natural way i.e by doing environment cleansing and sustainable conservation without causing any harm to the environment unlike various chemicals and aerosols.

4. CONCLUSION

Due to broad spectrum action (Krimighna, Kaphagna, antiseptic, anti-inflammatory, Anti-bacterial and Anti -infective activity) of Dhoopana Karma, this type of fumigation technique may become integral part of infection control and hospital epidemiology activities in current era. It can prove as main therapy to get rid of harmful micro-creatures. Extensive research is needed to prove this scientific approach of Dhoopana to create aseptic environment. These natural agents may help to prevent such diaseses as well as mitigate the side effects of syntheric desinfectants. Researches should be encouraged in future to develop standard protocol for fumigation with different Ayurvedic Dhoopana Dravya.

CONSENT

It’s not applicable.

ETHICAL APPROVAL

It’s not applicable.

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Authors have declared that no competing interests exist.

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