Role of Dhupa as Fumigation Therapy in Intramural Environmental Cleaning and Sustainable Conservation

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Abstract
Dhupa is a form of incense used in Hinduistic worship since times immemorial. During the Vedic period and establishment of Ayurveda, it was used not only for spiritual purposes but also as a healing tool to cleanse the environment especially for disinfection of labour rooms and houses in that period. The present case study aims to explore the effects of burning a specially formulated Dhupa in the intramural environment. The pre-post changes in the aeromicrospora were studied using standardized devices such as Tilak Air Sampler, Rotorod air sampler and PDA culture media method. The primary investigations demonstrated statistically significant changes in the various types of aeromicropsora after burning the dhupa twice daily for three consecutive days. Similarly, exposure of petri plate method revealed that after burning the dhoop there was not a single bacterial colony seen even after 5 days post exposure to Dhupa. it has significant role in reduction of various types of aeromicrospora within the intramural environment. Such a natural and bio compatible agent can potentially be used as a part of environmental cleansing and disinfection especially in the context of ever rising inhouse and external air pollution. These findings of preliminary study have revealed and proved clearly that burning of dhoop have significant decrease in aerobacteriospora & aeromycospora in the intramural environment & cleaned or purifies the air & development of sustainable environment.

Keywords: Environment, Development, Conservation, Dhoop, Aeromicrobiota, Air samplers, Air sampling, Purification of air.

1. Introduction

Vedas are the soul of Indian culture and the crux of ancient Indian literature. By churning the knowledge of Vedas, the sages of ancient times invented “Dhupa Vidnyan” (Science of Dhupa). “Dhupa” is a form of incense where the incense paste is rolled in the form of pyramids and logs and then dried. The Dhupa logs do not have the bamboo sticks as the common incense sticks (agarbatthis). For most Indians, incense remains an important part of the daily puja ritual, which is a religious offering performed by Hindus as a token of reverence to their deities. Burning of incense also transcended to China and South East Asia after the rise of Buddhism. The smoke created by burning incense is believed to ward off demons and cleanse the surrounding environment.

The modern, organized incense-making is strongly associated with the Ayurvedic medical system of India. The oldest source on Dhupa is the “Atharva-veda” and the “Rigveda.” Incense-burning was used both to create pleasing aromas and as a healing tool. Its use in medicine is considered paramount in Ayurveda wherein Dhupa is used both as internal and external fumigation therapy known as Dhupana (Dhupa burning). In the current context of fast paced life style, rapid industrialization and higher urban concentration of population our environment has been hugely deteriorated and contaminated by several pathogenic microorganisms and overburdened by tense problems in metropolis. Hence, there is a rapid increase in the prevalence of air borne diseases such as cold, hay fever, asthma to swine flu over the past few decades. There is also rise in internal house pollution. Thus, it is imperative to think about safer and natural control measures to deal with this intramural air contamination by various microbes.

‘Krumi’ in Ayurveda include all organisms covering wide range of infectious and infestation causing agents. Since ancient era, Dhupana was used for labour rooms, operation theatres as well as wound management. It was a part of Rakshoghna Vidhi (Preventive Procedure) for various surgical procedures mentioned elaborately in Sushruta Samhita. In this process various medicinal plants were burnt on fire and the smoke generated from it was used to make sterilization of different areas where chance of infections is more.

The classical text of Ayurvedic Paediatrics and Kashyapa Samhita describes in detail the role of Dhupa therapy, both internal and external for health of the mother and infant during post- delivery period. The Dhupa not only disinfects the local area and the surrounding environment but also has a beneficial impact on growth, brain and immunity development of the child.

Dhupa is prepared using prescribed guidelines and contains various liquid herbal extracts, dried powders as well as

oils with potent fungicidal, bacteriostatic and bactericidal action. Considering the potential role of Dhupa therapy in cleansing the indoor environment, the present study was conducted to explore the effect of specially formulated Dhupa on aeromicrobiota.

The principal aim of the study was to assess the effect of burning Dhupa on aeromicrobiota by using Rotorod air sampler, Tilak Air sampler and PDA culture sampling methods.

Material and Methods

For the purpose of the study, specially formulated Dhupa was used and contains 80 various herbs in the form of powders, oils and extracts such as Commiphora, *Ficus religiosa* L., *Santalum album* L., *Calotropis gigantea* (L), etc., having proven antimicrobial properties. One of the standpoints of this Dhupa is that it is a combination of principles of Ayurveda, Herbology and Vedic Science.

This was a detailed case study of a house in the rural area of Kurkheda, conducted over a period of 4 days. Dhupa was burnt continuously for one hour in the house in the morning and evening, before and after burning the Dhoop. Air sampling was done using a Volumetric Tilak air sampler (Tilak and Kulkarni, 1970), Rotorod air sampler (Perkins (1951) modified by Harrington1957) and petri plate culture method using PDA culture media. Tilak air sampler was continuously used for 4 days and Rotorod sampler was used during 4 consecutive days for one hour each (before & after the burning Dhupa). Petroleum jelly coated cello tape were fixed on rotating drum of Tilak air sampler and two brass rods of Rotorod air sampler for trapping the aerobiocomponents in these aerobiological investigations. Culture plates containing PDA media were exposed for 15 minutes before & after burning the Dhupa.

Descriptive statistical measures were used to measure the reduction in aeromicrobial counts and colonies pre and post intervention by burning the Dhupa.

Results

The various types of aeromicrospora that were observed during the study have been recorded as follows. Highest percentage of aero- microspora was encountered by the species of Cladosporium (38%), Fungal hyphae (20.7%), Aspergillus (9.33%), Nigropora (5.54%) and Cellulose fibres (5.25%) totally amounting to 4802mainly belonging to Basidiomycotina, Deuteromycotina and other types.

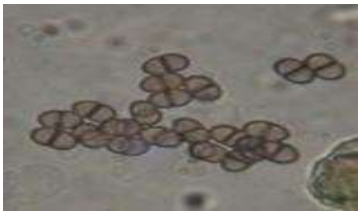
Table 1: Frequencies of Aeromicrobiota

Types of Spores	D1 M	D1 E	D2 M	D2 E	D3 M	D3 E	D4 M	D4 E	Total	Mult. by 14	%
BASIDIOMYCOT INA											
Basidiospores	0	0	0	1	0	0	0	0	1	14	0.29
Ganoderma	1	0	0	0	0	0	0	0	1	14	0.29
DEUTROMYCOTINA											
Alternaria	1	1	0	0	2	0	3	1	8	112	2.33
Aspergillus	23	0	0	0	8	0	1	0	32	448	9.33
Bispora	0	0	0	1	0	1	0	0	2	28	0.58
Cercospora	0	2	0	0	0	0	1	0	3	42	0.87
Cladosporium	23	9	26	0	9	33	13	19	132	1848	38.5
Cordana	0	0	0	0	1	1	0	0	2	28	0.58
Curvularia	0	1	2	0	4	4	4	0	15	210	4.37
Dictyoarthrinium	0	1	0	0	0	0	0	0	1	14	0.29
Helminthosporium	0	0	0	0	1	0	0	0	1	14	0.29
Nigrospora	5	3	3	0	1	3	1	3	19	266	5.54

Periconia	0	4	4	2	1	0	0	0	11	154	3.21
Pithomyces	2	0	2	2	0	2	0	0	8	112	2.33
Spegazzinia	0	1	0	0	0	0	0	1	2	28	0.58
Tetraploa	1	0	0	0	0	0	0	0	1	14	0.29
Torula	0	0	0	0	0	0	1	0	1	14	0.29
OTHER TYPES											
Cellulose fibers	4	0	2	3	1	6	0	2	18	252	5.25
Fungal hypha	13	8	8	7	7	14	6	8	71	994	20.7
Insect wings	0	2	0	1	1	0	0	1	5	70	1.46
Pollen grain	0	0	0	0	0	5	1	1	7	98	2.04
Protozoan cyst	0	0	0	2	0	0	0	0	2	28	0.58
Total	73	32	47	19	36	69	31	36	343	4802	100

Alternaria spp.

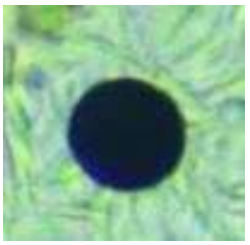
Aspergillus spp.



Bispora

Curvularia

Helminthosporium



Nigrospora

Pithomyces

Spegazzinia

Tetraploa

Epidermal hair

Insect wing

Pollen grain

Figure 1: Microphotographs of Types of Aeromicrobiota

The study demonstrated considerable reduction in the Aerospora before and after burning the Dhupa twice daily for the three consecutive days by Rotorod sampler and Tilak air sampler simultaneously using both to estimate the difference in before after counts in Aeromicrospora.

Table 2: Samples recorded by Rotorod Sampler: Before and After Burning the Dhoop in the Morning.

Morning	Before	After
Day1	18.2	2.96
Day2	14.3	3.45
Day3	8.87	2.46
Mean	13.75	2.95
p value	0.05	Significant

There was statistically significant difference in mean % of aeromicrospora in the morning session after burning Dhupa. (p=0.05)Mean % before burning dhupa was 13.75% in the morning whereas it considerably reduced to 2.95% after burning the dhupa .

Table 3: Samples recorded by Rotorod Sampler: Before and After Burning the Dhoop in the Evening

Evening	Before	After
Day1	16.7	2.96
Day2	15.8	3.45
Day3	7.88	3
Mean	13.46	3.136667
p value	0.06	Borderline signficance

There was no statistically significant difference in mean % of aeromicrospora in the evening session after burning Dhupa.(p=0.051)Mean % before burning dhupa was 13.46% in the morning whereas it considerably reduced to 3.13 % after burning the dhupa .

Table 4: Samples recorded by Tilak Sampler Before and After Burning the Dhoop in the Morning

Morning	Before	After
Day1	14.2	6.6
Day2	5.66	1.6
Day3	9.43	4.71
Mean	9.76	4.3
pvalue	0.04	Significant

Using the Tilak Sampler it was observed that there was statistically significant difference in mean % of aeromicrospora in the morning session after burning Dhupa. (p=0.051) Mean % before burning dhupa was 9.76% in the morning whereas it considerably reduced to 4.3 % after burning the dhupa .

Table 5: Samples recorded by Tilak Sampler Before and After Burning the Dhoop in the in the Evening

Evening	Before	After
Day1	9.43	7.55
Day2	7.55	0.96
Day3	15.1	2.8
Mean	10.69333	3.77
p value	0.14	

The PDA culture plates revealed considerable reduction in colony counts pre and post exposure of burning the dhoop.

Discussion

The present case study taken in house demonstrated statistically significant reduction in aeromicrospora after burning Dhupa for 1 hour continuously twice daily for 3 consecutive days by both Rotorod and Tilak Sampler readings, which revealed considerable reduction in microbial count during post exposure.

Similarly, exposure of culture plate revealed very interesting similar findings i.e. exposure of plate culture after burning the Dhupa there was not a single bacterial colony seen even after 5 days after exposure. While culture plate exposed for aeromycological investigations revealed significant growth of fungal colonies before burning the Dhupa

and there was significant decrease in the colony count after burning the Dhupa.
Burning of dhoop for three consecutive days and two random days resulted in progressive decrease in aerospora even before because of effect of treatment of the previous day as well as after the experiment. Because the effect of burning the Dhoop in the morning was long lasting, till evening. On the last day three Dhoop were burnt at a time which resulted more pronounced decrease in the biocomponents in the air.

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Declaration of Conflict
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